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Clean Energy Investment in the Former Soviet Union (Ukraine and Kazakhstan)

The domestic context

PointCarbon™

August 2008

A country case study completed for IISD's
Clean Energy Investment Project

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August 2008

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Introduction

This study provides an overview of the current status of clean energy development in two countries of the Former Soviet Union. Ukraine and Kazakhstan were chosen to provide an overview for two regions—Central Asia and Central and Eastern Europe.

As a background for the analysis of clean energy situation in the two countries, we review the economy of each country, the state of the energy sector, and government policy in the field of energy and environment. The study looks into major options for clean energy production in the two selected countries, namely: energy efficiency; renewable energy (wind, hydro and biomass); energy efficiency; and the use of biofuels. A separate overview is given of the existing legislation providing incentives for clean energy and energy efficiency. Opportunities under the Kyoto Protocol are also analyzed for both countries.

Clean energy definition

A usual international approach is to consider 'clean energy' to be renewable energy sources, and technologies that result in minimal or zero impact on the environment[1]. The purpose of this study is to identify the state of investment in clean energy technologies in the countries of Eastern Europe and Central Asia using Ukraine and Kazakhstan as showcases. Therefore, the definition of clean energy for this particular region has to be defined in a way to reflect the specifics of the energy market and to focus on the technologies that are already used, or have realistic economic potential to be utilized within the two countries. Technologies that reduce negative environmental impact are included in the clean energy definition for the purpose of this study. At the same time, the study does not focus on the use of such technologies as solar and geothermal energy production and the use of hydrogen, as the use of these technologies is very unlikely to become widespread in Ukraine and Kazakhstan in the near term, and therefore it is unlikely that any significant investment may be expected in these technologies.

Summary of findings

For both countries, the general shortcoming of the post-Soviet investment climate—insufficient legal base, corruption and bureaucracy—in combination with the lack of specific incentives for the use and development of renewables constitute the major barriers to clean energy development.

Neither country, while abundant with renewable energy sources, has effective legislation or policies in place to take advantage of them. While some progress has been made in recognizing the need for clean energy and laying down foundations for

[1] Canada's Clean Energy Technologies Portal. Definition of Clean Energy. URL: http://www.cleanenergy.gc.ca/faq/index_e.asp

its development, it has been insufficient to turn the tide away from reliance on conventional energy sources, especially when they are available in abundance locally.

Even when seemingly sound and innovative policies have been implemented to support clean energy production, their outcomes did not reach their potential. In Ukraine, for example, a robust program existed since early 1990s to support wind energy production which led to the installation of significant wind generation capacity. However, as Ukraine was far from being a market economy at the time, the engines installed were outdated and difficult to service, resulting in low power generation rates, and wide disillusionment with wind energy as a resource. State funding available though a wind power development fund targeted only state companies and Ukrainian equipment producers—in essence supporting a monopoly of an already failing technology. The conditions were, and still are, prohibitive for independent clean energy development, discouraging involvement of foreign companies that could have brought innovation and foreign financing to the failing industry.

Sixteen years after independence, the economies and political milieu in post-Soviet states have changed. Economies are no longer in tatters, the investment climate is improving, legislation and government policies are stabilizing, and policies and functions of the government are becoming more far-sighted. Still, corruption and political instability plague both Ukraine and Kazakhstan, although to different degrees.

While Ukraine has managed to evolve into a sometimes explosive post-Soviet democracy with frequently changing governments and numerous political crises, Kazakhstan remained an authoritarian state where political instability is more of a future threat rather than a pressing impediment. These changes have also reflected to certain extent in the clean energy development. The government of Ukraine has shown chaotic attempts to support energy efficiency and renewables during the last 15 years, in most cases being unable to achieve the planned objectives. Due to the constant political instability, Ukraine has experienced delays with development of legislation aimed at supporting renewable energy. A high degree of bureaucracy and a lack of real economic incentives have lead to similar delays with developing the legislation in Kazakhstan. Kazakhstan has also been slow in the Kyoto process, and as a result is currently losing opportunities to receive additional financing for the clean energy projects under the Kyoto mechanisms.

Despite a number of the serious barriers that hamper development of clean energy, Ukraine and Kazakhstan have significant potential for various activities aimed at energy efficiency and renewable energy development. This study is aimed at identifying the main barriers and incentives for the development of clean energy, providing insights for possible future progress in both countries, and formulating policy recommendations based on current realities and historical developments.

Ukraine

Chapter 1. Background

Trends in energy supply and demand, projections

Ukraine has inherited a large installed generating capacity from the Soviet times. The overall installed electricity generation capacity in Ukraine is over 54 GW. Thermal power plants account for 67% of this amount, nuclear power plants for 24%, and hydropower plants for 9%[2]. However, the structure of the electricity generation does not reflect the share of power plants in the installed capacity. In 2005 48% of electricity was generated by nuclear power plants; 46% by thermal plants and 6% by hydro.

The thermal power plants have a large overcapacity compared to the existing demand; this results in high competition between the plants. Thermal power energy units that were initially intended to work as baseload capacities are working on the margin and are operated under extreme regimes. This situation contributes to degradation of the existing capacity. Most of the electric thermal power plants are single-cycle; the cogeneration is not a widely used technology. Grid losses, although have been decreasing during the last years, still constitute over 14% of the electricity produced.

The current structure of primary energy consumption in Ukraine presented in a graph below characterises the prevalence of highly inefficient and energy-consuming heavy industries over the commodities production and services provision in country's economy. The country's economy heavily relies on the natural gas, mainly imported from Russia. After the sharp increase of the natural gas prices by the Russian suppliers, Ukraine has announced intentions to significantly decrease the share of imported fuels, especially natural gas, in its energy balance. As can be seen from the graph, the consumption of the natural gas has decreased by roughly 10% in one year due to economic reasons. As it is expected that the gas prices will continue to grow, it is most likely that the natural gas consumption will be decreasing further, replaced by increased reliance on the domestically produced coal.

[2] Ministry of Power and Fuel of Ukraine. URL: http://mpe.kmu.gov.ua/

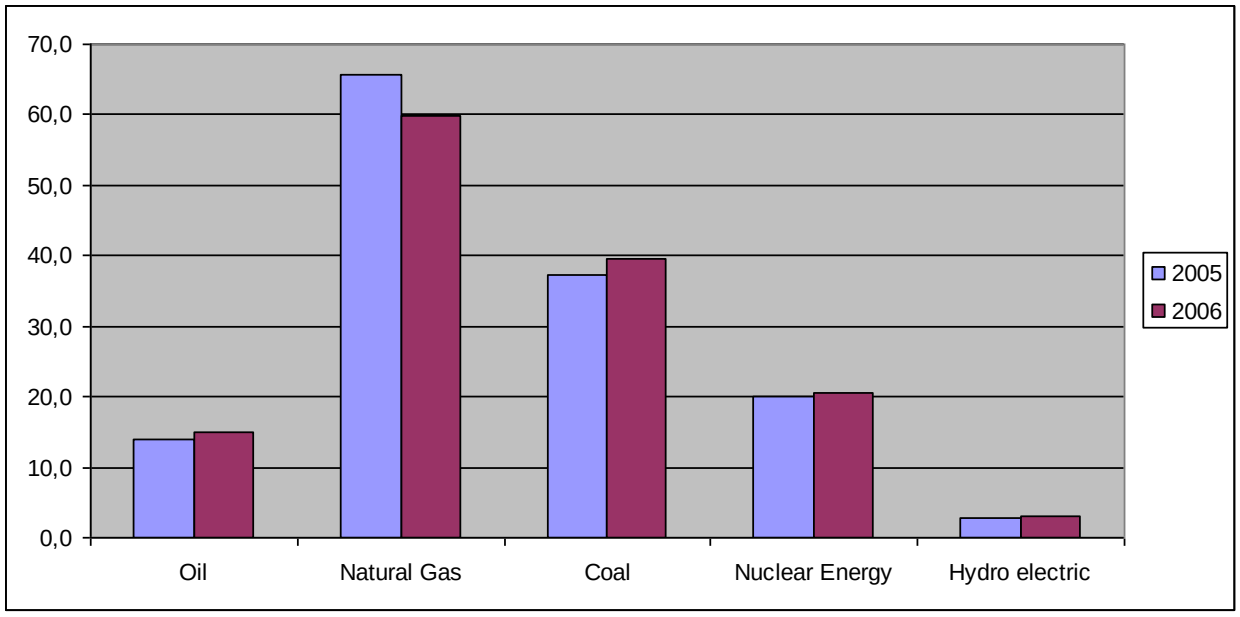


Figure 1. Total primary energy consumption in Ukraine in Mtoe, 2005-2006.

Source: BP Statistical Review of the World Energy; June 2007.

The National energy strategy until 2030 sets the target to decrease the share of the imported fuels in the energy balance from 54.8% of the total primary energy supply to some 11.7%. In particular, the share of gas imports is intended to be reduced from 31.3% to some 3.6% of total primary energy supply (TPES). It is expected that the share of the domestic coal use in the energy balance will grow significantly. The strategy envisages tremendous increase in the electricity production from sources that do not require fossil fuel imports (nuclear, hydropower and renewable energy sources). There are plans to introduce the full domestic cycle of nuclear fuel production to eliminate the need of using processing services abroad. It is projected

that the total energy supply is to grow from 205.2 tons of coal equivalent[3] in 2005 to some 302.7 tce in 2030.

Table 1. Projected changes in the total primary energy supply

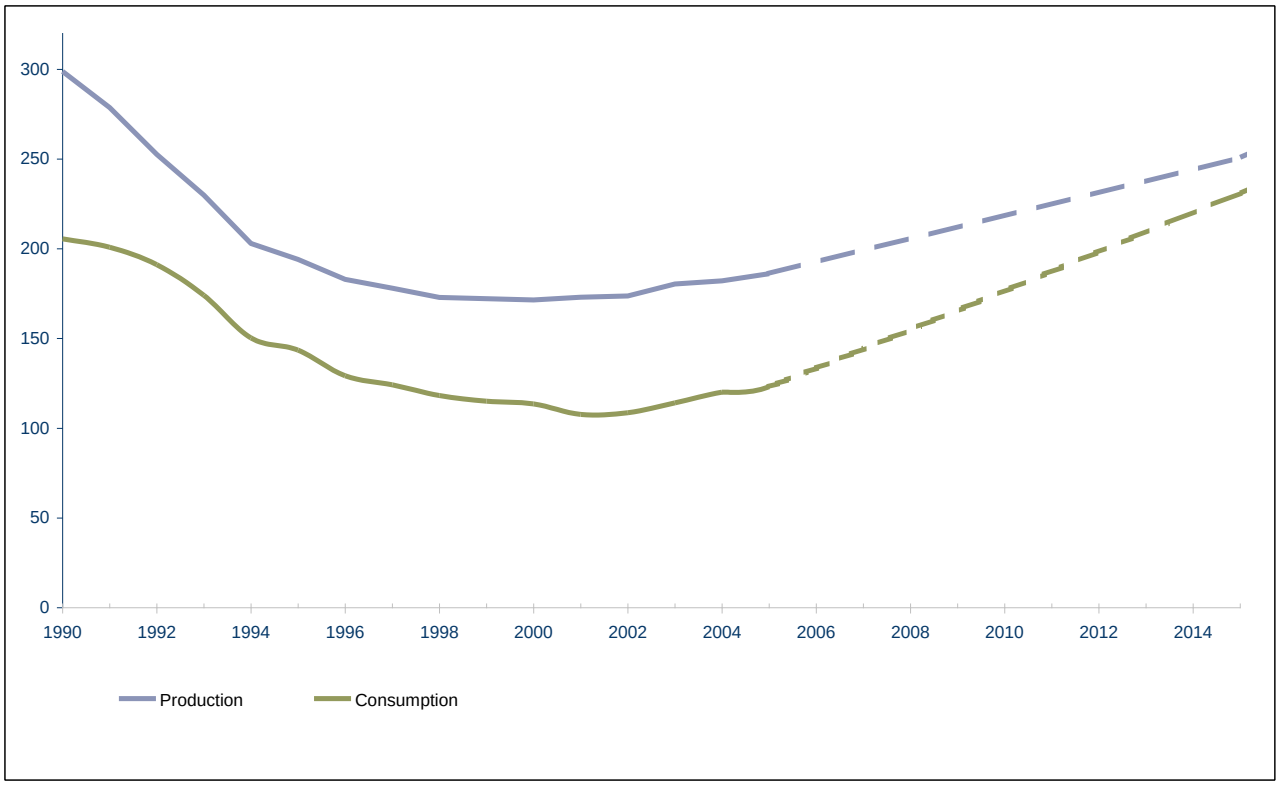
Energy supply	2005 share in TPES, %	2030 share in TPES, %
Domestic coal	20.7	29.6
Imported coal	2.4	3.7
Domestic oil	2.8	6.9
Imported oil	9.6	4.4
Domestic natural gas	11.5	15.2
Imported natural gas	31.3	3.6
Nuclear, hydro, renewable electricity production	10.2	33.6
Uranium imports	11.5	0

Source: National energy strategy until 2030

Electricity consumption is expected to grow 2.2 times by 2030 to some 395 billion kWh compared to 176.9 billion kWh in 2005. The generation is projected to be at the level of 420 billion kWh; some 25 billion kWh will be exported[4]. Therefore, no power shortage is expected in future. According to the strategy, additional demand is to be covered through new coal-fired and nuclear power generation capacities that may be built until 2030.

It is expected that the economy will rely to larger extent on the domestically extracted coal and decrease gas imports substantially. Oil imports are expected to grow from 14.7 Mt in 2005 to 30.4 Mt in 2030; while natural gas imports is expected to drop from 55.9 to 9.4 billion cubic meters during the same years. Ukraine also intends to strengthen its position as the net electricity exporter and boost power exports to 25000 GWh in 2030 compared to 8352 GWh in 2005[5]. Overall it is clear that the main target of the energy policy is to decrease the country's dependence on the imported fossil fuels, in particular the natural gas from Russia.

[3] The common format for presenting the aggregated energy statistics of the former USSR countries are the coal equivalent units. 1 tcoe is app. equal to 0.7 tons of oil equivalent, or 29 308 kJ.
[4] Ministry of Power and Fuel of Ukraine. Ukrainian National Energy Strategy until 2030. Kyiv, 2006.
[5] Ibid.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2014
Production
Consumption

Figure 2. Trends and projections for electricity production and consumption in Ukraine in 1990–2015, billion kWh.
Source: Source: IEA 2007[6], National Energy Strategy.

Table 2. Projected changes in the energy demand by sector

Sector	2005 share in total demand, %	2030 share in total demand, %
Industrial customers	49.6%	40.4%
Agricultural customers	1.8%	2.4%
Transport sector	5.0%	3.1%
Construction sector	0.5%	1.4%
Housing and municipal customers	8.3%	12.0%
Other non-industrial customers	2.5%	5.0%
Residential customers	14.3%	22.2%

Source: National energy strategy until 2030

Power and heat

Centralized district heating systems is the main source of heat and hot water supply in the municipalities. Typical production capacities are either boiler houses or CHPs. The district heating systems are partially privatized, although there is no comprehensive strategy to reform this sector yet[7]. Obsolete equipment and distribution infrastructure makes the district heating systems highly ineffective and leads to the massive energy losses; this contributes to increase of heat prices for the end consumers.

Although there are already few examples of investments in refurbishment of the electricity or heat power plants, such as for example, the modernisation of Starobeshevo power plant[8], the prevailing practice remains the continued use of the old equipment.

Oil and gas

Ukraine is a net importer of oil and natural gas. Although the country has its own oil reserves, the domestic extraction cannot cover the demand for oil and natural gas. Domestic natural gas extraction covers about 25% of the demand[9]; the rest is supplied mainly from Russia and Turkmenistan. The sharp price increase of natural gas supplied from the Russian Federation in 2005 has aggravated the large industry in Ukraine dependant on the unreasonably low gas prices. After the Ukrainian elections, the government of the Russian Federation has launched the negotiations on the current gas prices, showing the intentions on the ongoing gas price rise in long-term period. Recent publications claim possible increase of the price of Russian natural gas for Ukrainian consumers by 10% in 2008.

[6] International Energy Agency. Energy Statistics of Non-OECD Countries 1971-2005. CD-ROM
[7] The Danish Environmental Council. 2006. Barriers and recommendations for development of JI in end-use energy efficiency projects in the residential sector. Ukraine country report.
[8] EBRD. Starobeshevo power modernization project. URL: http://ebrd.com/projects/psd/psd1996/1314.htm
[9] International Energy Agency. Ukraine Energy Policy review. Paris, 2006.

Ukraine has six oil refineries mostly covering the country's demand for gasoline. The share of export and import of gasoline is not significant. All refineries are privatized, while the state retains significant shares in the two of six refineries. The domestic oil extraction covers roughly 15% of the demand in 2004; the rest is supplied mainly from Russia. Ukraine has constructed the Odessa-Brody oil pipeline hoping to diversify the oil supplies and get access to the Caspian oil. However, the project has not succeeded in reaching its initial goal and currently is used to deliver the Russian oil to Odessa refinery.

Coal

Ukraine has significant coal reserves and covers most of the domestic coal demand. Formally, the coal mining industry is mainly under the state control, though in fact most of the profitable mines are under the long-term lease agreements and are in private ownership. Coal to the certain extent is used for power production (17% of overall electricity generation; 2005), as well as for heavy industry such as metals production, cement, etc. The domestic coal consumption is expected to replace the significant share of the imported natural gas.

Coal mine methane

As discussed in the preceding section, the increase in coal extraction is likely to raise coal mine methane emissions to the atmosphere. As of 2000, only 12.4% (260 million cubic meters)[10] of the coal mine methane released from Ukrainian mine was captured. CMM capture and utilization may significantly contribute to greenhouse gases emissions reduction in Ukraine and provide an alternative fuel for energy production. The Kyoto Protocol provides a significant incentive for methane utilization activities in Ukraine.

Hydropower

Ukraine has a relatively large installed capacity of large-scale hydropower plants (4.7 GW). The plants were constructed mostly during 1950-60s and are in need of rehabilitation. Most of the large hydropower plants work on the margin due to the specifics of Ukrainian electricity grid—almost 50% of the electricity is produced by nuclear power plants, which are the must-run capacities. As a result, hydro plants, which are normally used as a baseload capacity, are utilized to cover the consumption peaks. The World Bank is financing a project on rehabilitation of large Ukrainian hydropower plants. The project is intended to be registered as JI under the Kyoto Protocol.

Ukraine has a noteworthy potential for the small-scale hydropower generation. According to Ukrainian Hydro Power Research Institute, over 950 small hydropower plants were operating in Ukraine in 1950 with the total installed capacity of 30 MW. In 1950-60's Soviet gigantomania in industrial development shifted official focus to the development of the large hydropower plants potential. In 1950-60's hundreds of small

[10] Pilcher et al. 2003. Recent trends in recovery and use of coal mine methane. http://www.coalinfo.net.cn/coalbed/meeting/2203/papers/coal-mining/CM056.pdf

HPPs were scrapped, equipment was dismantled and the sites abandoned. Currently only 48 small hydro plants remain in Ukraine, majority of them in urgent need for repair. The Ministry of Fuel and Energy manages 36% of all small hydropower stations (SHPPs), the Ministry of Agriculture manages remaining 60%. The majority of stations are located at rivers of the Central and Western Ukraine.

Biomass

As a country with a strong agriculture and a sizable forestry sector, Ukraine has a high potential for biomass energy development. Ukraine's main biomass resources are contained in agricultural residues such as straw, corn stems, sunflower stems and husks (technical potential estimates at 4 million toe), biogas generation from the cattle, pigs and poultry manure (2.2 billion m^3 or about 1.6 million toe). The overall wood energy potential in Ukraine was estimated at 6.37 million m^3 or 1.58 million toe (1999 data)[11]. The total biomass potential in Ukraine was estimated at 6.35 million toe, of which wood waste makes up a significant share[12]. Despite of high potential in biomass energy development, the actual number of projects in Ukraine remains limited to a small number of technical assistance projects.

Biofuels

As a large agricultural producer, Ukraine has significant potential for the production of biofuels—biodiesel and bioethanol. As of 2005, some 200,000 hectares were used for the rapeseed growing[13]. Most of the rapeseeds are used for the production of oil. At the moment there are no significant domestic capacity of biodiesel production, therefore most of the rapeseed products are exported mainly to the EU. According to the National Agency on Energy Efficiency the main barriers to commercial use of biodiesel in Ukraine are lack of approved state standards preventing the export of certified biofuels, and relatively high production costs that make biodiesel less attractive compared to the conventional fuel. The potential for bioethanol production is also significant, though the first attempt of commercial ethanol use in 2007 have failed due to taxation uncertainties[14].

The energy market

The Ukrainian electricity sector is a highly developed industry, characterized by a full generation and distribution cycle, and electricity and thermal power sales. It consists of seven power generating companies and 27 power supply companies (oblenergos). Close to 95% of all Ukrainian electricity is produced by the centralized generating companies:

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[11] European Bank for Reconstruction and Development. 2003. Renewable Energy Resource Assessment in Ukraine.

[12] Georgiy G. Geletukha, Tetyana A. Zhelyezna, Sergiy V. Tishayev, Sergiy G. Kobzar, Kostiantyn O. Kopeykin. 2001. Concept of bioenergy development in Ukraine.

[13] National Agency for Energy Efficiency. 'On the status of utilization of biodiesel and bioethanol in Ukraine and the world' (in Ukrainian). URL: http://naer.gov.ua/index.php?mod=index&id=104

[14] The production of BIO-100 is in the dead end. (in Russian). Alternative Fuel magazine. August 2007.URL: http://www.fuelalternative.com.ua/magazine/fa_issue.pdf

- 4 regional thermal (i.e. coal-fired) generation companies – Donbasenergo (eastern Ukraine) Dniproenergo (roughly Dnipropetrovsk and Zaporizzhya regions), Centrenergo (central Ukraine) and Zakhidenergo (western Ukraine) comprising 14 powerful thermal power plants (TPPs) with total installed capacity of 36.6 GW;
- 2 hydropower generation companies Dniprohydroenergo and Dnisterhydroenergo comprising cascades of 11 hydropower plants (HPPs) at Dnipro and Dnister rivers with total installed capacity of 4.7 GW;
- Energoatom, state-owned company operating 4 nuclear power plants (NPPs) with total installed capacity of 12.8 GW. One of the NPPs, the Chernobyl NPP was closed in December 2000. To replace its capacities, two new units were put online in 2004—one at Khmelnitsky NPP and another at Rivne HPP.

The state holds about 25% in most of the generating companies. Hydropower and nuclear power, as well as the high voltage grid were barred from privatization and have always remained in the hands of the state.

The 27 regional power supply companies (oblenergos) are in charge of electricity distribution: 25 regional oblenergos (one in each "oblast" [region] of Ukraine) as well as two oblenergos serving the cities of Kyiv and Sevastopol). Oblenergos' assets comprise low voltage power transmission lines, transformer substations, electricity consumption meters and systems and other equipment. Most of these have been privatised. Virtually all of the direct foreign investment in the Ukrainian energy sector is limited to the purchase of two oblenergos by the US-based AES and another four by VEZ (Vychodoslovenske Energeticke, based in Slovakia), now controlled by RWE.
Ukrainian power grid connects to the Western European grid through the Burshtyn Power Station, so-called Burshtyn Energy Island. A connection to the Russian power grid also exists, making it possible for Russia to sell its electricity through Ukraine to Western Europe. However, following launch of two new nuclear reactors, in 2004 provisions were made to allow small amounts of Ukrainian electricity to be sold to Russia.

About 100 independent suppliers - defined as electricity producers with an output lower than 20 MW or 100 GWh - hold the licences for electricity supply at non-regulated tariffs and are allowed use oblenergos' networks. However, obtaining such license is reported to be an extremely complicated process[15]. Electricity consumed by the supplier for its own needs does not need to be sold to the wholesale electricity market.

State-owned Energorynok (wholesale electricity market company) is the only monopoly trader on the market that purchases all generated power[16] and then resells it to power supply companies. Initially, the Ukrainian energy market was intended to

[15] Personal communication.
[16] Data obtained from the Independent electricity generators of Ukraine.

operate on the model of a competitive electricity pool. In reality, it is an administratively regulated system of energy supply and distribution, as the only buyer is a state company that controls all the financial flows (payments) on the energy market, using a system of clearing accounts. The tariffs are regulated by the National Electricity Regulatory Commission of Ukraine, and are determined as a weighted average forward price, based on the load curve and the utilized capacity of generating units.

Trends in energy policy

The main document covering the state energy policy in Ukraine is the National energy policy until 2030, approved in 2006. The energy policy sets a strong emphasis on reducing the imports of fossil fuels, increase of the domestic electricity production (mainly from nuclear, hydropower and renewables) and increasing the consumption of the domestically produced coal. It is planned to link the Ukrainian national grid to the European grid system for the purpose of electricity export to the EU countries.
According to the projections made in the energy policy, the primary energy consumption is expected to grow by 47.5% between 2005 and 2030, while the GDP projections expect three-fold growth[17]. The power consumption in the electricity sector will likely grow by some 123% compared to the level of 2005. The Government has proposed to increase the existing installed capacity of power plants from 52 GW to 88.5 GW by 2030. The capacity increase might be reached by construction of the new nuclear units as well as new capacities, and rehabilitation of the existing TPPs. It is expected that large hydropower storages are to be constructed to add more marginal capacity and compensate the increase of the nuclear share in the sector.

There are no clear plans for further privatization and deregulation in the energy sector provided by the National Strategy. The document considers a number of options for designing a new legislation that would allow privatization of those assets that are still in the hands of the state or have significant state-owned equity (see above). Still there is no existing schedule or roadmap for any major reforms of the energy sector. Therefore, it is most likely that in the near future the energy sector ownership structure would not change significantly.

Table 3. The proposed changes in installed capacity in Ukraine.

	Installed capacity in GW, 2005	Installed capacity in GW, 2030
Thermal power plants	33.5	46.4

[17] Ministry of Power and Fuel of Ukraine. Ukrainian National Energy Strategy until 2030. Kyiv, 2006.

Nuclear	13.8	29.5
Large hydro	4.7	10.5
Renewable energy	< 0.1	2.1

Source: Ukrainian National Energy Strategy until 2030

The strategy proposes to concentrate on utilizing coal mine methane and industrial waste gases as fuel for energy production in terms of clean energy development. Wind power, biomass use and small hydropower generation are also identified as priorities for the renewables development. According to expectations the renewable energy sources might contribute approximately 57.7 tons of crude oil equivalent (tcoe) to the energy balance of Ukraine.

Trends in investment

The country's economy experienced a sharp fall after the Soviet Union had fallen apart in the year of 1991. As a result, centralized economy faced the fragmentation process caused by raw material and energy dependence from the former Soviet republics. However, Ukrainian economy has experienced growth after the period of stagnation and the highest GDP growth rate of 12% was achieved in 2004. Over the past years Ukraine has liberalised its markets, reduced market regulation, removed the majority of licensing requirements and restrictions on foreign currency exchange. The country has curbed inflation and the national currency has been relatively stable over the last 6 years. Ukraine's objective to obtain WTO membership prompts further reforms and much remains to be done to achieve full economic liberalization.

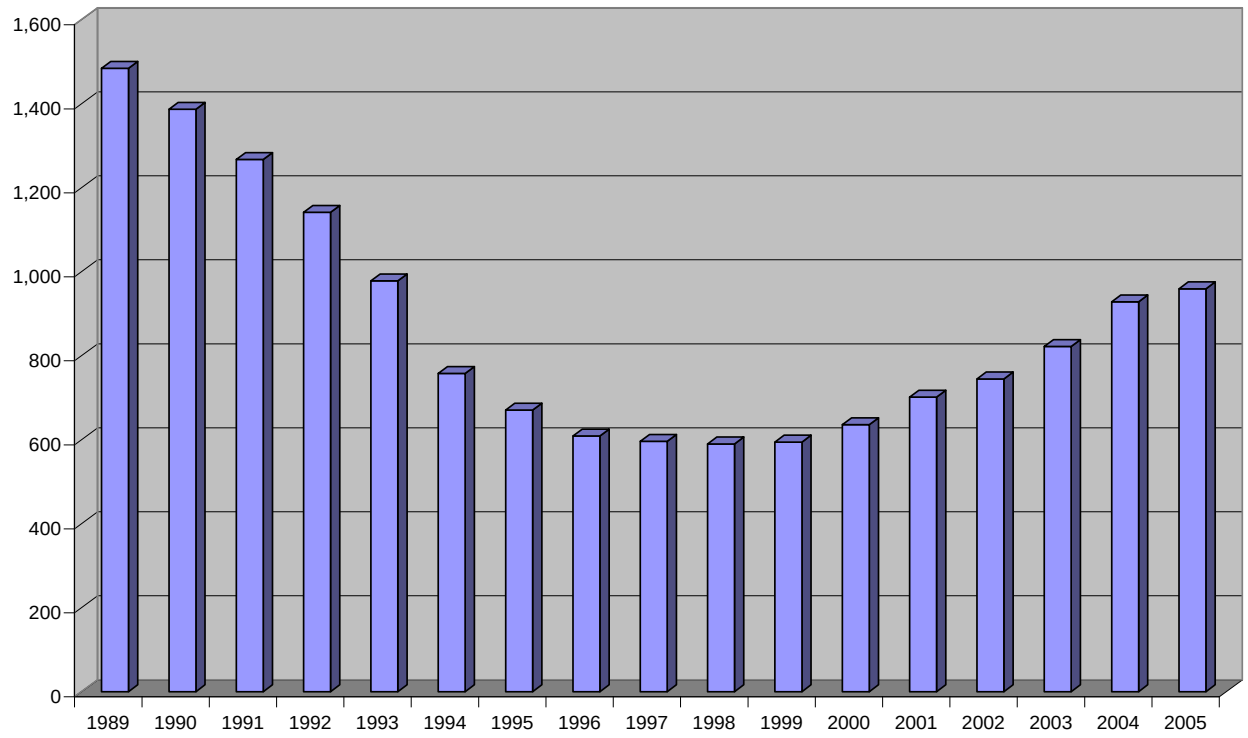
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Figure 3. Historical changes of GDP in Ukraine, 1991-2006.
Source: State Committee of Statistics of Ukraine[18]

Despite the macroeconomic success foreign investment has been deterred by corruption, lack of political and legal stability, transparency issues, and weak judiciary system. The latter includes poor or selective law enforcement and ineffective court system, which sometimes lacks independency. Foreign investors in many cases are disadvantaged compared to Ukrainian companies, and the courts often ignore contractual provisions for international arbitration[19].

Foreign Direct Investment (FDI) levels were modest comparing to neighbouring Eastern European countries until recently. The situation was considerably changed in 2005, when foreign investments more than tripled compared to the period before 'the Orange Revolution.' However, some investors expressed disappointment after they faced the same problems as before 2005. Decrease in the net FDI by 45% (USD 4.29 billion) was reported in 2006, mainly due to the absence of large-scale privatization. Overall FDI stock in Ukraine as of 1 January 2007 equals to USD 21.2 billion or USD 454.6 per capita[20]. The most attractive sectors for foreign investment are banking, wholesale trading, and real estate.

Trends in energy investment

The state keeps strong presence in the energy sector. Most of the large thermal power plants, nuclear power plants as well as coal-mining sector remain under the government control. Therefore, the state policy plays a key role in the energy investment. The majority of large thermal power plants were constructed in 1970s-1980s and are mostly in need of capital refurbishment. Although the Government is the major shareholder in large power generation capacities, the overall approach seems to be an avoidance of financial support for rehabilitation projects from the national budget. That is why the state of large hydropower plants remains insufficient.

For the last decade the energy sector investments were mainly limited by the inflows of the own capital, loans from multilateral banks, and investments from the large Ukrainian financial groups. In the cases when the own capital of the companies involved in rehabilitation projects, the share of external loans usually constitutes up to 80%[21]. Some examples of the large investment projects recently implemented in the energy sector mentioned below:

[18] URL: http://www.ukrstat.gov.ua/
[19] Office of the United States Trade Representative. 2005. Overview of Ukraine. URL: http://www.ustr.gov/assets/Document_Library/Reports_Publications/2005/2005_NTE_Report/asset_upload_file558_7504.pdf
[20] Ukrainian Economic Outlook, 1/2007, URL: http://www.case-ukraine.com.ua/u/db/ca10846b8d2f9ad0954c0eefb89eb377.pdf
[21] For example, see project summaries at http://ebrd.com/projects/psd/country/ukraine.htm

- Rehabilitation of the coal energy unit #8 (300MW) of Zmyivska TPP (financing provided by Siemens and EBRD);
- Rehabilitation of the coal energy unit #4 (175 MW) on Starobeshivska TPP (financed by EBRD);
- Rehabilitation of the large hydropower plants at the rivers of Dnipro and Dnister (financed by the World Bank group);
- Rehabilitation of Burshtynska TPP (financed by Mark & Weddel, Denmark);
- Rehabilitation of Darnytsia CHP (equity financing by Northland Power, Canada)[22]

Another successful example of financial support projects is the energy efficiency program, which was accomplished at Ladizhynska and Trypilska TPPs in the year of 2001 within the framework of Dutch-Ukrainian Project "GHGs Emissions Reduction at TPPs of Ukraine"[23]. The European Commission has approved EUR 120 million funding for 2007-2009 period aimed at launch of the financial program within the Memorandum of Understanding 'on the Energy Sector Partnership'. It is expected that the program will provide EUR 65 million financial support by the end of 2007[24].

Meanwhile, the National Energy Strategy of Ukraine until 2030 estimates the minimum investment requirements for the energy sector at app. US$ 200 billion for the period of 2005-2030. The strategy estimates the need for investments into energy efficiency in US$ 21 billion, which covers only measures at the demand side. Neither Ukrainian state budget nor the national banking sector can provide investments in amounts required. Therefore, investment sources are likely to be sought from multilateral banks and international financing institutions as well as installations privatization.

Trends in environmental regulation

Since achieving independence in 1991, Ukraine has developed an extensive legal base covering environmental protection. The basic rights for the safe living environment are guaranteed in the Constitution of Ukraine (approved in 1996). The Law of Ukraine "On the environmental protection" (1991) sets basic definitions of the environmental policy in Ukraine and distributes the responsibilities between the central and local authorities. Ukraine has established the procedure for environmental impact assessment is set up by the Law of Ukraine "On Environmental Expertise" (1995). Other important legislative acts include the Law "On the Protection of Atmospheric Air" (1992), the Law "On protected areas", the Law "On the wastes" (1998), the Law "On the hazardous objects" (2001), the Law "On Environmental Audit" (2004), etc. Similar to other post-Soviet states, enforcement of law enforcement remains a serious issue.

[22] Northland Power Inc. Darnytsia Heat & Power Station Case Study URL: http://www.northlandpower.ca/index.taf?p=89&z=4&l=&_UserReference=E665EF1AC589C7FF454BB217
[23] Ibid.
[24] http://www.dn.kiev.ua/economics/ukraine/evrtehpom_10.html

Currently no market-based mechanisms or other economic incentives exist in Ukraine that would stimulate the decrease of environmental impact in general, or stimulate the promotion of energy saving or clean energy development. Instead of market-based mechanisms, the pollution control is based on the pollution limit permits that are issued on the regular basis to large installations. The quantitative pollution limits are set for the pollution flow (typically in grams per second). However, the fines for exceeding pollution limits and violation of environmental acts remain the lowest in the countries of the Former Soviet Union, and even in the case when the breach of law was proven, the enforcement remains problematic[25]. Although there is a system of periodic state inspections of the large installations, the results of such checks are not taken into account during the permit reissuing process[26].

Ukraine declares its willingness to harmonize its legislation with the EU, in particular in the field of environmental protection[27]. Ukraine is a signatory of more than 30 international treaties in the field of the environmental protection, such as United Nations Framework Convention on Climate Change (the UNFCCC, 1992), the Kyoto Protocol to the UN FCCC (1997), the Convention on Long-range Transboundary Air Pollution (1979), the Aarhus Protocol on Heavy Metals (1998), the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999).
The summary of the most important legislative acts that may have potential influence on the development of clean energy, and the energy sector in general, is given below.

Program of State Support in Development of Non-traditional, Renewable Energy Sources, Small Hydro and Thermal Energy (1997). Envisaged to provide budget support for reaching the 10% renewables target in 2010. Only a fraction of envisaged measures implemented due to lack of financing from the national budget.

State Program "Ethanol" (2000). Envisages increased use of ethanol as energy source and raw material for industrial production. The program focuses on production of environmentally friendly gasoline mixes, ethylene, and biodiesel, among others. The program envisaged creation of a special-purpose fund to finance development of production capacities for the biofuels. However the fund was never created and objectives of the program have not been achieved.

Law "On alternative sources of energy" (2003). Defines "alternative sources of energy" as renewables and secondary energy resources. The law envisages accumulation of funds for the support to the renewable energy development through tariffs included in wholesale electricity and heat prices, but doesn't create any reward mechanisms for the producers of renewable energy.

[25] OECD. Translating environmental law into practice. Paris, 2007.
[26] Ibid.
[27] The Law of Ukraine "On the National Program for Adaptation of the Legislation of Ukraine to the Legislation of the European Union" (2004).

JI approval procedures (2006). JI framework procedures adopted by the Cabinet in February 2006 authorise the Ministry of Environmental Protection (MEP) as the institution responsible for JI project approval. The details of JI project approval process were specified in two orders adopted by MEP in July 2006, which provide guidelines for two stages approval procedure (LoE/LoA issuance). In November 2006 the national procedures were officially submitted to the UNFCCC secretariat. The Ukrainian cycle of JI approval in general follow the practices of other countries in the Central and Eastern Europe. Some JI project owners and developers have reported significant delays with issuing the letters of approval by MEP. As of October 2007, some 11 JI projects were approved in Ukraine.

Draft Law of Greenhouse Gas Emissions (2007). The draft Law on Greenhouse Emissions aimed primarily at filling the gaps in the existing national legislation regarding the Kyoto flexible mechanisms. The proposed law outlines the responsibilities of various government institutions (the Cabinet of Ministers, MEP and the National Environmental Investment Agency) and describes a range of policies Ukraine is planning to implement with regard to mitigate climate change, among other under the Kyoto Protocol. The law sets up principles of the national system of GHG allowances allocation, trading of those allowances and fines for excessive GHG emissions. To date the draft seems to be quite contradictory and does not provide a clear vision of the possible national allowance trading. Nevertheless, limitations of GHG emissions on the national level may create an additional incentive to introduce energy efficiency measures and develop renewable energy sector. It is not likely that national GHG emission trading system will be established in Ukraine in the near future.

Draft Law on the Green Tariff (2007). The proposed draft Law on the Green Tariff envisages introduction to a market-based incentive for the owners of the renewable energy installations. The definition of renewable energy proposed to be similar to the definition made in the Law on the Alternative Energy Sources (energy of sun, wind, energy of rivers and tides, geothermal energy, biomass). The draft proposes to limit the hydropower plants' eligibility for green tariffs by only small-scale installations with the capacity up to 20 MW. The proposed methodology to define the feed-in tariff is the current annual average value of tariff for industrial consumers in the national grid. According to the estimations made in the draft law, the initial value of the green tariff might be UAH 0.198 per kWh (app. US$ 0.039). In addition to the fixed electricity tariff, the draft law suggests mandatory electricity purchases by the regional distribution companies on the electricity market. Alternatively to mandatory purchase, under the draft law the RES energy producers will be given the right to sell electricity under direct contracts to customers.

Energy and climate legislation

Ukraine has an extensive legislation base regulating the energy sector. The national

laws set up the principles of the energy sectors organization and distribute responsibilities between different actors. The state support to energy sector segments is defined in most cases in the state programs. The programs mainly rely upon the financing from the state budget and in many cases fail to reach the objectives due to the lack of financial support from the central government. To date the legislation do not provide any sound incentives for the clean energy projects, therefore most of the existing RES projects has been launched without state support. Joint Implementation mechanism seems to be the only working initiative, but its financial sources do not come from the national budget and any state programs of Ukraine. The current status of the JI mechanism will be reviewed in the Chapter 3.

Brief summaries of the existing legislation and state support programs are provided below.

Comprehensive State Energy Conservation Program of Ukraine (1997), revised 2000. The program is the main framework for state support in area of energy efficiency. It identifies and assesses priority energy efficiency measures, including introduction of new energy-efficient technologies and equipment, fuel switch, and reduction of energy losses. The Program estimated the total cost-effective potential for energy saving at 28-31.2 million tce in 2005 and 37.9-43.0 million tce in 2010, envisaging investments in the amount of $6.1-6.7 billion until 2005 and $8.5-9.7 billion until 2010 (in 2000 prices). It estimated measures beyond financing of the program at about 30.7-34.5 million tce in 2005 and 39.8-50.3 million tce in 2010. Only a fraction of the envisaged measures had been eventually financed. A new State Energy Conservation Program of Ukraine for 2005-2010 is under development.

The Law on Electric Power Industry (1997). Delegates the responsibility of setting electricity tariffs to the National Electric Power Regulatory Commission and local governments. Among other, envisages financial incentives for wind power plant construction with the help of state budget (the tax of 0.75% on all electricity sales supports the development and construction of wind power). The law also guarantees a feed-in tariff for wind power currently 4 times the regular rate. Such support is provided only for state owned wind power plants.

Decree of the President of Ukraine "On the Wind Plant Construction in Ukraine" (1996). Authorised creation of a special fund to finance development of wind mills by means of 0.75% surcharge of electricity bills paid by the consumers.

Integrated Wind Plant Construction Program in Ukraine by the year 2020. Establishes targets for wind power development in Ukraine and encourages various technical and strategic aspects of wind power development, including establishing of certification centres, repair bases and staff training centres.

Law "On Energy Conservation" (1994). Determines legal, economic, social and ecological

bases of energy conservation for all enterprises, associations and organizations located in the territory of Ukraine, and also for the individuals.

Chapter 2. Obstacles to clean energy investment

Financial returns

Electricity prices in Ukraine remain at one of the lowest level in Europe. Although, the price of a kilowatt-hour rose after the gas prices increase in 2005, it is still below most of the Eastern European neighbours of Ukraine. Meanwhile, the state of the power sector has improved during the past years. The massive non-payments for consumed electricity are not an issue anymore; grid losses have been also gradually reduced over the past years.

The recently proposed draft law 'On the green tariff' will likely support the development of renewables significantly since the renewable power producers are expected to receive a privileged status for selling their electricity via the regional distribution networks. It is still unclear, when the green tariff law can be approved due to the ongoing political crisis after the parliamentary elections in 2007.

Political risks

Frequent government changes pose a threat for the overall investment climate in the country thereby creating an additional barrier to investment into the modern technologies. Yet, the sharp political changes during the past three years have shown little impact on the macroeconomic indicators. Therefore, it is unlikely that changes in the parliament after the last elections will have significant influence on the country's economy.

Governance

Foreign investment companies active in Ukraine[28] refer to a number of major issues hampering improvement of the country's investment attractiveness. Investors complain about the lack of dialogue between the business sector and the government. The process of obtaining licenses and permits usually is time consuming and complicated. Some investors are reporting the need of making additional payments or taking additional obligations to invest into the infrastructure construction, such as electricity transmission lines or grid connections, while such infrastructure is normally to be provided by the state in other countries.

Transparency International[29] has rated corruption in Ukraine at the level of 2.8 (10 is the lowest corruption level), and ranked 104 among 163 countries. The latest report issued by the Transparency International recognizes progress in fighting corruption in

[28] Edilberto Sigura, Ukraine: Improving its business environment. Sigma Bleyzer, 2005 URL: http://www.sigmableyzer.com/files/Improving_Ukraine_Business_Environment_04_05.pdf
[29] Transparency International. Corruption Perception Index, 2007. URL: http://www.transparency.org

Ukraine. However, more efforts have to be made to improve the business environment in the country.

The process of obtaining permits and licenses, which are necessary for business operation, reported as one of the serious barriers for the business development in Ukraine. According to the study provided by the International Financial Corporation[30], around 64% of the companies that are subject to obtain permits or licenses considered the licensing process as a difficult one. Complicated permits/licensing process leads to the cases of corruption. According to IFC, over one third of the companies who participated in the study had to make unofficial payments to obtain permits.

Taxation

The system of taxation is complicated, frequently amended and not completely transparent[31]. The legislation itself in some cases includes unclear formulations, allowing arbitrary interpretation by the tax authorities. Furthermore, business administration may consume significant resources. According to a recent study of the World Bank, an average medium-size Ukrainian enterprise needs to make about 98 different tax payments per year, which require over 2,000 work hours annually for administration [32]. The tax system in Ukraine was considered to be one the most complicated among the 185 country cases reviewed in the study.

Trade barriers can be a serious issue for renewable energy since the projects often involve equipment import. The imported equipment is subject to 20% VAT tax - delays from 6 to 18 months with VAT reimbursement have been reported in the past[33]. In addition to VAT, special custom import fees and licensing procedures are reported as serious barriers to the companies that are exporting to Ukraine[34].
The government of Ukraine is keen towards using such instruments as special economic zones with preferential taxation regime or tax preferences for individual companies to stimulate investment and business activity. At the same time, such tax preferences are seen as a breach of the overall tax system integrity and generally unfair by some foreign investors.

Certain attempts made by the government aim to improve the taxation regime in the country and integrate the existing legislation into a single Tax Code. However, due to the political instability the approval of the Tax Code has been delayed. Due to the ongoing political crisis it is unclear when the new parliament elected in 2007 may approve the new Tax Code.

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[30] International Financial Corporation. 2005. Business environment in Ukraine.
[31] PriceWaterhouseCoopers. The business climate in Ukraine. URL:
http://www.pwc.com/extweb/insights.nsf/docid/C840A6C1040A377880256F3400424B56
Doing Business in Ukraine 2008, World bank/IFC, accessible: http://www.doingbusiness.org/
[32] Ibid.
[33] Office of the United States Trade Representative. 2005. Overview of Ukraine. URL: http://www.ustr.gov/
[34] Ibid.

Financial barriers

Fitch sovereign ratings (2007)[35]

Slovakia	AA
Poland	AA-
Hungary	A+
Russia	A-
Ukraine	BB-

Sources of the medium and large-scale project financing in Ukraine are limited. Despite the recent inflow of the foreign capital into the banking sector, the interest rates offered by the domestic banks range from 18% to 24% in the national currency for the term of up to 3 years. The possibilities to attract international financing seem to be limited due to the relatively high sovereign risk perception by the international community. To date the economy of Ukraine is relatively stable and growing steadily, but the country's sovereign ratings remain low compared to the neighbouring countries (see the table to the right). Comparatively high perception of the country-specific risks makes it difficult for the small or medium scale projects to account for an external source of financing or equity.

The possibility to attract commercial loans from the international sources is available mostly for the large companies that can afford to organize an IPO on the international market. Due to the high costs of the IPO preparation, this option is not realistic for the most medium and small size Ukrainian enterprises. There are only few examples of direct foreign investment into renewable energy in Ukraine. The case study of the Nova Eco wind energy project provides an analysis of example of foreign investments in renewables in Ukraine.

The technologies for energy saving or renewable energy production are often new for the Ukrainian market. In many cases the payback time of renewable energy projects is comparatively long. For the most of the wind power projects implemented in Ukraine so far the payback time amounts to 12 years or above[36]. The risk of the new technology and usually long payback times create a serious barrier for the clean energy projects in receiving financing on the local level under the current circumstances.

[35] Fitch sovereign ratings. URL: www.fitchratings.com

[36] The National Agency for Energy Efficiency of Ukraine. 2007. Analysis of the implementation of the comprehensive state program for wind power plants construction until 2010.

Multilateral investment banks, in particular the EBRD[37] and the World Bank[38] group state promotion of energy sector reforms and investments among the top priorities of their assistance strategies for Ukraine. In the past, the multilateral banks have been one of the main investors into the energy sector, and in particular into energy efficiency and renewable energy sources. Multilateral development banks remain the main realistic source of the long-term project financing for the clean energy in Ukraine. However, in many cases multilateral banks work with large infrastructure projects, often backed up by the sovereign state guarantees. The small and medium size projects, which are in many cases the clean energy projects, are unable to secure their financing with the state guarantees; and therefore their access to the multilateral bank's financing is limited.

Technological barriers

There are a number of technology-specific barriers for investments into renewable energy and energy efficiency in Ukraine. This section provides a brief overview of the most known problems reported during the development of clean energy projects.

Wind energy

Ukrainian government has taken serious efforts to support the development of domestic wind power generation and production of wind turbine by national producers. Ukrainian producers had purchased license for manufacturing of the US-designed USW 56-100 and T600-48 wind turbines. The technology has been reported as rather outdated with low efficiency and need for frequent maintenance works. According to the evaluation of the existing wind power plants done by the National Agency for Energy Efficiency (NAEE) in 2007[39], the efficiency of the locally produced turbines was lower compared to the similar equipment manufactured in the US. The reported average cost of installing 1 kW of capacity was up to US$ 2,850, being 2-3 times higher compared to the average costs in the rest of the world. Due to the mistakes during the site planning it is reported that electricity generation was below planned levels by 33-58%. According to NAEE, the state efforts in developing wind energy production have not reached expected results. Although at the moment there is no significant wind power generation capacities owned by private sector, the projects currently under consideration (e.g. Nova Eco 300 MW wind power project) are to show whether the private investors (the consortium led by Martifer Group, Portugal) may be more successful in the wind energy development in Ukraine.

Small hydropower plants

[37] EBRD. 2007. Country assistance strategy for Ukraine. URL: http://ebrd.com/about/strategy/country/ukraine/strategy.pdf

[38] World Bank. Country assistance strategy for Ukraine. URL: http://wbln0018.worldbank.org/ECA/ECC11/UkraineCAS/AR/DocLib.nsf/Table+Of+Contents+Web?OpenView&Start=1&Count=30&Expand=3.2#3.2

[39] The National Agency for Energy Efficiency of Ukraine. 2007. Analysis of the implementation of the comprehensive state program for wind power plants construction until 2010.

Currently, small scale hydropower plants constitute 3% of the installed hydropower capacity[40]. The potential of economically viable small hydro generation is estimated at 600-700 MW of installed capacity. However, the average cost of installation of 1 kW capacity is rather high and estimated at app. US$ 1,100. The absence of special feed-in tariffs for hydropower makes this type of projects financially unattractive. In addition to financial aspects, one of the factors affecting investment attractiveness of small hydropower projects is the difficulty of connecting projects to the grid, resulting in the need to secure a consumer nearby. This in turn raises concerns over the bankability of projects - given the relatively low household demand for electricity in rural areas and poor financial standing of many of the large farms, ability of the rural consumers to pay is rather low and often cannot be relied on. These issues make it significantly more difficult for small hydro projects to find financing.

Biomass and biogas

Large-scale biogas plants can be installed at pig-breeding farms (livestock more than 12 thousand), cattle farms (livestock more than 1 thousand), poultry farms and food industry enterprises. According to the estimates of Ukrainian experts[41], it is possible to construct 2903 biogas plants in Ukraine including 295 at pig-breeding farms, 130 at poultry plants and 2478 at cattle farms and food industry plants.

Introduction of biogas technologies into Ukraine at farms as a rule requires complete overhaul of manure management systems. The majority of hog farms, for example, are equipped with liquid-based manure management systems with water jets or hoses and anaerobic logons. The water content in the liquid is very high (98%), which is much higher than required for efficient production of biogas (88-90%)[42]. A switch to a liquid-based system where manure is removed as sludge and organic dry matter content is high would be rather costly.

In the case of biomass projects, the most typical constraints are supply of biomass (specifically when it comes to straw and wood waste), relatively small size of the projects, and bankability concerns. Similarly to other renewable energy projects, the main barriers are lack of financial incentives, most notably feed-in tariffs, and difficulties with the connection to the grid for the small capacity generation. The proposed draft law on the green tariff includes biomass and biogas into the definition of 'alternative energy' eligible for the tariff utilization. Still some concerns[43] are expressed that during the approval process the green tariff law might become more focused on wind energy, and provide no incentives for other types of renewables, including biomass.

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[40] European Bank for Reconstruction and Development. 2003. Renewable Energy Resource Assessment. Novyny Enegetiki, volume 9, 2003.

[41] Georgiy G. Geletukha, Tetyana A. Zhelyezna, Sergiy V. Tishayev, Sergiy G. Kobzar, Kostiantyn O. Kopeykin, Concept of bioenergy development in Ukraine. Kiev, 2001

[42] Geletukha et al. The development of biomass technologies in Ukraine. Ecotechnology and Resource Savings, volume 3, 2002. Kiev, Ukraine.

[43] Personal communication.

Chapter 3. Incentives for clean energy investment

Ukraine has developed a number of laws aimed at promoting the use of renewable energy and energy saving. The law on energy conservation (1994), the law on alternative energy (2003) and the law on cogeneration (2005) provide the main framework of the state support to RES and energy saving.

The Law on Energy Conservation sets the definitions for energy saving and energy efficiency. The law emphasizes the need to promote energy saving and energy efficiency, in particular by creating of the special state programs (to be developed by the Cabinet of Ministers). The energy conservation law sets the mandatory examination procedure for the effectiveness of energy use according to the state standards for energy consumption at installations with annual fuel consumption over the 1000 tons of coal equivalent. Other important requirements set by the law:

- Mandatory introduction of metering and automated regulation equipment for fuel and other energy resources use;
- Development of the incentives for combined-cycle production of electricity and heat (see also the Law on Cogeneration);
- Introduction of energy labelling for home appliances.

The term 'alternative energy' is commonly used in Ukraine to define the renewable energy sources. The definitions of the Law on Alternative Energy include the energy of sun, wind, energy of rivers and tides, geothermal energy, biomass. In addition to the conventional renewables, the legal definition of alternative energy includes any energy sources that exist in nature and may be reproduced. According to the law, financial incentives for the development of renewable energy sources have to be created. The law declares willingness of the state to support to the construction of new renewable energy installations. Nevertheless, the Law on Alternative Energy is rather a framework document, which contains no particular mechanisms to support the development of the renewables.

Combined production of electricity and heat is not widely used technology in Ukraine. The total installed capacity of power-only thermal electricity generation is 27.2 GW while combined cycle capacity is 6.4 GW. The total installed capacity in Ukraine is 52.2 GW[44]. The Law on Cogeneration, approved in 2005, is an attempt of the state to stimulate the introduction of combined heat and power production in Ukraine. The main provisions of the law on cogeneration include:

- Creating of incentives for retrofitting of the existing single cycle installations into cogeneration plants;
- Creating new combined cycle generation to serve on the local level (to serve municipalities/district heating) and industrial CHPs;

[44] International Energy Agency. 2006. Ukraine Energy Policy review. Paris, 2006.

- Providing a guaranteed access to the grid irrespective of the CHP capacity, including the right to sell electricity during the consumption peaks;
- Providing exemption from surcharges to electricity tariff for the cogeneration installations.

The proposed draft law on the green tariff is mentioned by the potential renewable project investors as a strong incentive for the development of clean energy. The law is supposed to give preferential access to the regional distribution networks for the renewable energy producers. Regional networks are to be obliged to buy electricity generated from renewable sources unless the generator would be more willing to sell electricity directly to a consumer. Due to some political instability in Ukraine, it is unclear when the green tariff law can be finally approved by the parliament.

The final approval of the green tariff law is perceived as one of the potential key drivers for the development of renewable power generation in Ukraine. The proposed financial incentive scheme is similar to the special renewable feed-in tariffs that are successfully applied in most of the EU member states. Investors have reported positive expectations towards the introduction of green tariff in Ukraine. However, due to the upcoming parliamentary elections it is most likely that the final approval of the green tariff law will be delayed. Some attempts were made to introduce real economic incentives in the course of approval of the Law on Alternative Energy. However, in the course of the draft approval the incentive mechanisms were removed and the finally approved version contains rather general intentions of state to provide support to development of the renewable energy without any particular mechanisms. There is a similar risk that the proposed green tariff law might be changed during the review process in the parliament.

Despite the declared willingness of the state to support renewable energy development and energy efficiency, in practice the legislation contains rather intentions than workable mechanisms, such as tax preferences or preferential tariffs. In reality, the increase of the gas prices and subsequent growth of electricity prices provided stronger incentives for investments into improving energy efficiency compared to the legislation incentives.

Kyoto Protocol

The Kyoto Protocol JI mechanism is an important additional incentive for improving energy efficiency and promoting of renewables in Ukraine. So far Ukraine is perceived as one of the most attractive JI host countries by the market players. At the moment of writing, 11 JI projects have received approval from the government of Ukraine. Still, some project sponsors and developers point out numerous delays with passing the national JI approval procedure in Ukraine.

Ukraine's enormous JI potential includes project opportunities in sectors as diverse as industrial energy efficiency, biomass, district heating, small hydro, coal mine

methane, and landfill gas utilization. Ukraine's heavy industry sectors (metals, chemicals, cement) have significant potential for energy saving and technology upgrades. The sharp increase of prices for natural gas in the years of 2005 and 2006 creates a very strong additional incentive for the local project owners to introduce efficiency measures, many of which can potentially qualify as JI projects.

After the approval of the JI national guidelines in August 2006 the interest from potential buyers of carbon credits towards the JI projects in Ukraine has notably increased. However, many potential project hosts have limited understanding of the JI mechanism resulting in a limited supply of readily-available JI projects. Slow process of issuing the Letters of Approval by the MEP creates an additional uncertainty for the project hosts and developers. At the same time, the pipeline of projects that received endorsement as of September 2007 has grown to 74 LoEs issued with the total volume of 83 Mt CO_2e. Despite delays with project approval, some six contracts for purchasing emission reductions have been concluded with Ukrainian companies. The buyers are mostly government procurement programs and development banks, though private companies also demonstrate interest in purchasing reductions from Ukrainian JI projects.

The economic incentive from selling emissions reduction may significantly vary depending on the type of a project. According to Point Carbon estimations, the most profitable JI projects in Ukraine are the abatement of N_2O emissions originating from fertilizer production, and utilization of methane emissions from coal mines. Utilization of methane from landfills has a very good potential in terms of emissions reduction volumes and potential IRR improvement; nevertheless these projects are considered risky by investors due to poor waste management practices and landfill ownership issues. Other types of projects have significantly lower IRR improvement from reductions sales, typically some 10% or less. A summary of the most typical JI projects with their potential IRR improvements due to emissions reduction sales is given below.

Table 4. Impact of the JI proceeds on the internal rate of return of different project types.

Type of Project	IRR improvement
Wind power	~ 1%
Hydro	1-3 %
Energy efficiency, district heating	2-3 %
Cogeneration	10 %
Biomass	up to 10%
Coal mine methane	> 50%
Landfill gas utilization	> 50%
Fertilizer production (N_2O emissions abatement)	> 50%

Source: Point Carbon

At the moment the most popular types of JI projects proposed in Ukraine currently are small and medium scale cogeneration, utilization of methane from coal mines and landfills and use of biomass. A significant potential for emission reductions can also be offered by heavy industry (mostly steel and chemical industry); though this potential for JI has just been started discovered. The development of renewables is limited due to relatively low electricity tariffs. Municipal energy suppliers and district heating companies also have a significant potential for emission reductions; though in practice these types of projects are problematic due to poor financial status of the host companies and ownership issues. A summary of the existing JI projects in Ukraine is provided in the table below.

Table 5. JI project pipeline in Ukraine.

Project types (PDDs)	Number	Volume until 2012 [MtCO2e]
Energy Efficiency	10	22.6
Industrial processes	1	3
Fugitive emissions	11	26.1
Renewable	3	4.6
Waste	6	2.8
Total projects at PDD stage	31	58.4

Source: Carbon Project Manager database, Point Carbon

Another Kyoto mechanism, the emissions trading, may become one of the incentives for energy efficiency and stimulate investments into modern technologies. The government of Ukraine intends to establish the Green Investment Scheme (GIS), finance the projects that reduce greenhouse gas emissions from revenues generated from selling the overhead state quota. Currently there is no regulation in place for establishing the GIS and it is not clear which projects may be eligible to receive financing under the scheme.

Chapter 4. Case study

Nova Eco is an ambitious project that envisages construction of two large-scale wind power plants in Crimea, Ukraine. The project is being developed by a consortium of companies lead by the Martifer Group (Portugal), a producer and operator of wind power turbines. The overall installed capacity of Nova Eco power plants is expected to be 300 MW, being higher compared to overall wind power capacity that exists in Ukraine so far (86 MW). In the case of implementation, Nova Eco is to become the largest private investment into the wind power development in Ukraine.

The development of Nova Eco has started in April 2005. Currently the project is at the stage of finalizing the feasibility study. The company has also started the process of registering the potential emission reductions. It is expected that the sale of emission reductions will certainly improve the project's financial indicators. This section based

on the existing project documentation[45] is available publicly, the information provided at the website of Nova Eco[46] and personal communication with the company's staff.

Nova Eco project envisages construction of two new large-scale wind power plants on the Crimea peninsula. About 200 MW is to be constructed in the western part of Crimea; another 100 MW plant will likely be located in the eastern part of the peninsula. Currently the region is exporting electricity from mainland Ukraine. However, the capacity of the existing transmission lines is limited, and the construction of the new lines is both expensive and limited by the geographical conditions. As it is expected that electricity consumption in Crimea is likely to grow in future, following the overall tendency in Ukraine, Nova Eco is expected to significantly increase the local generation capacity in the region and provide an additional clean source of electricity production.

The construction stage of the project is expected to start in the middle of 2008. REPower MM92 wind turbines with the capacity of 2 MW are to be installed. The current estimations show that the efficiency of the proposed turbines is significantly higher compared to the domestically produced wind turbines.

Nova Eco has finished the preparation of Environmental Impact Assessment, and is currently finishing the feasibility study. The permits for land use and connection to the high voltage grid are being negotiated at the moment. Nova Eco has contracted a local company to solicit the process of obtaining the necessary permits. In order to secure the land use rights, negotiations with the private owners are expected in future.

The process with connection to high voltage grid is seen as satisfactory by the investors. A study of the connection options was done by a group of international and Ukrainian experts and a number of options have been identified. Currently Nova Eco intends to construct the high voltage connections to the grid at its own expense, since the existing local grid is not able to serve the project. Although such practice is unusual in other countries, it is not perceived as a major barrier for the project by the company's management.

The approval of the draft law on green tariff is the main prerequisite for the project sponsors to start the project implementation phase. In its current form the draft law provides incentives sufficient to make the project financially viable. The current estimation of IRR without additional income from selling emission reductions is 12.5%. The cost of Nova Eco project is estimated at US$ 800 million. The costs have increased compared to initially estimated numbers mainly due to the increase of the world prices for copper and steel.

[45] JI Project Design Document, UNFCCC.
[46] Nova Eco. URL: http://www.nova-eco.kiev.ua

Project's registration under the joint implementation mechanism is expected to generate some 2.955 million tons CO2 equivalent of emission reductions. The project's IRR is expected to improve to 14% as the result of transfer of the emission reductions. Nova Eco has concluded preliminary agreements with the potential ERU buyers, namely the Swedish Energy Agency and NEFCO. In the view of the management of Nova Eco, the existing agreements on ERU sales add credibility for the project itself and provide certain political support on the international level.

Registration of Nova Eco as a JI project is in progress now. The government of Ukraine has provided the project with a Letter of Endorsement, indicating there is no objection to the project activity. Nova Eco also obtained a Letter of Approval (LoA) from the host country in January 2008. LoA serves as a guarantee from the state to transfer the emission reductions once they are achieved. Some of JI project hosts and developers have complained about the slow progress with issuing the Letters of Approval in Ukraine. At the moment some 11 JI projects received approval in Ukraine. According to Nova Eco, the existing JI procedures are workable and there were no major obstacles with receiving its LoA.

Though the project has not reached the financing stage, the equity commitments have been made by the members of Nova Eco consortium. In addition to this the loan possibility is being discussed with multilateral banks, primarily EBRD and IFC. It is mostly likely that EBRD or IFC will provide loans to Nova Eco covering certain share of the costs. Participation of a multilateral bank is typically up to 35% of the total project cost; while the rest of financing should be provided either by commercial banks or from own sources. The conditions of a commercial bank are expected to be more favourable in this case, as the involvement of EBRD/IFC serves as a solid guarantee. Nova Eco would seek additional financing from Ukrainian commercial banks with foreign ownership, in order to be sure that the bank has sufficient lending resources. In general, the size of the project and the expected participation of the multilateral banks in its financing are likely to minimize the financial risks.

Although there are many complaints about the legal system, the existing Ukrainian legislation is acceptable to Nova Eco as an investor. Though the legislation is not always clear enough, it is workable. Changes to legislation are made rather frequently, but this is perceived by Nova Eco as an opportunity for new business development. Obtaining licenses for imported equipment takes time, but this is a country specific regime that has to be followed. VAT regulation in Ukraine is seen as clear enough, and Nova Eco expects no issues with reimbursement of VAT charged for equipment import. Though the media in Ukraine pays significant attention to problems with VAT reimbursement, Nova Eco expects that following all formal procedures should be the best way to avoid problems. Nova Eco has international political support which helps them to avoid certain barriers, like corruption, that can be more serious for smaller companies. As a large company, Nova Eco was successful in avoiding involvement in corruption so far.

The general perception of business climate in Ukraine by Nova Eco is rather positive. Though the local business practices are different sometimes from the West, the company is able to communicate effectively to the state authorities. The authorities are helpful and officials respond quickly. Administration on the local level has been helpful so far, and there is a strong support from the local village councils. Applications for permits at the local level were processed satisfactory. One of the issues is high competition for the workforce—it is not easy to retain the skilled employees. This results in additional time spent hiring and training. In general Ukraine shows a strong economic growth that increases the value of investment made. Renewable energy is a new growing market, and it has good perspectives in Ukraine as well as in the rest of Eastern Europe.

According to Nova Eco, the main barrier for investments into renewable energy in Ukraine is lack of a clear incentive regime. However, there is political will to move forward and the proposed law on the green tariff is the main prerequisite for Nova Eco to start the implementation stage of the project. The company is overall optimistic about the development of renewables in Ukraine

Literature sources and companies working in Ukraine refer to a number of serious barriers for foreign investment in Ukraine, and in particular to investing into the renewable energy sources. Among the most frequently mentioned problems are complicated and non-transparent legal and tax systems, lack of available financing and technology-specific risks. Nova Eco is a large project owned by a consortium of foreign investors. Though the project has not reached the implementation stage, the experience with doing business in Ukraine is rather positive. Foreign investors were able to bring the modern technology and attract financing from the multilateral banks. While Kyoto mechanisms do not provide significant financial contribution to the Nova Eco project, it has to be noted that buyers of the emission reductions are able to provide certain political support to the project and improve its financial credibility. The final project implementation strongly depends on the introduction of the feed-in tariff and the approval of the respective legislation on the national level.

Kazakhstan

Chapter 1. Background

Trends in energy supply and demand, projections

General trends in energy supply and demand of Kazakhstan reflect the dynamics of the country's economic development. In Kazakhstan, where population has been fluctuating around 15 million people, the major consumers of energy during the Soviet time were industrial enterprises. In the early '90s after Kazakhstan gained independence, overall consumption of electricity has drastically decreased due to the economic breakdown, bankruptcy and insolvency of state enterprises. In late '90s

with population being the major energy consumer, the low-payment rate for the bills held back the electricity demand, but starting from year 2000, the electricity demand from the individual consumers increased significantly. The increase was driven by overall economic growth with the intensive exploration of Caspian oilfields in late '90s to the early 2000s.

Currently, there are 54 thermal power plants and 5 hydropower plants with total installed capacity of 16.9 GW. The major power stations are Ekibastuz-1, Ekibastuz-2, Aksuk, and Zhambylskaya national thermal power plants (NTPP), Karaganda, Ust-Kamenogorsk CHPs (combined heat and power plants), and Shulbinskaya hydropower station[47]. Approximately 85% of electricity is produced at regular thermal power plants, and only about 38% of total installed capacity (6.7 GW) by CHPs. The thermal power plants are 70% coal-fired, 15% operate with gas and furnace oil as fuel[48].

Table 6. Total primary energy consumption in Kazakhstan, (Mtoe) in 2005-2006.

	Oil	Natural Gas	Coal	Hydro electric	2005 Total
	10.0	17.6	27.2	1.8	**56.6**
2005	17.66%	31.14%	48.06%	3.14%	**100.00%**
	10.6	18.2	29.7	1.8	**60.3**
2006	17.58%	30.22%	49.20%	3.00%	**100.00%**

Source: BP Statistical Review of the World Energy, 2007.

The potential for alternative energy sources for Kazakhstan is considered noteworthy. Wind energy potential is estimated at approximately at 1.8 trillion kWh per year, solar energy potential is approximately 2.5 billion kWh per year[49]. The biomass residues processed into biogas or biofuel can produce approximately 35 billion kWh of power and 44 million Gcal of heat[50]. Despite significant potential of alternative energy sources, they account only for 0.02% of country's power consumption[51].

Large electricity losses occur during transmission and distribution over distribution lines. According to various sources, approximately 10 to 15 per cent of electricity generated in Kazakhstan is lost before it reaches consumers due to the widespread deterioration of Kazakhstan's power infrastructure[52].

Insufficient coverage of the transmission line network in Kazakhstan results in uneven distribution of energy supply throughout the country. In terms of the energy supply, Kazakhstan can be divided in three distinct regions: (1) the North and the Center, which are connected to Russian grid, and well-supplied by coal-fired plants operating

[47] Kazakhstan #1, 2007. Sergey Smirnov. Energy industry. Two years until crisis? (in Russian). URL: http://www.investkz.com/journals/50/469.html
[48] Ibid.
[49] Kazakhstan Today. April 16, 2007. Alternative energy sources account for 0.02% share in total power supply.
[50] Ibid.
[51] Ibid.
[52] ADB. 2005. Electricity Sectors in CAREC Countries. A Diagnostic Review of Regulatory Approaches and Challenges. URL: http://www.adb.org/Documents/Studies/Electricity-CAREC/drrac.pdf

on locally produced coal from the local coal-producing areas (2) partly isolated West, and (2) the Southern, which strongly dependent on imported electricity from Kyrgyzstan and Uzbekistan[53].

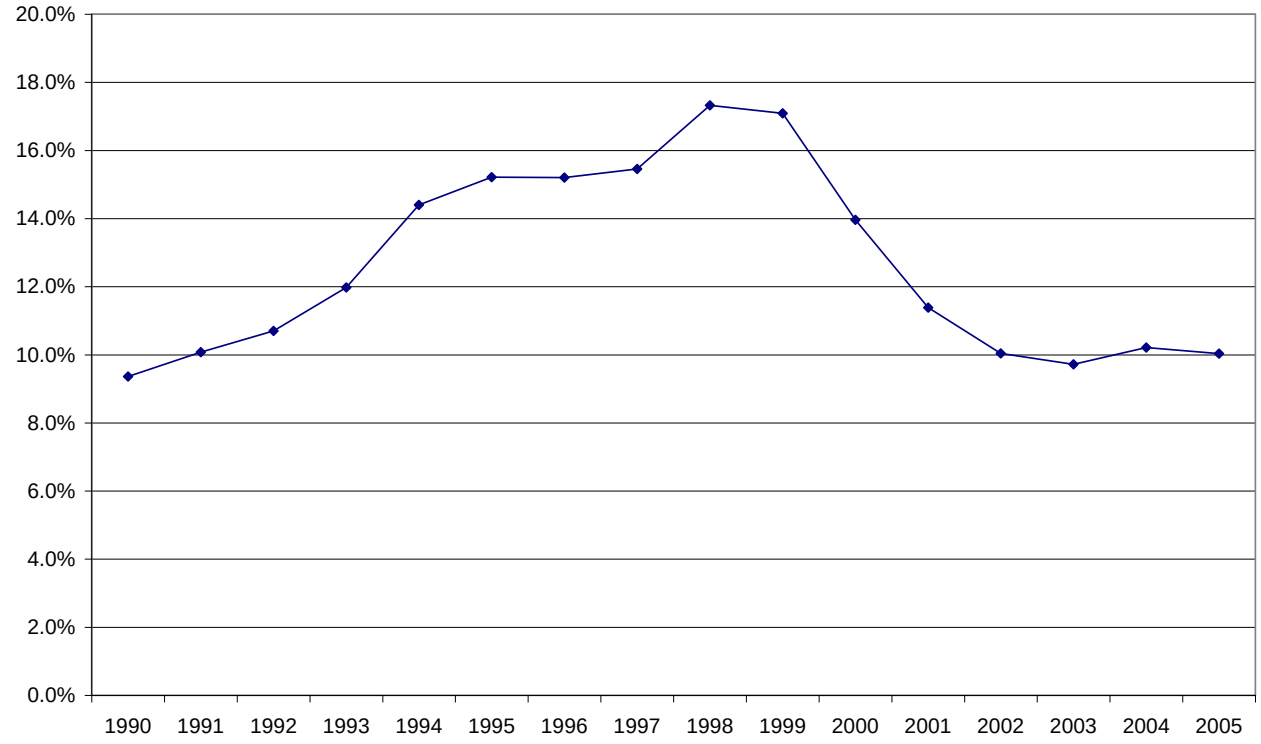

Figure 4. Distribution losses in the transmission lines in 1990–2005, per cent of production.
Source: IEA, 2007[54].

Regional disparities and the general level of dilapidation of generation equipment result in significant constraints on the possibility of the future growth of the sector. Experts estimate that the electricity consumption in Kazakhstan in 2010 will reach 84 billion kWh, in 2015, respectively, 101 billion kWh. The supply, however, considering

[53] Expert Kazakhstan. Issue 47, 2006. Kanat Shaymerdenov. Economics and capacities of grid (in Russian). http://www.expert.ru/printissues/kazakhstan/2006/47/programma_razvitiya_elektroenergetiki/
[54] International Energy Agency. Energy Statistics of Non-OECD Countries 1971-2005. CD-ROM.

the installed capacity and its state, is likely to be limited to 72–74 billion kWh[55]. Moreover, the power industry in Kazakhstan currently requires massive retrofits[56].

It is expected that power demand in Kazakhstan will likely to exceed the production at the existing capacities, and the country might experience significant power shortages. The Kazakh government estimates that in 2008-2009 the power shortage will reach up to 2 billion kWh. In 2010 the projected shortages will reach 5.9 billion kWh which are to be imported. In the winter of 2007-8, due to the abnormally cold weather, the power supply from other Central Asian countries—Tajikistan, Kyrgyzstan, and Uzbekistan became unreliable. This led to the point power cuts in highly import-dependent Southern region of Kazakhstan. The situation put power security issues high on the agenda of the Government.

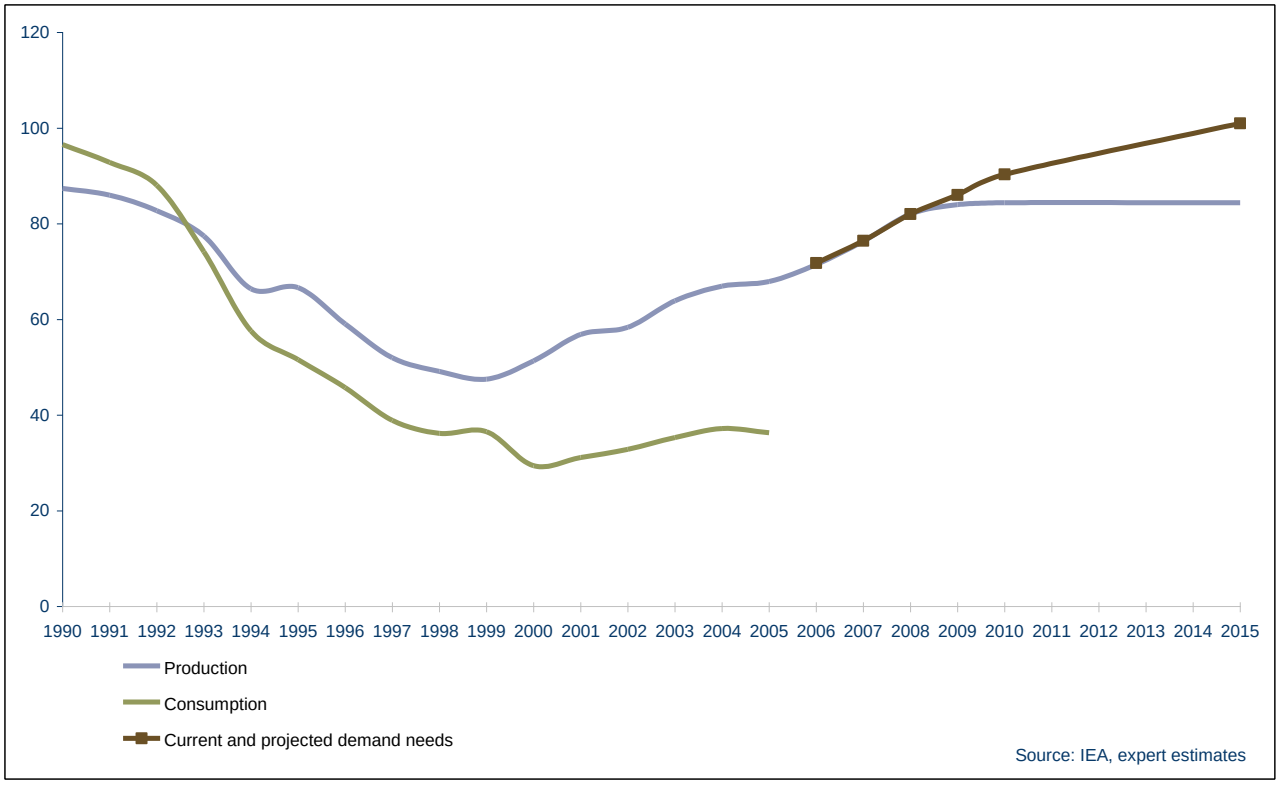

Figure 5. Trends and projections for electricity production and consumption* in Kazakhstan in 1990–2015, billion kWh.

Source: IEA, 2007[57]; Report of Minister of Energy, February 7, 2008[58].

**Consumption is defined as gross production + imports - exports - transmission/distribution losses*

[55] Expert Kazakhstan. Issue 47, 2006. Kanat Shaymerdenov. Economics and capacities of grid (in Russian). http://www.expert.ru/printissues/kazakhstan/2006/47/programma_razvitiya_elektroenergetiki/

[56] Expert Kazakhstan. Issue 41, 2007. Sergey Smirnov. The electricity martyrdoms (in Russian). URL: http://www.expert.ru/printissues/kazakhstan/2007/143/investicii_v_elektroenergetiku/

[57] International Energy Agency. Energy Statistics of Non-OECD Countries 1971-2005. CD-ROM

[58] Report of Minister of Energy, dated February 7, 2008. URL: http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat_id=29&id=259

With the further growth of the Kazakh economy, the demand for power and heat supply will increase significantly over next decades. The available generating capacities mostly cover present demand for electricity. However, the current generating capacities are clearly not enough to satisfy the moderate demand projections of 101 billion kWh in 2015. Consequently, the power shortage can reach at least 17 billion kWh, which should be imported from the neighbouring countries. While the Governmental program indicates target to increase share of renewable energy sources in power supply, through construction of small and medium hydropower plants and wind power, mostly probably capacities are insufficient to perform conversion towards clean energy sources in the nearest future.

Table 7. Projected changes in the total primary energy supply of Kazakhstan

Energy supply	2005 share in TPES, %	Projected 2030 share in TPES, %
Domestic coal	48	51
Imported coal	0	0
Domestic oil	18	10
Imported oil	0	0
Domestic natural gas	31	32
Imported natural gas	0	0
Nuclear	0	1
Hydro and renewable electricity production	3	6

Source: Program of Kazakhstan power sector development by 2030.[59]

Oil & Gas

Kazakhstan's proven oil reserves are estimated to be between 30 billion barrels[60] and 39.8 billion barrels[61], making it is one of the major oil producers of Central Asia, and among the important world exporters of oil and oil products.

Vast Kazakhstan oil reserves are located at Caspian continental shelf. As for now, there are 4 major oil fields Tengiz, Karachaganak, Kashagan, and Kurmangazy out of 18 oil fields under development. Their development is exercised jointly by international and national oil companies. Under the Kazakh legislation, the international companies can develop the oil fields only by establishing joint ventures with national companies, which insures government's strong influence of the oil industry.

[59] Program of Kazakhstan power sector development by 2030. Adopted April 9, 1999. URL: http://www.memr.gov.kz/html/2030.html

[60] Embassy of Kazakhstan in UK. Kazakhstan Economic overview. Oil and Caspian Off-Shore Development Strategy. URL: http://www.kazakhstanembassy.org.uk/cgi-bin/index/66

[61] BP. 2006. Statistical Review of World Energy.

Crude oil is usually exported; the domestic needs for oil products are covered by domestic refineries. There are three oil refineries - Atyrau oil refinery located in Western Kazakhstan, Shymkent (PetroKazakhstan Oil Products) located in Southern Region oil refinery, Pavlodar oil refinery located in Northern Kazakhstan.

Natural gas available in Kazakhstan is mostly "associated" gas from the oil fields, with reserves located in the west of the country[62] in Caspian region. Quite often, natural gas is being flared during oil-mining process. While oil and oil products are mostly used for the transportation purposes, natural gas mined locally and imported from Uzbekistan is being used for the domestic purposes.

Power and heat supply

The overall installed capacity of power stations in Kazakhstan decreased from 19.12 (as for the year 1995) to 16.9 GW (2003)[63] due to the collapse of the economy in the country in early 1990s, In present, Kazakhstan has 54 power plants including five hydropower plants, giving the country 14.6 GW of actual capacity[64]. Kazakhstan gets from 80 to 85 per cent of its electricity production from coal power stations fired with domestically mined black and brown coal, located in the northern coal producing regions, and 12–14 per cent of which are hydroelectric, primarily located along the river of Irtysh.

According to the division of functions between different tiers of state governance, the capital investments in electricity generation and distribution at state-owned facilities is responsibility of central government, while the local and regional level akimats (local executive bodies) are responsible for the maintenance and construction of new local electric power lines[65]. The provision of district heating services is in full responsibility of local executive bodies, including construction and maintenance of engineering networks[66]. Quite often, the resources of executive bodies available for maintenance and construction purposes are limited. The electricity distribution, district heating and hot water supply networks are outworn due to the improper maintenance in 1990s.

The energy system of the country is greatly unbalanced, with considerable North–South discrepancy. Hosting the country's largest power generator, owned by AES since 1996 Ekibastuz - 1, Northern Kazakhstan is fully supplied with the electricity, surplus of which is being exported to the Russian Federation. The Southern Kazakhstan does not have high-voltage lines connection with the northern region of country, and electricity is being supplied from Uzbekistan through the territory of Kyrgyz Republic.

[62] US Energy Information Administration. 2006. Kazakhstan Country Analysis Brief.
[63] UNDP Kazakhstan InfoBase. URL: http://www.undp.kz/infobase/tables.html?id=38
[64] ADB. 2005. Electricity Sectors in CAREC Countries. A Diagnostic Review of Regulatory Approaches and Challenges. URL: http://www.adb.org/Documents/Studies/Electricity-CAREC/drrac.pdf
[65] Munteanu Igor, Popa Victor, eds. Developing New Rules in the Old Environment. Chapter 8. Local Government in Kazakhstan. By Meruert Makhmutova. Budapest: OSI/LGI, 2002.
[66] Assignment of Responsibilities to Different Levels of Government in Countries of Central Asia: Prospects for Further Development. OSI/LGI, 2001.

The net export-import balance has changed from negative to positive (from –6.5 billion kilowatt hours in 1994 to 0.4 billion kilowatt hours in 2001).

The electricity supply has significantly decreased after USSR's collapse mostly due to the overall stagnation of the industry and the significant decline in the society's purchasing capacity. Since 2000, the economic growth lead to increase in demand, which has driven the overall increase in electricity supply due to the general economic improvements.

According to the Governmental projections, Kazakhstan's power generation sector total output was supposed to reach 86 billion kWh by 2015, when power consumption projections were at 81 billion kWh. In 2005, the deficit of installed generating capacities in Southern and Western regions of Kazakhstan was estimated at 800 MW and 300 MW respectively. In 2007, the projected deficit of electricity may reach 6.9 billion kWh in electricity-deficit regions (Western, Aktiubinskiy, and Southern regions), while surplus of electricity in Northern region of country is foreseen as 7.6 billion kWh[67]. According to experts, if new power capacities are not installed, the country will face deficit of 0.5 billion kWh in 2008, 14.5 billion kWh in 2015 respectively47.

The latest developments of the energy system are investment projects by KEGOC, aimed at construction of the northern–southern Kazakhstan power lines, and overall rehabilitation of the country's energy transmission system is partially completed[68].

Due to the massive deterioration of the generating capacities, the Kazakh Government announced plans for construction of 2 large heat and power plants—Balkhash and Unit 3 at Ekibastuz—as well as Moynak hydropower plant during 2008–2016[69].

Coal

Black and brown coal mined in Northern Kazakhstan is mainly used for the electricity production at coal plants of Kazakhstan. During years 1997–2002, Kazakhstan remained one of the coal exporters in the region, with export volumes remaining at the level of 21–22 million of tonnes per year. The domestic consumption have seen significant decline in 1998–2000, but in the recent years turned to growth due to the increased demand from electricity producers and steel industry.

Coal-fired power plants along with transportation are the two most significant sources of the atmospheric pollution in Kazakhstan. So far coal remains the cheapest source

[67] Power Expo Kazakhstan. News September 10, 2007. Ministry of Energy has provided brief balance of energy production and consumption in Kazakhstan for this year (in Russian). URL: http://www.powerexpo.kz/ru/2007/news_items/power_inputs

[68] JSC KEGOC. Investment projects. URL: http://www.kegoc.kz/page.php?page_id=211&lang=2

[69] Power Expo Kazakhstan. News September 10, 2007. Ministry of Energy has provided brief balance of energy production and consumption in Kazakhstan for this year (in Russian). URL: http://www.powerexpo.kz/ru/2007/news_items/power_inputs

for electricity production in the country, therefore energy efficiency projects at existing power plants and fuel switch projects should achieve governmental support on the highest level in order to be successful.

Hydropower

The anticipated hydroelectric potential of Kazakhstan ranges from 27–30 billion kWh per year, approximately one third of electricity produced[70] to 170 billion kWh per year[71]. So far, hydropower capacities stand for 10 - 14% of electricity produced in the country. As far as water is the strategic resource and among the major factors of political and social tension in Central Asia, the hydropower resources, in terms of reservoir construction and operation, are scarce and difficult to manage due to the international relations in Central Asia. Therefore, the further significant development of large hydropower plants is highly unlikely.

Despite the problems with the construction of the large scale facilities, the development and reconstruction of small and medium scale hydropower installations is considered feasible. In the present time, up to 10 small and medium hydropower plants in the Southern Kazakhstan are under rehabilitation or construction[72]. The state programs envisage construction of small and medium hydropower plants. The Kazakh Government aims at attraction of USD 200 million investments in the South-Eastern Kazakhstan for construction of 12 to 14 small hydropower stations with total installed capacity of 69–81 MWh in order to enhance the electricity production in the region[73].

Nuclear energy

In April 1999, Kazakhstan's single 90 MW Mangyshlak Nuclear Power Plant in Aktau, has been shut down. In April 2003, Government of Kazakhstan sold this NPP to Kazatomprom, the national nuclear power company[74].

Despite the negative attitude of the country's population to nuclear power due to the experience with Semipalatinsk nuclear weapons testing site, the country's government is planning to construct nuclear power plant near Aktau[75]. The significant power shortages in winter 2007-2008 strengthened the Kazakh Government's position on the further nuclear power generating capacities development. The Kazakh Government plans to start 2 units nuclear power plant construction in 2011, with commissioning of the first unit in 2016, and the second to be ready by 2017[76].The suggestions on potential cooperation in development of nuclear energy in Kazakhstan

[70] Expert Kazakhstan. Issue 13, 2007. Svetlana Grybanova. Vital electric power of the country. (in Russian).
[71] Kazakhstan Today. April 16, 2007. Alternative energy sources account for 0.02% share in total power supply.
[72] Kazinvest. List of projects. URL: http://www.kazinvest.kz/en/projects/
[73] c. News March 18, 2008. The construction of small hydropower stations USD 200 million worth is foreseen in South-Eastern Kazakhstan (in Russian). URL: http://www.powerexpo.kz/ru/2008/news_items/ges
[74] Embassy of Kazakhstan in Ukraine. Kazakhstan country profile.
URL: http://www.kazembassy.com.ua/ua/elprofile/Kazakhstan__economica_energy_oil.html
[75] Expert Kazakhstan. New nuclear energy station replacing the old one (in Russian). Issue 26, 2007.
[76] Power Expo Kazakhstan. News November 23, 2007. Construction of nuclear power plant in Kazakhstan is foreseen in 2011 (in Russian). URL: http://www.powerexpo.kz/ru/2008/news_items/atomic_power_station_kz

so far have been received from Russian Federation and Japan, however the Government is reviewing the application of the Russian company "Atomstryproekt Ltd".

As the country possesses approximately 30% of world uranium reserves, the potential for such development is high. The uranium mining and uranium ore concentration continues in Kazakhstan with involvement of international companies.

Biofuel and biogas

The biofuel production in Kazakhstan has seen rapid institutional development during recent time. Ministry of Agriculture of Kazakhstan has already drafted the strategy for biofuel production to 2007, and proceeds with feasibility studies in bioethanol and biodiesel production.

The recently established national association of biofuel producers consists of seven companies working in field of biofuel production. The goal of this association is support the innovation technologies in biofuel sector and legislation development.

Capacities of biofuel production are highest in Central Asia due to the huge territory, and large scale agricultural complex. Currently, one biodiesel plant in Northern Kazakhstan is already operational with the supply of raw materials (rapeseed) from the agricultural lands in company's property; therefore the operational chain is eased. Moreover, construction of two additional plants is scheduled to the end of 2007. These enterprises will be established in a form of joint-stock companies by private partners and government on a parity basis.

The capacities for the biofuel production range from 1 to 3 billion litres per year of low-quality grain reprocessing according to Ministry of Agriculture's estimates[77]. Domestic market of Kazakhstan has low capacity in terms of biofuel demand. Its projected volume is approximately 250–300 thousand tons of biofuel per year[78].

Despite the low capacity of the national market, the governmental incentives on reduction of excise-duty for bioethanol for fuel purposes from 400 tenge (USD 3.3) to 0.1 per litre is seen as the strong incentive for the further development of biofuel industry.

Regardless of positive signals for the biofuel producers, they envisage continuing growth of prices for grain (up to USD 256 per tonne) and corn (up to USD 160) as the major barrier for bioethanol production.

The biogas production remains questionable, as far as the prerequisites to it are the proper wastes handling and landfilling practices. Capacities for biogas production are

[77] Ministry of Agriculture of Kazakhstan. URL: http://www.agrihort.iteca.kz/en/2007/news_items/biofuel_kazakhstan
[78] Alternative fuel. August 2007. Interview with Akhmetzhan Yesimov: Biofuel produced in Kazakhstan will be competitive at the international market. URL: http://fuelalternative.com.ua

quite low due to the lack of waste sorting practices, insufficient state of the existing landfills and illegal landfilling taking place.

Trends in energy policy

After the break-down of the Soviet Union the energy sector in Kazakhstan was left in the state of crisis as consumers were not longer willing or able to pay for the energy supplied to them and utilities were no longer able to pay for the services they received. Though the government had been trying to solve the problem by increasing tariffs, the sector suffered from lack of circulating assets, facing debts for consumed power and heat as well payment arrears for utilized fuel, labour etc. The situation prompted the government to introduce a deep reform of the sector, adopting targets to privatize substantial part of utilities. The state intention for privatization of power industry was announced in 1996, and meant restructuring of production, transmission and distribution.

In 1996, AES bought one of the biggest coal power plants in the world—Ekibastuz - 1. Consequently, in Eastern Kazakhstan AES has concluded the concession agreements for Ust-Kamenogorsk and Shulbinsk hydropower plants, bought Ust-Kamenogorsk and Sogrin CHPs, and Maykuben coal bed in Pavlodar oblast. Total installed capacity for heat and electricity production constitutes for 6800 MW. According to company's estimations, these facilities stand for 30% of total installed capacity for electricity production of Kazakhstan. The company also operates Eastern Kazakhstan Regional Power Distribution Company, Semey (former Semipalatinsk) Power Distribution Company since 1999, and Ust-Kamenogorsk heat distribution network.

The production side, covering power plants, and distribution sides were partly privatized, while high-voltage transmission lines remained under the state control with a monopoly status. So far the process continues - large power plans have been sold to strategic investors, smaller facilities transferred into municipal property. Though privatization was the only way to liberalize the market some of the outcomes of the reform were not entirely positive. For instance, some of the newcomers on the electricity market continued to work on outdated equipment, without any plans to replace it with new technologies, keeping electricity prices at relatively low levels. As prices on electricity generated from renewable sources cannot yet compete on the spot market with prices offered by coal power plants, tariffs for energy remain one of the most significant barriers for clean energy development.

Kazakhstan has partially privatized its power plants, but the electricity distribution system remains in state property. The low-voltage regional distribution networks have been reformed into joint-stock companies. Joint Stock Company "Kazakhstan Electricity Grid Operating Company KEGOC" established in 1996, the national operator of the high-voltage grids, has granted management rights to several private companies, but maintains control over high-voltage transmission lines, substations, and the central dispatching apparatus. JSC KEGOC is the System Operator of the

Unified Power System of the Republic of Kazakhstan, which main objective is to provide stable operation of UPS of Kazakhstan and reliable control of the National Power Grid.

Ninety per cent of electricity sales are made in the bilateral forward market, and there is also a day-ahead spot market and a real-time balancing market. Generators and load submit schedules for balancing energy three hours ahead and the system operator controls the settlement.

The modern electricity market of Kazakhstan according to the Law on power industry is divided into wholesale and retail markets. Principles of the free trade are effective in the wholesale market, where authorized buyers can choose the provider and conclude contracts without commissioners. While the transmission and scheduling tariffs are set by government, wholesale prices for the energy are not subject to the state regulation[79].

The spot market in Kazakhstan functions since February 2002 and operates within first in Former USSR country-level energy exchange. Up to 40% of total energy deals were concluded at the wholesale energy market as for 2004.

There are no green tariffs for the renewable energy generation in Kazakhstan so far, which is regarded as the major impediment for the alternative energy development. Moreover, the existing differentiation of tariffs for industrial enterprises and private consumers creates strong disincentive for the large scale energy consumers increase their energy efficiency.

The functioning of the energy system of Kazakhstan is legally provided with Law on power industry (July 2004), Law on Energy saving (December 1997), Governmental program for power industry development until 2030 (April 1999), Concept of wholesale energy market improvement (April 2000), Rules of the organization and functioning of the wholesale electricity market (January 2001), and Order of Antimonopoly Agency "On approval of the rules for the compensation of expenses of energy transmission organization for expansion and reconstruction of energy transmission lines" (February 2007).

Table 8. The proposed changes in installed capacity in Kazakhstan.

	Installed capacity in GW, 2005	Installed capacity in GW, 2030
Thermal power plants (CHPs included)	14.7	22.3
Hydro	2.2	5.5
Nuclear power plants	0	2.6
Others	<0.1	0.5

Source: Program of Kazakhstan power sector development by 2030

[79] Ingard Shulga. *Energy sector reforms in Kazakhstan.* Energorynok #7, 2004. URL: http://www.e-m.ru/

Trends in investment

Considering the volume of the FDI into the country by FDI per person, Republic of Kazakhstan takes the lead in CIS countries. In the absolute measures, Kazakhstan has the third place after Russian Federation and Ukraine in Newly Independent States. The drastic increase in the FDI to Kazakhstan was seen in early 2000s due to adoption of new country's investment legislation, and massive exploration of Caspian oil fields. In order to provide safety and augmenting of revenues from oil mining and export the National Oil Fund of Republic of Kazakhstan was established in 2000. In August 2006, the Funds resources comprised of USD 24 billion[80].

[80] Department of Energy. *Country analysis brief. Kazakhstan.* URL: http://www.eia.doe.gov/emeu/cabs/Kazakhstan/Background.html

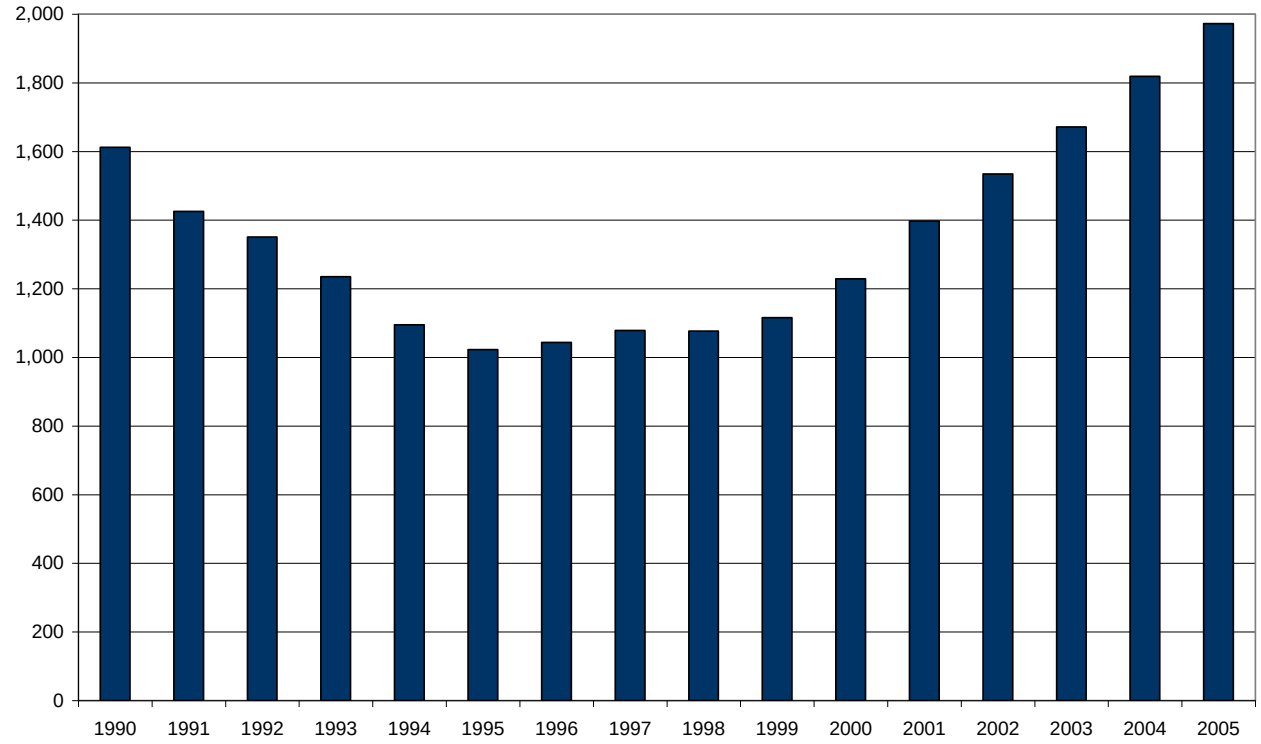

Figure 6. Historic changes of GDP in Kazakhstan, 1989-2005.

Source: National committee for Statistics of Kazakhstan

All sectors of the economy are by law open to foreign investors but some industries have ownership limits. For instance, foreign ownership of land is banned, and leases only of up to ten years are permitted (49 years for Kazakhstan citizens). However, foreign companies and individuals may still obtain control of agricultural land through a Kazakh-registered company and invest in agricultural production[81].

Investment concessions are available for investments in a number of priority economic sectors, including scientific research and development (R&D); certain agricultural activities; public utilities (water, gas, electricity); transport; production of food, clothing, paper, non-metal mineral products, machinery and equipment; chemicals production; communications; construction; education; health; and some others. In order to qualify, investors must sign a contract with the government and commit to investing in fixed assets that create new (or expand existing) facilities through the use of modern technology.

[81] Deloitte. *Kazakhstan. International Tax and Business Guide.* URL: http://www.deloittetaxguides.com/index.asp?layout=countryGuideDtt&country_id=300000030

Trends in energy investment

The government has supported the development of Free Economic Zones in order to develop local "downstream" industries in the oil and gas sector. Also, special tax break was created for companies operating in petrochemicals. This incentive includes five-year exemption from corporate income tax for companies that are registered for tax purposes throughout 2004–07 and earn at least 90% of their income through the sale of products developed from the processing of Kazakh oil and gas. Subsurface users are barred from benefiting from this exemption[82].

Generally, the foreign investors are mostly concentrated on the oil exploration and petrochemicals production and export, even though the preferences are given to the national companies. The international companies involved into Caspian oil fields exploration and oil mining are namely: ExxonMobil, Shell, BP, Lukoil, Chevron, Agip and others.

Due to the worn equipment and deteriorated infrastructure, demands for power investments in Kazakhstan still remain quite high, despite available funding. Thus, according to the latest estimates of JSC "KEGOC", Kazakhstan will need approximately USD 21 billion investments in power generation and transmission until 2015[83].

Investments in generating capacities

Due to the economic situation, the international financial institutions have been the major source of financing for reconstruction and rehabilitation for generating facilities in Kazakhstan. EBRD and the World Bank Group (IBRD and IDA) have provided funding in form of loans. Thus, IBRD and IDA commitments in terms of loans with state guarantees during 1998 until present constitute for USD 470 millions for three projects including generating and transmission components. EBRD provided EUR 11 million loan to JSC Karaganda Power for refurbishment and upgrade of power generation and heat distribution facilities in city of Karaganda.

Owing to economic growth, the state funding for power and heat generation facilities increased starting from 2001. Thus, the new generating capacities have been put into operation in Kazakhstan in 2006. These capacities include upgrade of Akmola TPP-2 (Thermal Power Plant), Ural TPP and gas turbine power plant in Atyrau region[84].

Besides JSC Power Karaganda, the private funding for the power generation facilities is mainly represented by AES Silk Road. Since 1996, AES has invested over $220 million in Ekibastuz-1, while the planned investments envisaged reaching USD 800 million.

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[82] Ibid.

[83] Power Expo Kazakhstan. News Sep 9, 2007. *President of JSC "KEGOC": The estimated size of investments to electricity production in 2015 is USD 21 billion*. URL: http://www.powerexpo.kz/ru/2007/news_items/power_industry_invest

[84] Power Expo Kazakhstan. News August 28, 2007. Prospects of Power Engineering – Energy of Prospects. URL: http://www.powerexpo.kz/en/2007/press_releases/power_expo_07.

The Kazakh Government announced plans on construction of Balkhash and Ekibastuz-3 heat power plants, Moynak large hydropower plant, and one nuclear power plant near Aktau by 2016. The estimated investments[69] for Balkhash power plant with two units of 660 MW each for 2008–2016 are approximately USD 4.5 billion. Ekibastuz-3 construction is planned for 2008–2012, with estimated investments of USD 602 million. Moynak hydropower plant of 330 MW installed capacity will cost USD 340 million, and commissioning foreseen in 2011. The Government plans to invest from 25 to 50 per cent into the each project, while the remaining investments should be provided by the private domestic and international companies.

Investment in transmission capacities

Similarly to investments in generating capacities, transmission investments capacities have been provided mostly from the governmental side, with significant involvement of the international financial institutions.

While state-owned JSC KEGOC operates power transmission system, the investment projects are held under auspices of this company. The IBRD and EBRD have provided funding of USD 240 million and EUR 58.6 million respectively in form of state-guaranteed loans since 1998 until present.

Trends in environmental regulation

The environmental legislation of Republic of Kazakhstan mainly covers the natural resources exploration and utilization, and the associated issues. The legislative framework consists of Water Code (2003); Land Code (2003); Forestry Code (2003); Law on atmospheric air protection (2002); Environmental Code (2007), Forest Code (2003), Law "On specially protected territories" (2006), Law "On protection, use and restoration of fauna" (2004), Law "On protection of flora" (2002), Law "On oil" (1995), Law "On underground resources and their usage" (1996), Law "On contracts for production partition for oil operations at sea" (2005), Law "On nuclear energy use" (1997), Law "On quarantine of plants" and others.

Kazakhstan has not ratified the Kyoto Protocol yet. Although the intentions were expressed in 2006, the Parliamentary crisis and following re-elections on August 18, 2007 hindered the consideration process.

Kazakhstan follows the international tendencies in incorporation of the principles of the sustainable development, social responsibility and environmental security in the legislation development. For instance, in 2003 the Concept of Ecological safety of the Republic of Kazakhstan for years 2004-2015 was adopted, Concept of Transition to Sustainable Development for Republic of Kazakhstan for years 2007–2024 was approved by President on November 14, 2006.

The existing environmental protection legal framework was recently codified with enactment of Environmental Code in January 9, 2007. According to "Translating

environmental law into practice" by OECD[85], this document resolves many discrepancies in the preceding legal acts and advances important new concepts and instruments. The Environmental Code incorporates all previous legislation of Republic of Kazakhstan with regard to

> "[R]egulations for protection, restoration and conservation of environment, utilization and reproduction of natural resources during conduction of economic and other activities, connected with natural resources utilization and impact on the environment within the borders of Republic of Kazakhstan." [86]

Although in terms of environmental regulations Kazakhstan is advanced compared to most of the Eastern European, Caucasus and Central Asia countries, the legislation and its enforcement is being criticized[87]. The critics comprises of mostly declarative character of legislation, when the proper enforcement is lacking. Although significant advances are present, the existing mechanisms for compliance ensuring are rather penalty-orientated than incentive-based[88].

The violation of the national environmental protection legislation is seen as the significant problem. For example, the international oil-mining companies typically do not abide the domestic laws, which have lead to the massive environmental degradation. Starting from January 2008, the integrated permitting for large industry is foreseen in the Environmental Code, and considered mandatory to all economic entities. Some of the experts envisage such type of regulation as leverage for international companies operations in Kazakhstan.

According to information from the governmental officials, Ministry of Environment of Kazakhstan foresees introduction of strict quotas for emissions particularly from oil companies operating in Caspian Sea in 2008[89]. The Governmental response to the non-conformity of companies with legislation is also seen as the leverage. For instance, on August 21, 2007 the Government of Kazakhstan has announced the possibility to halt the exploration of the country's largest oil field Kashagan due to the non-compliance with environmental legislation by Agip KCO Concern. The final decision will be made according to the results of current audit, and the sanctions can include license withdrawal. Further operation of mining companies will be under supervision of environmental inspectorates. According to the statement of Vice-Minister for Environmental Protection, the government has managed to get all mining companies

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[85] OECD. 2007. Translating environmental law into practice. Progress in Modernizing Environmental Regulation and Compliance Assurance in Eastern Europe, Caucasus, and Central Asia.
[86] Environmental Code of Republic of Kazakhstan (in Russian). January 9, 2007.
[87] OECD. 2007. Translating environmental law into practice. Progress in Modernizing Environmental Regulation and Compliance Assurance in Eastern Europe, Caucasus, and Central Asia.
[88] Voice of Freedom Central Asia. August 9, 2007. *Environmental legislation in Kazakhstan: myth or reality?* URL: http://www.vof.kg/kz/publications/?publications=82
[89] *Ministry of Environment foresees introduction of strict quotas for emissions from oil companies operating in Caspian Sea*. May 2007. URL: http://www.ecotech.kz/ru/2007/news_items/ecology_quotas_caspian

to develop programs to utilize associated gas with a view to abandoning the practice of flaring.

Presently, Republic of Kazakhstan does not have enacted legislation which would clearly regulate country's position towards clean energy. It is expected that more attention will be paid to enforcement and improvement of the existing legislation. Approval of a legal act providing incentives for renewable energy development[90] is foreseen in the nearest future. The draft law has been reviewed and supported by Ministries in spring 2007. Despite of the positive tendencies in legislation development, the clean energy projects should be specially supported with the Government in order to be successful.

Chapter 2. Investment climate and obstacles for clean energy investment

The risks associated with investments into Republic of Kazakhstan mainly derive from both political reasons and undiversified economy relying on outcome from natural resources export. That is why, despite sharp FDI increase for the last few years, it has been mostly limited to investment into the extraction industry. Starting from 2002 Kazakhstan has experienced stable growth in ratings regarding investment climate and national currency due to FDI growth in energy sector and increase of pipeline export, which were also facilitated by firm fiscal and monetary policy and strengthen of banking system. Further improvements in ranking can be easily explained by stable high oil prices and long-term development of energy sector in the country. Hence, hydrocarbons production has been driving economic development during the last five years thereby depressing commodity production sectors which could diversify state revenue. If the government does not make a proper decision, Kazakhstan will continue to rely mainly on revenue deriving from oil, which is rather dependent on market and political situation and is more prone to corruption cases.

Political risks

Experts characterize Kazakhstan as a country with "soft" autocratic regime, which actually contribute to stable prognosis on political risks. Therefore, political situation holds a stable forecast even though the lower house of Parliament was re-elected in mid August, 2007, after President Nazarbayev dissolved the Mazhlis earlier this year. New elections have been undergone by proportional system according to newly adopted changes in constitutions. So far there are few parties—NUR OTAN, OSDP—which have enough political weight and financial capacities to participate actively in elections and run an aggressive election campaign. However, at elections, pro-president party NUR OTAN won a significant share of votes and expected to establish a majority in the lower house.

Despite the widely known consensus within Kazakhs regarding seats distribution in the parliament, discord has been sown among so called elite or oligarchs—a powerful political force that strongly influences the decision-making process. After few months

[90] *Kazakhs Lean Towards Renewables Legislation.* URL: http://www.intersolar.ru/en/news/novosti/policy/396.html

of debates and mutual accusations, the president in his speech to the previous parliament on the first session of third convocation mentioned negative impact of oligarchs on political and respectively on economical situation. Dariga Nazarbayeva, president's daughter, emphasized for a few times that her father's opposition based inside state institutions and undermines president's power and authority from the inside. Especially, it refers to her father's Party and according to the recent changes in the legislative base Nazarbayev will be able to head Kazakhstan far beyond the current presidential terms.

Another big issue for investors is a communication between business and state, which becomes more and more fruitful from year to year but not easier, though. Some discrepancy still exists between businesses and state approaches what necessary measures should be undertaken regarding state investment policy. Moreover, Kazakhs energy sector lobby enjoys an essential support in political circles, which can be easily assessed as corruption cases and state pressure on international companies—shareholders of companies developing oil fields.

Governance and Corruption

In 2006 Transparency International awarded Kazakhstan 2.6 points in the corruption on 10 point scale[91], denoting one of the highest corruption levels in the world. International organizations such as the World Bank and the UN have noticed that corruption in the country is costly and inhibitive for business development. Some efforts have been made by the state to reduce corruption levels. The parliament adopted anticorruption law, and two national programs aimed to counteract corruption for 2001-2005 and 2006-2010, as well as some specific decrees. Financial Police—the agency charged with keeping corruption in check—was established and operates under President Nazarbayev's supervision. Given that these initiatives are carried out under the auspices of President Nazarbaev, the question remains how committed his government is to change the status quo.

The Government also came up with legislation initiatives in order to diminish bureaucratic barriers. Bureaucracy is named as one of the most important factors that hamper business activity revealing a scope of actions to be undertaken by the Government regarding bureaucracy elimination. The vice-minister of economic and budget planning has recently revealed plans to significantly minimize the licensing procedures. Nevertheless, it is not clear how effective may be the anti-bureaucracy steps planned by the government in the near term.

Financial barriers

Fitch sovereign ratings (2007)[35]

Kazakhstan	BBB+
China	A
Azerbaijan	AA+

[91] Transparency International. Corruption Perception Index, 2007. URL: http://www.transparency.org

Russia	A-

Kazakhstan aims to become one of the top 50 most competitive countries and the government takes measures to influence the country's economy in order to reach this. At the same time, investors point out a number of issues that prevent higher investment volumes, in particular in the banking sector. Local private companies as well as municipalities and other public institutions have difficulties with obtaining commercial loans. Though the banking sector is developing fast, high interest rates and bureaucratic procedures for loan disburse remain serious barriers for project financing. Clean technology projects are usually perceived to have higher risks because they rely on new less known technologies. Therefore, obtaining project financing for clean energy can be difficult.

Since the Law on Investment was adopted on 8th of January 2003, Kazakhstan implemented the so-called investment parity policy. The first measure under the new policy was establishment of new priorities for the investment flows. Comparing to previous decade, when the main aim was to attract foreign investors, Kazakhstan now also opened investment opportunities for domestic companies. Recently, the Prime Minister Karim Masimov has announced that in case of non-compliance with the contractual agreements on oil fields or any other resources exploitation, the Government will start nationalization process of the investor company's shares[92]. A few large foreign energy companies have already experienced difficulties in negotiating the contract withdrawal with Kazakh Government. The uncertainties caused by the new governmental policy have somewhat decreased the investment attractiveness of the Kazakh economy.

At the moment there are no existing financial incentives for clean energy development in Kazakhstan. The Government has recently disclosed plans to introduce certain fiscal initiatives (such as feed-in tariffs or renewable certificates) in the renewable energy law, which is being prepared now for consideration by the Government. At the same time a special fund—JSC "Kazyna"—was established to support innovative technologies implementation including the clean technology projects development. Kazyna is the state-owned company created for effective management of eight different financial funds facilitating to national development targets. The projects usually are financed through different national development institutions such as the Bank of Development of Kazakhstan, the Investment Fund, the Kazakhstan investment promotion centre KAZINVEST, the National Innovation Fund, and the Fund for small business development etc. The fund's purpose is to contribute to increase of investment activity in all sectors of economy, which apparently covers sound technologies having environment and social component.

In addition to the energy efficiency projects under Kazyna umbrella, there are also few successful projects financed by KAZINVEST, which promote renewable energy implementation, in particular hydropower plants construction in the southern region (e.g. building the Moinaksk hydroelectric plant on the Charyn River, construction of

[92] K2Kapital. Astana. Kazakhstan will nationalize oil fields and mineral resources. 7 February 2008. http://www.k2kapital.com/news/fin/359200.html (in Russian)

Nizhniy Issyk hydropower plant). KAZINVEST is also financing construction of the Dzungarian Gates wind power plant.

The Kazakhstan development fund comprises of few agencies involved in the RES and other clean technologies development: Institute of innovations, and other development institutions, constituting the umbrella organization, established recently—the National Investment Fund Kazyna Capital Management. Kazyna Capital Management operates under Kazyna umbrella and mainly contributes to improvement of investment attractiveness of Kazakhstan.

The Kazyna considers and approve the projects awarding them with long-term loans under preferential conditions (up to 10 years, interest rate depends on the project type and its economic and environment value). However, the fund mostly considers the projects for local communities' development and support as well as heavy industry (metallurgy, oil and gas industry) leaving renewables outside of its scope in most cases.

One of the few examples of the state financing of clean energy projects is the construction of bioethanol plant in the Northern region of Kazakhstan supported jointly by Kazyna Fund and its financial affiliate company - the Development Bank of Kazakhstan. The Kazyna Fund has financed purchases of necessary equipment and launched the plant. However, the bioethanol produced at the plant is currently imported to the Western Europe due to the lack of demand on the domestic market. The current prices for conventional gasoline remain rather low (at 60-65 US cents per litre), therefore the domestic market cannot be attractive for the biofuel producers.

To date Kazyna is the only domestic institution in Kazakhstan managing investments in the energy efficiency projects and, to the less extent, in the renewable energy. At the same time international organizations actively participate in the wind and solar power development. Multilateral development banks provide attractive conditions for small and medium business to develop new technologies. Interest rates of the multinational banks are more attractive compared to the private banks' loans.

Interest rates of the commercial banks in Kazakhstan are rather high—up to 14% per year in national currency or US dollars with the payback time from 12 to 120 months. Still it has to be noted that compared to the case of Ukraine the local project financing in Kazakhstan is less expensive and available for longer term.

The lack of legal basis is one of the main obstacles for the development of renewables and other clean technologies implementation in Kazakhstan. The only existing document regulating investments in renewable energy is the Law on Energy Efficiency. According to the law, renewable recourses shall receive priority in the state development programs for power sector[93]. Despite the declared priorities, the

[93] Law of the Republic of Kazakhstan on energy saving from 25 December 1997. N 210-1 об (Amendment enacted on 20 December 2004, N 13-III). http://www.climate.kz/rus/?m=html&cid=61

Program for Development of Renewable Sources approved in 1995 did not result in any significant steps towards establishing the necessary legislation base for RES and clean technologies. The Sustainable Development Concept for the period 2007-2024[94] approved in November 2006 requests for the development of necessary regulations to encourage implementation of energy efficiency measures and rational exploitation of renewable energy sources. The Concept sets a deadline for a few responsible ministries—Ministry of Environment Protection, Ministry of Energy and Natural Resources, and Ministry of Agriculture—which are to develop a range of legal acts by the autumn 2008. The document is also to provide a basis for greenhouse gases reductions in Kazakhsat charging the Ministry of Environment Protection for submitting a list of necessary measures to the Government by 30 July 2009. This document expected to be more successful than its predecessor - the Program for Development of Renewable Sources. Some experts assume that Kazakhstan might adopt a GHG strategy reducing emission three times per unit of GDP[95] and increase a share of renewable energy in the total energy supply in 250 times by the year 2024[96].

The Ministry of Environment Protection, UNDP Kazakhstan jointly with other interested executive agencies are working on a national concept for renewable energy to substitute useless RES Program. Despite the schedule set in the Sustainable Development Concept, the draft was expected to be approved as early as by the end of 2007, but none of the documents regulating renewable energy development in Kazakhstan have been submitted to the Parliament for consideration. The new law is expected to introduce tax preferences and financial support to facilitate renewable project development. Though the details of the draft law were not published as the draft is still being developed, according to UNDP Kazakhstan the law will include specific targets for power generation from renewable sources - possibly 2 GW of wind power and 1 GW of small-scale hydro by 2024[97]. Companies operating fossil fuels power plants will be required to buy green certificates, which will provide additional revenue for RES energy producers. At the same time it is expected that the certificates are to have a fixed price, be allocated in a one-off competitive bidding process and will not be openly traded. A new body - the Renewable Energy Agency - will be established to manage the system of green certificates as well as to provide security in trading contracts for stakeholders. The draft has been going through the processes of consultation and is to be presented to the parliament before the end of 2007. The Parliament approval has to be followed by the approval from the President to finally enter into force[98].

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[94] Concept on Sustainable Development for the period 2007-2024 from 14 November 2006. N 216. http://nature.kz/docs/kur.php

[95] Expert Kazakhstan #8 (156). 25 February 2008. Warm… Warmer. Adyl Nurmakov. http://www.expert.ru/printissues/kazakhstan/2008/08/globalnoe_poteplenie/ (in Russian)

[96] United Nations, News Feb 13, 2008. Kazakhstan intends to increase a share of renewable energy in 250 times by the year 2024. http://www.un.org/russian/news/fullstorynews.asp?newsID=9113

[97] UNDP Kazakhstan. Press Release: Renewable Energy Ministerial Delegation to the United Kingdom. March, 2008. http://www.undp.kz/script_site.html

[98] Information provided by the UNDP Kazakhstan. Mail from Mr. Doroshin (14 Sep 2007)

The Government widely supports pilot projects on renewable sources, such as UNDP pilot wind farm project, as well as energy efficiency project on district heating in cities. The World Bank is also active on the RES projects development and implementation. However, as the country is top 10 oil producer in a world, Astana often follows oil industry lobbies in decision making and legislation development.

Chapter 3. Incentives for clean energy investment

One of the most important arguments for investments into clean energy technologies in Kazakhstan is a current situation emerging in energy sector and especially in the regional distribution networks. Huge territories mean long transmission lines and respectively high power losses up to 14%. Local distribution networks, particularly in rural areas, very often do not meet basic requirements on operational conditions and are in urgent need for replacement (24% or 49.830 km of transmission lines (6-10 kV) as well as approximately 36% (43.769 km) of lines with lower capacities)[99]. Situation is likely to be jeopardized by unequal distribution of generating capacities within country as about 70 % of power plants are located in Northern Kazakhstan, resulting in need of construction of new high voltage transmission lines.

Outdated power plant equipment operating beyond the engineered life-time also opens some additional opportunities for investors in clean technologies, especially in energy efficiency. AES, a major foreign investor in the Kazakh energy utilities sector, has already finalized a modernization project at the biggest coal power plant AES-Ekibastuz. The project involved reconstruction of generating unit and implementation of advanced technologies on the power plant. On the other hand, AES is the biggest foreign investor operating 30% of the Kazakh power market, which has financial tools and institutional capacities for large-scale modernization programs for both energy generation units and transmissions lines. Regional companies, particularly those belonging to municipalities, may be restricted in monetary resources and would thereby require additional financing.

Modernization of coal and gas power plants is likely to have a significant impact on price. According to existing forecasts energy prices are to increase during the next five years due to modernization matters as well as construction of new capacities. Price increase up to 6 US cent per kWh may also become a supplementary incentive for companies to attract investment into clean energy development. Especially, price change would be relevant for improving the feasibility of wind power projects. For instance, payback period for the Dzhungarian Gate wind power project is estimated at 10 years for the case of electricity price at 3.6 US cents per kWh; the expected project lifetime is estimated at 25 years. Moreover, householders in that area pay 4.6 cents per kWt/hour for electricity generated from coal power plant[100].

[99] ADB. 2005. *Electricity Sectors in CAREC Countries. A Diagnostic Review of Regulatory Approaches and Challenges*. URL: http://www.adb.org/Documents/Studies/Electricity-CAREC/drrac.pdf

[100] Terra #10, 2004. The potential for renewable energy use in Kazakhstan. URL: http://www.greenwomen.freenet.kz/pdf/terra-10.pdf (in Russian)

According to the governmental program for 2006-2008 approved by the President in March 30, 2006, the framework of effective cooperation between public and private sector should also cover policy development on tariffs, particularly in case of exploitation of the natural monopolies such as water, power supply etc. In September 2007 the Government approved plans submitted by the Ministry of Energy[101] and Natural Resources on energy sector development making the first step toward tariffs liberalization. The key option discussed within the plan is a concept paper on tariffs increase. The reason behind such important steps is sharp increase in energy consumption. Even with the addition of new facilities to be launched during the next few years, it is expected that demand for energy would increase to 101 billion kWh by 2015[102]. As the existing capacities cannot meet such demand, the government's first priority is to attract investment into energy efficiency modernization projects as well as construction of new capacities. Higher tariffs are expected to spur introduction of energy efficiency measures and support construction of new installations. According to the Agency on Natural Monopolies Regulation[103], tariffs will rise even for the generation capacities under the state ownership. Certainly, prices on energy will increase gradually, however, tariffs for some regions will likely increase in the nearest time since it is necessary to improve return rate to operate normally. The Agency has set a ceiling for the tariffs growth at 15.7% compared to rates in the year 2007. The price on electricity remains extremely low compared to price in Europe or the United States. However, as Kazakhstan enjoys such a huge energy potential, the price seems to be lower in any case compared to the industrialized countries.

Development of the local renewable energy recourses also might be the appropriate solution to meet increasing demand for energy in Southern and Western Kazakhstan and avoid both replacement of transmission lines and construction of new power plants operating on imported coal and natural gas. Particularly wind and small hydro projects could be recommended given the region's geography. The Ministry of Energy and Resources[104] has reported to the Government on planned completion of "North-South" transmission line by 2009. The Ministry also expects energy deficit in the Southern regions even after the line will be set - approximately 215 MW at peakloads. Power generation utilizing local recourses would make possible to meet the local demand for power while avoiding costly construction of new transmission lines and generating units.

As the overall tendency in energy sector in Kazakhstan, investment flows mainly directed into the expansion of coal fired capacities. Coal-fired generation is seen as the primary solution to the potential power supply shortage in the middle

[101] Kazakhstan legal portal, www.zakon.kz. Ministry of Energy foresees electricity price increase (in Russian). URL: http://www.zakon.kz/our/news/news.asp?id=30121694

[102] Expert-Kazakhstan: High temps of Kazakh economics development increase probability of energy capacities deficit (in Russian). URL: http://www.tazar.kg/news.php?i=2757

[103] Agency of Natural Monopolies Regulation. http://www.regulator.kz/page.php?page_id=114&lang=1&news_id=1078 (in Russian. March,)

[104] The report to the Government from the Ministry of Energy and Resources (7 February 2008). http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat_id=29&id=259

perspective. Meantime there is a gradually growing understanding within the government institutions on the need to develop environmentally friendly technologies, with the scope of international initiatives covering renewable energy resources and energy efficiency. For instance, the UNDP program on wind power market development became a part of the governmental strategy on compliance with United Nations Framework Convention on Climate Change. The project is aimed at investigation of the wind potential on the territory of the Republic of Kazakhstan. The main purpose of the UNDP project is to eliminate existing barriers on the way of clean technologies implementation.

Wind Power

Due to its geographical location—Kazakhstan situated in wind-braced boom of northern hemisphere—the country is extremely rich in wind resources. According to different estimations, wind potential for the Republic of Kazakhstan is equal to 10 MW/km^2. South-Western and Central regions enjoy significant potential in terms of wind project development. Average wind speed exceeds 5 m/s and reaches 6-7 m/s in some areas, which is more than enough for wind mill operating.

The agency developing technical background for wind platforms—the "Kazselenergoproject" institute– has investigated 15 areas for big wind farms installations with capacities up to 1 000 MW. The State Program on Electricity Sector Development by 2030 foresees installation of few big wind projects with total capacities 520 MW[105]. The projects, if implemented, are likely to produce over 1-1.5 billion kWh annually. Dzungarian Gate and Shelekskij corridor in Almaty region have been defined as the most favourable areas to establish wind mills. Dzungarian Gate is recognized to have the most significant capacity for wind power generation within the country[106].

Moreover, tariffs on electricity have been increasing steadily during the recent years and continue to grow so far. Experts forecast that the price for one kWh of electricity generated on new power plants, which are to be constructed in the nearest future, can exceed 6 cents/KWh or even more for under-populated rural areas. At the same time, representatives of the "Kazselenergoproject" affirm that price of one kWh of electricity generated from the wind project will likely vary from 3.5 to 5 cents/kWh. Therefore, investments into wind power may happen to be the most in demand soon due to particularly favourable local conditions.

Hydropower

The use of hydropower remains a controversial issue, as water has been always an issue in semi-arid Central Asia. Kazakhstan's neighbouring countries located mostly upstream will likely suffer in the case Kazakhstan starts regulating downstream water

[105] The State Program on Electricity Sector Development by 2030 (in Russian). URL: http://www.memr.gov.kz/?mod=news&year=2007&lng=rus&cat_id=12&id=125

[106] Regulation of Government of Republic of Kazakhstan #384. April 9, 1999. Program for power sector until 2030. URL: http://www.kz.spinform.ru/

supply according to its own power production patters. In 2005 the government approved the Concept of Hydropower Sector Development up to 2015, according to which 20 hydropower stations are envisaged to be constructed. However, the projects have experienced uncertainties due to lack of political will to move forward with implementation and investments. The government in this document has mentioned only those stations, which will be operating on margin covering consumption peaks. The biggest hydropower plant to be built according to national targets is Mojnaksk power station with projected capacity of more than 300 MW at the cost of US $ 251 million. It is important to emphasize that the construction of the Mojnaksk HPP has raised a lot of discussions regarding the project's environmental impact. Nevertheless, even if the Government proceeds with the construction of Mojnaksk HPP, it has been estimated that Almaty region will likely face a deficit in power supply of up to 1300 MWh by 2020 in case new generation capacities are not commissioned.

Despite the critics and potential issues with the neighbouring countries, Kazakhstan retains an opportunity to construct and operate large hydropower plants. Astana also demonstrates interest in rehabilitation of old or abandoned small HPPs particularly in areas with well developed infrastructure. Though the government acknowledges environmental reasons to develop small-scale hydropower, energy producers face a lack of economic motivation to launch such projects before the legislation on renewables is developed to improve the conditions for small hydropower projects on the electricity market. Recently, The Ministry of Environment Protection has revealed its plans to commence up to 14 small-scale hydropower plants with installed capacity approximately 69-81 MWt/h located in Southern and Western regions[107]. The project has been submitted to the Government for consideration and approval.

The installed small-scaled hydropower plants produce up to 0.36 billion kWh, which is only 5% of used potential. The power sector reform and massive privatization process had significant impact on hydropower plants (HPP) sector—all HPP facilities currently operate in concession with private companies. But there was no increase in power generation from hydro sector since the process was finalized. Due to power deficit in the Southern region (about 900 MW during winter consumption peaks), rehabilitation and reconstruction of abandoned small-scale HPP has been considered. The projects were approved for implementation and financed by the KAZINVEST as one of the fund's purposes is to support the regions with energy supply deficit.

Solar energy

The situation with solar resources is similar to as wind power energy—there is considerable potential but it remains underutilized due to the lack of incentives and investment. The flow of solar radiation over the territory of Kazakhstan is enough to generate one trillion kWh. Solar energy projects are the most favourable for poor in natural recourses and under-populated regions including South-Western region.

[107] Power Expo Kazakhstan. News Mar 18, 2008. Small-scale hydropower plants are to be installed in the South-Western Kazakhstan .

Biggest opportunities there lie in provision of hot water supply to small consumers, which are not able to connect to centralized heat and power distribution networks. Despite the rising interest in solar energy utilization, there is no significant progress towards the development of actual projects. Some work has been started by international agencies - in 2003 UNDP Kazakhstan launched the first pilot project on solar energy in Almaty financed by Canadian International Development Agency. The Ministry of Environment is also being developing the project aimed to identify priorities and regions for solar energy promotion as well as application of advanced solar technologies for waste gases treatment. The project costs reach US$ 5.4 million for 2007-2010 including foreign investments, private financing and the state budget allocations[108].

Coal mine methane

Coal-mining industry plays key role in energy generation sector as 80% of power in the Republic of Kazakhstan generated at coal power plants. The most significant reserves of coal as well as all power burning of domestic coal are located in the Northern and Central regions. Since the sector was reformed and privatized, all coal production companies have been offered for sale or lease contracts giving new incentives to all related industries, particularly to power production from coal bed (CBM) and coal mine methane (CMM).

Estimated emissions of CBM are equal to 870 million cubic meters per year, and constitute quite a significant source of methane emissions, demonstrating huge potential for capturing CBM/CMM emissions in the country.[109] Karaganda basin alone possesses capacity of about 550 to 750 million m^3 CH_4, and total potential estimated for all coal basins varies from 1.2 to 1.75 billion m^3. Significant reserves in Karaganda and Ekibastuz basins mean a great potential for low costs of power generation utilizing CBM/CMM.

A major coal production company in Karaganda basin—Mittal Steel Temirtau—has already implemented coal mine methane flaring technology. However, the company continues developing additional projects to reduce emissions from coal mining and produce additional power. Recently the project on utilization coal mine methane on the Karaganda coal mine has been submitted for consideration to the United Nations Economic Commission for Europe[110]. This project also listed as the potential Joint Implementation project on the Climate Change Coordination Centre in the Republic of Kazakhstan.

[108] The Ministry of Environment of the Republic of Kazakhstan. URL: http://www.nature.kz/proekt/proekt.htm
[109] Coal Methane: Potential Energy Prospects for Kazakhstan. URL: http://www.unece.org/ie/se/pp/coal/mustafin.pdf
[110] Third Session of the Ad Hoc Group of Experts on Coal Mine Methane, Geneva, 2-4 April 2007. Project for the extraction and use of methane from mines and in theKaraganda coal basin (Kazakhstan). URL: http://www.unece.org/ie/se/pdfs/cmm/cmm3/ECE.Energy.GE4.2007.6_e_2.pdf

CBM and CMM projects usually seek to involve foreign investors to finance equipment purchases and installation, however so far there are other successful examples of domestically financed projects. In the mid-2007 the JSC "Aluminium of Kazakhstan"—the second biggest supplier of aluminium in CIS—launched gas power station operating on syngas from lignite on Shubarkol coal field. The project capacity is 318 million m3, which shall replace fuel oil during the alumina processing and save millions US dollars for company reducing the prime cost and increasing its competitiveness. Hence, it is expected that this kind of projects may be very attractive for investments due to low costs and short payback periods, and vast availability of the typical projects for the potential investors.

There are also some legislative incentives for CMM/CBM technologies applications such as it is expected that new petroleum law will encourage additional foreign investment by providing some VAT exemption for all exploration period. The sector seems to be certainly attractive for foreign investments in terms of economic, social, and environment outcomes. Especially, investments are welcome in the central region due to insufficient amount of power generated by the local coal power stations.

Landfill gas

Waste management as well as municipal solid wastes treatment is to be coordinated by the Ecological Code of the Republic of Kazakhstan amended in January 2007. However, the Government has quite slowly started with approving necessary legislation to avoid further worsening of situation regarding to unauthorized dumping and contamination. The Prime Minister signed the Decree on rules for solid waste landfills construction in April, 2007, albeit there are few more decisions considered on that problem. Environmental issues with municipal waste management have rose before Soviet Union collapsed, but at that time the Government was facing other essential environmental and social problems leaving the waste treatment issues on the backsides of decision-making process. That is why, current situation in the waste management sector in Kazakhstan have to be considered on the highest level to date since the main burden of responsibility for the scope of problems on insufficient control of landfills operations as well as lack of smartly developed legislation lays on the Government.

So far, 340,000 tonnes of municipal waste are generated annually only in Almaty City, which equals almost 390 kg per capita—one of the highest levels among CIS countries[111]. At the same time there are a lot of unauthorized landfills, which have not been permitted to open, even within the residential territories. The other quite significant feature referring to waste management is a lack of centralized program of actions contributing to solid wastes sorting by households or on landfills as well as absence of legal initiatives, which would introduce any financial mechanisms to contribute to sorting and reducing of municipal wastes amount (so far almost all municipal solid wastes are landfilled).

[111] Environmental performance review of Kazakhstan as discussed and approved by the 7th session of the Committee on Environment Policy, September 2000. URL: http://www.unece.org/env/epr/studies/kazakhstan/welcome.htm

Despite of some internal problems in waste management, Kazakhstan enjoys relatively high potential in implementation of projects on landfill methane utilization. The Government and the Ministry of Environment works jointly to develop a comprehensive legislation on waste treatment and it is expected to be on place by the end of 2007. Environmentalists also rely on the project-based Kyoto mechanisms, which might assist not only to methane capture activities at landfills, but also will be able to reorganize and keep landfills meeting international sanitary and hygiene norms. Though existing opportunities for implementing clean technologies on landfill gas utilization and energy production seem to be quite promising, there are rather few big landfills situated near cities such as Almaty and Astana or regional centres, where the projects implementation would be feasible in technological and economic means.

In theory, one of the most appropriate landfill regarding clean technologies implementation is newly constructed landfill for municipal waste disposal near Astana city. Since the landfill developed and built by foreign company corresponds to all sanitary and hygiene norms, methane capture and energy production will likely take less time and efforts for the project installation, than the projects at old landfills would take. However, due to the limited number of such projects in Kazakhstan—and uncertain plans of some akimats to proceed with solid wastes incineration instead disposal to landfills—it is complicated to estimate, in practice, which landfill meets all necessary requirements without site visits and trilateral negotiations with owners and transportation companies.

Biofuels

There is no legislative base yet that could coordinate all activities on biomass utilization; such legislation is especially needed in cases of bioethanol and biodiesel production. Currently the law on biofuel is under development and is expected to address the following issues:

- Introduce tax preferences for the producers of biofuel;
- Designate the institution for project activities coordination;
- Establish general regulations on biofuel use.

Although the Government is keen to introduce the law coordinating biofuel production, distribution, and feedstock purchases, there are numerous delays in the process. Since the first draft of legislation on biofuel was submitted for consideration to Mazhylis in November 2006 there was no progress made in law adoption process. The first proposed draft law aimed to contribute to state support for biofuel usage within the country. Moreover, the draft covered softening of tax burdens for enterprises producing biofuel, partial reimbursement of feedstock grown by Kazakhs farmers, local agricultural companies support, incentives for biofuel consumers, and other financial incentives.

The second draft is being developed by the Ministry of Energy and Natural Recourses and likely to be adopted until the end of 2007. The draft shall cover such important issue as excise tax reducing duty from 40,000 tenge to 10 tenge per 1000 litre (from app. US$300 to US$0.08). Besides, one of the problems to solve in the new biofuel law remains a lack of custom regulations between Kazakhstan and the transit countries, which borders are to be crossed. It is expected that new RES legislative base or legislation on biofuel will coordinate this issues and establish some incentives for subsidies since industry used to lose almost 40% of revenue to supply the product to the end consumers in Europe.

The draft law shall also protect domestic consumers of corn, wheat, and rape competing with international consumers of biofuel for internal supply. This statement shapes the basics of national policy and received support from the Ministry of agriculture. Officials from the Ministry emphasize the necessity to maintain a balance between international demand on biofuel and demand on feedstock coming from food producers on the internal market. Therefore, new draft law is aimed at securing the food supply for the national market, and at the same time to guarantee the supply of biofuel with regard to already taken obligations.

Kazakhstan already hosts 3 plants processing rape and wheat into biodiesel/bioethanol fuel. Two of bioethanol capacities are located in Southern Kazakhstan and operate mainly for the export markets in Europe, the plant in Northern refines biodiesel from corn; the fuel is also supplied for export. As domestic market has experienced difficulties with both legislative and investment inflow, the biofuel plants are likely to continue to operate for export. There is no developed supply chain from plant to refinery and then to gasoline stations. This chain may remain undeveloped as whole biofuel production industry mostly export oriented despite the issues related to trucking (Kazakhstan is landlocked) and transportation losses. Furthermore, Kazakhstan possesses essential reserve of natural resources such as oil and gas, which push fuel price down to very low levels comparing with the costs of fuel produced from biomass.

Kazakhstan has announced ambitious plans to produce approximately 1 billion litres of biofuel annually by the year 2010 using mainly agricultural wastes for production instead of wheat or corn. However, market players claim that production is becoming unprofitable due to the price increase on feedstock for biofuel processing. In the case wheat will continue growing, gasoline is most likely to stay much cheaper than biofuels. The situation seems to be also geared up by the national goods classification - biofuel production sector experienced some difficulties in terms of regulatory framework as different types of bioethanol are still classified as an alcohol in excise taxation system, which increase the price on biofuel in approximately 10 times and might make the product uncompetitive on the market. Notwithstanding the biofuel sector has only started developing and is quite quickly becoming one of the most

attractive sectors for investments.

Kazakhstan has certain potential of biogas production in the agricultural sector, though currently biogas is not used widely for energy production. There are two main obstacles that prevent wider use of biogas - high costs to produce biogas on the local level (unprofitable for farmers in the remote destinations); and lack of efficient infrastructure for the waste management handling and agricultural wastes, which hinders implementation of small scale projects. To date there are no waste management programs on the national level and in particular for agriculture industry.

Energy Efficiency

In 1996 the Government of the Republic of Kazakhstan adopted State Energy Saving Program covering wide scope of energy efficiency measures for both demand and supply side. So far there are few legal acts, which also coordinate energy efficiency programs and constitute a legal basis for the projects implementation. On the supply side the biggest project envisaged in the national legislation is the modernization of existing power plants in the period between 2020 and 2030. However, all of the existing coal power plants were privatized in the course of energy sector reform. The legislation thus has to introduce not only targets, but also financial incentives providing additional motivation to current owners to up-grade obsolete installations and improve efficiency of generation facilities.

Industry seems to be another important part of energy efficiency strategy as approximately 70 % of generated power is consumed by energy intensive sectors, such as ferrous and non-ferrous metallurgy and mining. The energy saving potential in industry is estimated at 10% of overall consumption[112]. However, significant potential and existing room for technologies improvement can be easily prevented from materializing by the low energy prices. Despite the discussions on electricity tariffs increase, the power prices remains more or less stable, thus eliminating any financial motivation to implement costly energy saving projects.

Due to its geographical position and continental climate Kazakhstan sees significant winter-summer temperature amplitude—winter peaks can reach -50ºC. Hence, district heating system has been developed and constructed regarding local environment conditions launching mainly co-generation for both heat and power production. According to the Program on electricity sector development up to 2030, the municipalities have to focus on construction and modernization of small and medium CHPs (up to 100 MW) with regards to the most advanced technologies developed for this sector.

[112] Kazakhstan. Regular Review of Energy Efficiency Policies 2006. Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects PEEREA. URL: http://www.encharter.org/fileadmin/user_upload/document/Energy_Efficiency_-_Kazakhstan_-_2006_-_ENG.pdf

Therefore, the projects aimed at energy efficiency improvements will certainly play significant role in clean technologies implementation and moreover, reduce the emissions of hazardous substances hampering environment, particularly in metallurgy and mining.

Kyoto Protocol ratification and flexible mechanisms

Some types of renewable energy remain economically inefficient for Kazakhstan, e.g. biogas, large energy efficiency projects etc. However, Kyoto Protocol's mechanisms can provide an additional incentive to go further with such projects. There are a lot of discussions in the country whether Astana shall join Annex B and take over a target for 2008-2012. No decision has been made so far, but the Mazhlis still appears to be in favour of ratifying the Kyoto Protocol. However, no legislative process with regard to Kyoto Protocol ratification has been started.

Kazakhstan's participation in the Kyoto Protocol is hindered by the special position it has negotiated for itself under its framework. Once Kazakhstan ratifies the Kyoto Protocol it will have a non-Annex I country status for the purposes of the UNFCCC, and Annex I country for the purposes of the Kyoto Protocol. Annex I status will allow Kazakhstan to participate in JI and International Emissions Trading, but only after it accepts a reduction target through an amendment of Annex B to Kyoto Protocol. Kazakhstan has made some steps towards Annex I status. The COP/MOP -2 in Nairobi approved Kazakhstan's proposal to join the Kyoto Protocol as an Annex I country with 1992 as base year.

This peculiar situation has complicated the process of ratification. Kazakhstan announced its position in the international negotiation process to define country's commitments regarding GHG emission reductions, however the current official position is to insist on zero reductions or even increase its level to positive number compared to the base year. Officials insist that Kazakhstan will increase its emissions, but reduce its energy consumption. In addition, despite the understanding that Kyoto Protocol will stimulate investments, legislative authorities has been delaying the consideration of the draft due to long negotiations between different institutions on responsibilities and roles they will be able to play if Kazakhstan joins Annex I countries.

It was expected that the parliament would support the law on the Kyoto Protocol's ratification before the COP/MOP in Bali in December 2007. In reality, Kazakhstan has carefully watched negotiations on the establishment of the target for Belarus, which showed that the adoption of the target will not likely make it eligible for JI and International Emissions Trading. As Belarus's case demonstrated, the need to ratify the amendment of Annex B by 70% of all Kyoto Protocol Parties, puts the chances of eligibility close to zero.

In terms of JI, Kazakhstan has seen a fair share of interest from project developers

and brokers due to potentially lucrative high volume project opportunities in the gas, oil and power sectors. The most preferable projects type for the government seem to be energy efficiency both on supply and demand side with fuel switch from coal to gas, as 90% of electricity so far generated from coal-firing power plants. It is expected that these projects to be implemented in the Eastern part of country—in the regions rich in gas resources. Also very promising project types cover fugitive emissions reduction and renewable energy production. Kazakhstan already implemented two pilot JI projects. One of them performed by NEDO, Japanese government agency, in cooperation with the Ministry of Energy and Mineral Resources was implemented at Uralsk CHPS, with approximate annual emissions reduction at 62 thousand tonnes of CO_2e. The second project on utilization of the associated gas with the approximate GHG emissions reduction of about 500 thousand tons per year is located at Kumkolfield, Harrikein Company[113].

With regards to reporting obligations, Kazakhstan has been noted as having a rather strong system for estimating greenhouse gas emissions and absorption by sinks, supported through several capacity building projects by the governments of US, Canada, and the EU. In its address to the COP in Nairobi, Kazakh representative stated that Kazakhstan has been preparing annual inventories for the last seven years and that the inventories in CRF format and the national inventory report have been submitted to the Secretariat in 2006. Emissions in the base year—1992—were 340 MtCO2e. The last national communication however, dates back to 1998, and will have to be revised to show up-dated forecasts for emissions in 2008-12.

Chapter 4. Case study

Kazakhstan Wind Power Market Development Initiative

Kazakhstan: Wind Power Market Development Initiative is a project implemented jointly by the Ministry of Environment Protection, the Ministry of Energy, Trade and Industry, and United Nation Development Program (UNDP). The project is aimed at developing the wind energy market in Kazakhstan, particularly focusing at eliminating of main barriers for renewable energy projects implementation such as lack of well-developed legislation base and absence of positive practical experience. The project envisages informational support for local communities to contribute regional municipalities in capacity building. According to the project objectives the 5MW pilot wind farm will be constructed in Djungar Gate, the most potential in terms of wind recourses area. Wind power plant construction has to reveal possible risks and develop a sample road map for other potential investors. Moreover, the initiative targets to assist the Ministry of Environment and Ministry of Energy in developing of the National Wind Energy Program by 2030 as well as comprehensive Renewable legislation.

[113] Kazakhstan incentives in climate change capacity building. Presentation of Lyubov Inyutina. URL: http://www.unido.org/file-storage/download/?file_id=29429

The project has been identified as one of the priority measures to reduce greenhouse gases emissions in Kazakhstan. The total impact of the project is expected to be around 400,000 tons of CO_2 over 20 years for the pilot project. In the case of full-scale utilization of the Djungar Gate potential some 500 MW installed wind power capacity could be commissioned with annual production of 1.7 billion kWh, equal to reduction of 1.7 million tons of CO2, 10 thousand tons of SO2, 5 thousand tons of NOx and 10 thousand tons of ash compared to the same amount of power produced at coal fired power plants[114].

The UNDP project has started in July 2004 and resulted in draft law submission to the Governmental agencies for consideration and approval. Another big step under the project, the development of the 5 MW pilot wind farm and monitoring program on wind potential for eight selected sites is still in the preparatory stage. UNDP experts are also effectively cooperating with teams in Ministries regarding the National Wind Energy Program, which is currently being drafted. However, it is important to emphasize that pilot wind projects might be launched only upon the Governmental approval of renewable energy legislation as none of legal document establishes regulatory framework to date.

The wind power potential of the Djungar Gate

The 5 MW wind farm is to be constructed in Djungar Gate ravine. According to the measurements conducted by Risø National Laboratory of Denmark[115] the wind potential in that area is to be very favourable for wind turbines installation. Djungar Gate seems to enjoy one of the best wind potentials in the world regarding electricity production. The Djungar Gate has been identified for construction also due to its beneficial location—the ravine is situated near Almaty city, which faces steady increase in power consumption. Moreover, the southern region is experiencing power deficit since power plants in the region operate mainly on the imported coal and cannot fully meet the demand needs. Therefore, launch of pilot wind project will demonstrate feasibility of wind energy utilization in the southern region as well as reveal obstacles for the wind projects implementation.

Financial aspects and tariffs

The total project costs have been estimated at US$ 7.274 million, US$ 1.55 million of which are provided by the Global Environment Facility (GEF) to cover the technical assistance component of the project and to share the costs of the first pilot project.

Being co-financing party, the Ministry of Energy and Mineral Resources under auspices of the Government of the Republic of Kazakhstan is to provide 24 million tenge (approximately US$ 164,000 as of August 28, 2003) to develop the "National Program on Wind Energy Development". The total costs of the 5 MW power plant have been

[114] Removing barriers to wind power production in Kazakhstan. Project documentation. http://www.undp.kz/projects/start.html?redir=center_view&id=61

[115] UNEP Risoe Centre for Energy, Climate, and Sustainable Development, The Wind Power Potential Of The Djungar Gate And The Chilik Corridor. http://www.undp.kz/projects/files/61-17333.doc

estimated at US$ 5.5 million, - the GEF expected to cover US$ 1 million of required amount. The rest of necessary volume is to be leveraged from the private sector through tender process. Furthermore, the Government will also provide some volume of needed investments into the construction of the first pilot wind farm in Djungar Gate applying financial tools to increase interest among potential investors in accordance with the law "On Investments". The government has committed to sign a long term feed-in agreement on the purchase of power generated by the Djungar wind power project.

Risks and barriers

The main risks for the initiative implementation might be bundled into three blocks - capacity, institutional and financial risks. The legislation, which is to eliminate most of obstacles, has not been adopted—the cross-sectoral strategy "National Wind Energy Development Program" as well as RES law is being prepared yet jointly by the experts from UNDP, the governmental implementing institutions (Ministry of Energy and Resources and Ministry of Environment Protection, KEGOC, Almaty region Akimat), and private sector (EBRR, ALD Consulting, and NIF), and Renewable Energy and Energy Efficiency Partnership (REEEP).

Current situation on the retail electricity market demonstrates existing state monopoly in electricity distribution system, which gives an opportunity to the government to control the power prices. Moreover, the level of technical standards and testing facilities for quality control of the wind turbines might be very low because of increasing amount of obsolete technologies entering the market.

In terms of financial risks, it is quite difficult for host companies to attract local or foreign investors to participate in financing of the project due to lack of information about potential investors who can facilitate the wind power development in Kazakhstan. Although there are a number of investors that during the past few years have indicated strong interest in starting wind energy development in Kazakhstan, the existing barriers like lack of institutional framework, investment risks of the country have prevented the realization of these projects in practice. Therefore, the success of the project in overcoming the identified barriers, together with the continuing co-operation and commitment of the Government to introduce changes supporting the development of the wind energy sector and the role of the small independent power producers in the power sector development in general, will largely determine the sustainability of the project as a whole. The project tries to foster the close co-operation with the different Government bodies and other key stakeholders in Kazakhstan through the Project Steering Committee and by maintaining regular contacts among institutions concerned. It is also expected that special working groups with the participation of the key stakeholder groups will be organized to discuss,

among others, the changes needed in the legal and regulatory framework to promote wind energy.

Additionally, among the barriers it should be mentioned the long term power purchasing tariffs that are uncertain as well as the lack of a long term agreements on energy purchase. The tariffs are expected to continue to increase in Kazakhstan to reflect the full costs of rehabilitation of the existing power plants, electricity transport and construction of new capacity needed. In addition, the impacts of power generation are increasingly taken into account in the course of decision-making for investments, which is expected to give an additional boost to the development of the renewable energy resources. Should this not happen, however, the current tariff levels will make it very difficult to justify the investments into wind or any renewable power generation facilities in Kazakhstan.

The investment risk of Kazakhstan is high, that leads to very high interest rates and short expected pay-back periods of local financing, making the available commercial credits in Kazakhstan practically unusable for any long term energy sector investment. Moreover, the preparation cost of the project is high but there is no guarantee that partners will be found to cover the costs of its implementation[116]. To attract investors for the construction of the 5 MW pilot project, the Government is expected to provide certain privileges to investors.

And finally, the initiative and the construction of the wind farm is a totally new activity for Kazakhstan that is why there is a lack of awareness and experience of the local utilities on the performance of wind power generation and its operation within the grid and lack of information and experience to determine accurately the specific construction and operational costs of wind power generation in Kazakhstan. The assessments of the wind maps for the perspective sites and regions under preparation now, so the reliable wind resource assessments and wind maps just do not exist. A lack of trained professionals to install and to ensure a reliable operation of the wind turbines can be one more barrier of the implementation of the project. Beside experience and good knowledge of wind energy activities in general, the qualifications of the project management should include a proven track record and experience on promoting and managing national/regional projects of similar size and complexity.

Conclusions

Ukraine and Kazakhstan have, to a large extent, followed the same paths in terms of economic development since the break-up of the Soviet Union. Both countries had experienced sharp economic decline since 1991, followed by economic growth since the early 2000s until now. While sharing the common legacy of high energy intensity across virtually all sectors of economy, the two countries have different positions on

[116] Removing barriers to wind power production in Kazakhstan. Project documentation. http://www.undp.kz/projects/start.html?redir=center_view&id=61

the global fossil fuel market. Ukraine is a net oil and gas importer, and therefore is naturally interested to increase energy efficiency and reduce its dependence on the external fossil fuel supply. Kazakhstan has vast resources of oil and gas, therefore having no need to decrease its reliance on fossil fuels.

The availability of domestic fossil fuels has, to a certain extent, formed the medium-term tendencies in the energy sector development in the two countries. Both Ukraine and Kazakhstan heavily rely on domestic coal for electricity production. While in Kazakhstan some projects switch from coal to gas, this is not the case of Ukraine. Over the past several years, Ukraine has experienced sharp growth in prices for natural gas imported from Russia and has expressed strong intentions to increase the use of domestic coal and nuclear power. The Ukrainian electricity generation sector relies heavily on nuclear power (slightly lower than 50%), while Kazakhstan decommissioned its only nuclear power plant. Still, both countries have ambitious plans to develop nuclear power in future despite the Chernobyl disaster of 1986.

Ukraine and Kazakhstan have shown significant progress in liberalizing their energy sectors. High voltage transmission lines remain state property in both countries, while electricity distribution companies are private. In terms of generation capacities, Kazakhstan has shown a faster pace of reforms and has privatized the major power plants, while in Ukraine, power generation remains largely under government control. Despite certain differences, the two countries share similar problems in the energy sector. Losses during grid transmission remain rather high in the both cases. While Kazakhstan has a problem of distributing electricity over its vast territory, Ukraine already experiences limitations within its national grid and looks for better opportunities for electricity export. Both countries have intentions to develop high voltage transmission lines to improve the general state of their power grids.

In both countries, electricity tariffs are differentiated between the industrial consumers and private sector, and providing lower tariffs for the large consumers provides no incentive for energy efficiency in the industrial sector. Electricity tariffs in general remain comparatively low, being one of the main impediments to the development of renewable energy development. Low energy tariffs also remain one of the main barriers to the large-scale energy efficiency projects.

Large-scale investment in energy sector in Ukraine is mostly represented by the international development banks, namely EBRD and the World Bank Group. While Kazakhstan shows less willingness to cooperate with the multilateral banks, EBRD remains one of the largest investors in the country's energy sector. UNDP currently provides financial support to the pilot wind power program in Kazakhstan.

Kazakhstan's government has a large presence in oil extraction and refinery; while Ukraine has privatized its refinery capacities, though leaving oil and gas extraction under the state control. Ukraine and Kazakhstan have large, well developed

agricultural sectors and have great potential for the production of biofuels. However, low fuel prices in the local markets prevent the increase of biofuel production to any significant scale. It is most likely that in the near future the two countries may become suppliers of the raw materials for biofuel production to the EU states while having targets for biofuel consumption on the national level.

Environmental legislation in both countries is rather comprehensive and declaratively follows the principles of sustainable development. A declarative nature that lacks real economic incentives and the lack of enforcement of the existing environmental regulation are the main issues in Ukraine and Kazakhstan. The declarative nature of state programs supporting energy efficiency and renewables has resulted in failure to achieve any notable results in the both countries.

Both Ukraine and Kazakhstan may receive additional benefits from the mechanisms of the Kyoto Protocol for the development of clean energy projects. Ukraine is one of the most attractive JI countries at the moment, while Kazakhstan does not have clear position towards the Kyoto ratification. Though the Kyoto mechanisms provide relatively modest improvement for renewable power projects (about 1% of IRR improvement for the wind power and up to 3% for hydropower), this is an important incentive for private sector initiatives.

Policy recommendations

The experience gained so far in both countries shows that the state often declares a willingness to support clean energy development, mainly by means of various government programs. The legacy of centralized economic planning still leaves momentum for the development of rather ambitious programs of support to main economic sectors, including the energy sector. The existing state programs are rather process-oriented and often cannot fully reach their objectives.

Ukraine has given broad support to the local producers of wind power turbines. However, to a large extent, the government support eliminated the need for wind power producers to be economically effective. As a result, in most cases, the constructed wind power plants have shown poor performance indicators and have not met the initial objectives. It is unclear whether Kazakhstan may follow the path of Ukraine, but at the moment, the only existing wind power project is supported by financing from international institutions and from the government, and therefore might follow the example of Ukrainian wind projects in not being commercially viable.

Examples of EU countries that managed to develop a significant share of renewable power prove that the best results in developing clean energy may be reached by supporting private initiatives through government-imposed incentives, usually in the form of market-based mechanisms. While the mechanisms may vary from the application of feed-in tariffs to green certificate trade, usually in combination with

mandatory targets for renewable generation on the national level, any transparent form of support to private initiatives should stimulate the inflow of private capital into clean energy development.

Ukraine and Kazakhstan are currently considering introducing national legislation to support renewable energy by means of market-based mechanisms—the feed-in tariffs and green certificates respectively. At the same time, both countries have experienced delays with the final approval of the financial mechanisms for renewable energy support. Lack of the appropriate legislation, together with the relatively low electricity tariffs, is most likely to distract the potential investors from the idea of developing any medium or large scale renewable power projects. Therefore, the approval of the necessary legislation and the creation of a transparent and understandable regime for the new players on the energy market should become priorities for both countries.

Unattractiveness to foreign investors and a rather poor business environment in general are barriers to the development of clean energy in the two countries. Fighting corruption, improving the transparency of business-related procedures—such as licensing—and attracting foreign investment into the energy sector should become major priorities for the governments to increase the willingness of the private sector to invest into clean energy development.