Energy Sector Reform in the Ukraine

*By Laszlo Lovei**

Summary

Many countries in the world are struggling to liberalize their energy markets and to replace rigid state controls by private initiative and ownership. The case of Ukraine illustrates the extreme difficulties of this transformation in a country suffering from macroeconomic imbalances, poor enterprise governance, and ineffective political leadership–a combination of factors present in several countries of the Former Soviet Union (FSU) today. Although the reform of the energy sector in Ukraine is still far from being complete, this note, together with another two on gas and coal, describe the process Ukraine's energy sector has gone through since independence, with particular emphasis on the interplay between economic and political factors.

The First Three Years

Ukraine became independent in late 1991. The new state consumed 229 million tons of oil equivalent of primary energy in that year, more than most countries in Europe on a per capita basis. Half of Ukraine's energy demand was supplied from Russia at prices that were a small fraction of world market prices. In early 1992, the Russian government announced that the price of fuels exported to the "near abroad" would be gradually increased to world market levels (within a year for oil, and within two years for gas), giving little time for Ukraine to prepare for the coming terms of trade shock.

Following an intense lobbying effort by domestic energy producers, the Ukrainian government decided that the best defense was the substitution of imported oil and gas with a combination of domestic fuels (mostly coal) and energy saving measures. The government also decided that increases in the price of imported fuels would be reflected in domestic energy prices with a lag in order to provide time for industrial and residential consumers to adjust. The budget was left as the only source of funding for the necessary investments in domestic coal production and energy conservation.

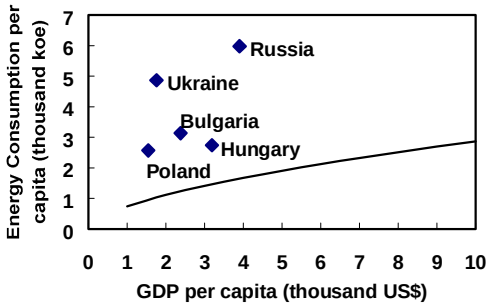
In the next three years, the budget deficit reached 10% of GDP, the energy intensity of the economy increased by 10%, coal production decreased by 30%, and the value of unpaid energy imports surpassed $5 billion. The energy utilities–electricity, gas and district heating networks–could not cover their operating costs, and service quality rapidly deteriorated. The leadership of the electricity industry was the first to respond to the wake-up call.

The Electricity Industry in 1991-94

Ukraine inherited a highly developed electricity industry from the Soviet Union. With a generation capacity of 52,000 MW (65% thermal, 25% nuclear, and 10% hydro), 18,000 km of high and 50,000 km of low voltage lines, the power industry provided 296 TWh of electricity in 1991, including 28 TWh for customers outside the FSU. The non-nuclear part of the power industry was organized into seven vertically integrated regional monopolies under the Ministry of Power and Electrification (Minenergo). The five nuclear power plants were under a separate state committee (Goskomatom).

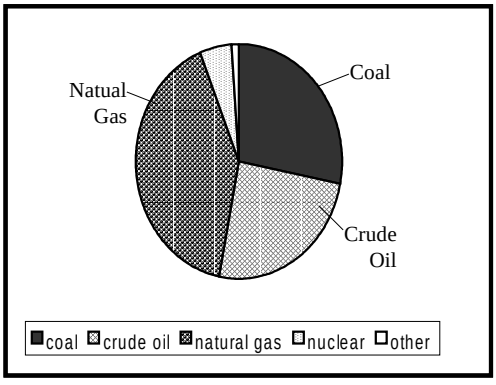
Despite a growing surplus of (nameplate) generation capacity due to decreasing domestic demand, a sizeable backlog of investments started to accumulate in the first years of independence: (i) Ukraine's Western partners demanded safety upgrades for nuclear plants; (ii) aging thermal and hydropower plants badly needed rehabilitation; and (iii) automatic controls and flexible peaking capacity had to be installed so the quality of electricity supply (stability and security) could improve.

Ukraine: Composition of Primary Energy Consumption versus GDP (1990)[1]



Source: World Development Report (1992)

Ukraine Energy Consumption (1990)



Origin of the Reform Concept

The leadership of Minenergo actively studied electricity reforms in other parts of the world. They were particularly impressed by the reform that took place in the United Kingdom in 1989-90. First, they noted the similarity of the size and the generation mix of the two power systems. Second, they liked the comprehensiveness of the UK reform: the establishment of specialized generation companies which compete to sell electricity through a competitive pooling arrangement; the introduction of a license-based regulatory system; and privatization. Third, they had a strong desire to restore Ukraine's place as a leading force in the power industry in Eastern Europe[2], and felt that the adoption of the UK model would place Ukraine in the forefront again.

Minenergo also became increasingly convinced that the current structure and governance of the Ukrainian power industry was an impediment to modernization. The price of electricity needed to be de-politicized, but this was unlikely

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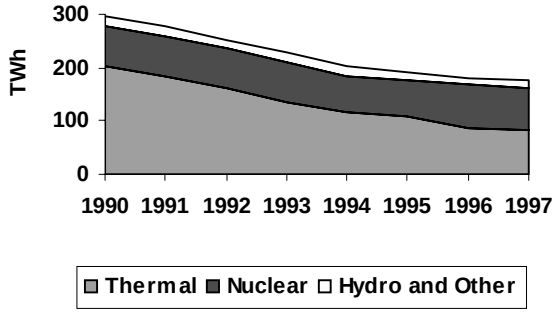
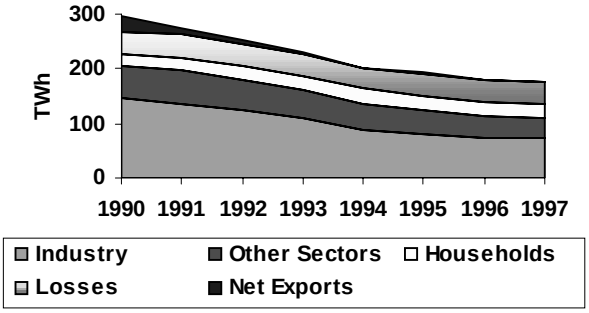
See footnotes at end of text.

to happen without an autonomous, transparent, rule-based regulatory system and a high degree of competition among generators and suppliers. The industry needed know-how and investment that the current owner (the state) could not provide, but the privatization of regional monopolies seemed politically unacceptable in a fragile new state which was pulled in various directions by the regions.

Electricity Generation



Electricity Consumption

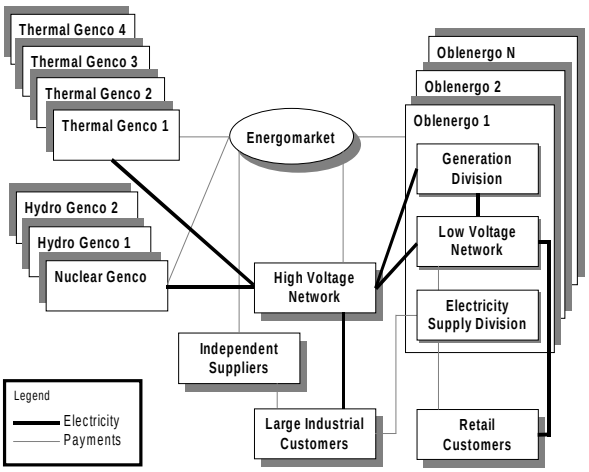


The New Industry Structure

In May 1994, the President of Ukraine issued a decree "On the Market Transformation of the Power Sector of Ukraine" which stipulated the unbundling of the power sector and the development of a competitive national wholesale market for electricity. The restructuring of the sector took place in 1995-1996, supported by extensive technical assistance from a large number of multi- and bilateral donors. This international assistance program was coordinated by Minenergo[3] and the World Bank. As a result of restructuring, today Ukraine's power sector is organized as follows:

- The 14 largest thermal power plants are owned and operated by four joint stock generation companies. Two joint stock companies own and operate the eight hydropower stations on the Dnieper river and the three hydropower stations on the Dniester river. A nuclear generation company–Energoatom–owns and operates Ukraine's five nuclear plants. The state owns the majority of the shares of the thermal generators, and 100% of the shares of the hydropower and nuclear companies.
- Twenty seven joint stock companies (oblenergos) own and operate the low-voltage networks and some generation capacity (mostly CHP plants) in the 25 oblasts and two city administrations (Kiev and Sevastopol). The majority of the shares of most of the oblenergos is state owned. The oblenergos as regulated tariff suppliers have an obligation to serve all customers wishing to buy electricity at the regulated retail price.
- Several licensed non-regulated tariff suppliers purchase electricity from the wholesale market and re-sell it to large consumers. By late 1997, the share of electricity sold by these privately owned suppliers reached 20%.
- Ukrenergo, a state company, owns and operates the high-voltage network (220 kV and above) and the National Dispatch Center (NDC). NDC's main functions include: (i) the control and financing of the high voltage grid; (ii) the purchase of all electricity from generators (except industrial self-generators) and re-sale of this electricity to regulated and non-regulated tariff suppliers; (iii) the dispatch of power generators; and (iv) the purchase of ancillary system services.

Ukraine Electricity Industry Structure



Technical and financial market operations are governed by a set of Market Rules described in the Energomarket Members Agreement (EMA) signed by the generators, suppliers and Ukrenergo. The price of electricity purchased from thermal power plants and their dispatch is determined on the basis of hourly bids. A National Electricity Regulatory Commission (NERC) was established in 1995. NERC issues and monitors licenses for electricity generation, high voltage transmission, low voltage distribution, wholesale market operation, and tariff and non-tariff supply. The licenses stipulate the methodology to calculate high and low voltage network fees, NDC's margin, and retail tariffs applied by oblenergos. The average retail price of electricity was tripled (in US$ terms) between 1994 and 1996, eventually reaching $39/Mwh, a level that was close to the economic cost.

By mid-1997, the reform laid down the foundation for competition in electricity generation as well as in electricity supply. The wholesale market had a functioning governance structure and a demonstrated capacity to evaluate hourly bids, implement dispatch accordingly, determine financial claims and obligations, and implement the financial transactions needed to settle these claims among market members. Access to the high and low voltage networks was regulated by an entity (NERC) independent from the power companies as well as government ministries. The regulator made a commit-

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ment to allow the full pass-through of justifiable costs (including the market-determined wholesale price) to retail tariffs. The new industry structure and the basic operating principles received the approval of the Parliament in October 1997, when a new Law on Electricity was passed. In spite of these remarkable achievements, the main promises of the reform–de-politicization of electricity price setting and attraction of investment and know-how to the power industry–have remained unfulfilled so far. The reasons for this disappointing result are described below.

Half-Hearted Stabilization

The tripling of the electricity price in Ukraine in the 1994-96 period coincided with macroeconomic stabilization and the introduction of a new currency, the hryvnia. Macroeconomic stabilization included the application of rigid controls over the cash deficit of the state budget, the elimination of directed credit, and a tight monetary policy leading to very high interest rates on domestic loans. These factors, coupled with the generally poor status of most industrial enterprises and an inadequate social safety net, led to rapidly growing payment arrears and the barterization of the economy. Energy suppliers–electricity, gas and district heating companies–were particularly severely affected. Their best self-defense mechanism, reducing or cutting off deliveries to delinquent customers, was considerably weakened by pressure from central and local government officials to protect important constituencies (e.g., municipal services, budgetary organizations, agriculture cooperatives, coal mines, and industrial enterprises of "strategic" importance). By determining which individuals and enterprises should be allowed to consume energy without a corresponding payment, the government was able to cushion selectively the impact of tight monetary and fiscal policies on enterprises, workers, and the population at large. In essence, *the government decided to use the energy sector as a substitute for the social safety net as well as an instrument of industrial and agricultural policy*. This slowed structural adjustment down, delaying the supply response and ultimately undermining the whole stabilization effort.

Political Interference in Market Operations

According to the Market Rules, oblenergos who have not paid fully for the electricity purchased from the wholesale market should be penalized by the curtailment of future electricity deliveries. NDC, the operator of the wholesale market, was presented with a choice between following the Market Rules, or obeying instructions from Minenergo. The latter opposed the curtailment of deliveries to oblenergos, and tried to address the problem through reaching agreements with central and local government officials on lists of customers who could be disconnected without political repercussions. Since Minenergo represented NDC's owner, the state, the choice for NDC's management between these two options was clear–there was no curtailment directed at delinquent oblenergos.[4] The governing body of the wholesale market did not raise objections to NDC's non-compliance with Market Rules because its members were also under Minenergo control. In theory, the regulator could have intervened as the last line of "defense", however, NERC was still strongly under the influence of the government (see below).

In a parallel development, the government became concerned about the impact of electricity price increases on the rest of the economy. At the end of 1996, NERC was instructed (informally) by the Cabinet to leave retail prices unchanged until further notice. Minenergo was ambivalent about the indefinite postponement of the planned price increase. On the one hand, Minenergo recognized that the existing average retail price could not fully cover generation, transmission and distribution costs. On the other hand, the higher retail prices would have increased the tax obligations of the sector while the increase in actual revenues would have been negligible as long as oblenergos were not permitted to disconnect non-payers. NERC knew well that it could not keep retail prices unchanged without control over the wholesale market price. Accordingly, it instructed NDC to apply (ex post) downward corrections to the daily average system marginal price in contradiction with the applicable Market Rules.[5]

The proliferation of barters and various other non-cash payment modes (mutual cancellation of payment obligations, promissory notes, tax write-offs, etc.) further compromised the application of the Market Rules. Since non-cash-payments had limited fungibility, only cash payments could be collected and distributed by the wholesale market. This created strong incentives for each individual generator as well as for other market members to maximize barters. Soon, the share of non-cash transactions in the power industry surpassed 80% (the economy-wide average was about 40%). In essence, only the population paid cash for electricity. The problem of perverse incentives that was created by the exemption of barters from the revenue allocation rules[6] could have been solved by reducing the cash entitlements of market members by the reported value of barters they entered into. Generators and oblenergos, however, were reluctant to disclose fully their non-cash transactions, and constantly lobbied for exceptions to the Market Rules (e.g., generators argued that they needed a minimum amount of cash to pay wages and buy essential spare parts). These demands were accommodated by the Energomarket Board as well as NERC, and the incentives in favor of barters remained in place.

Not surprisingly, the above "adjustments" to the Market Rules–the tolerance of non-payment by oblenergos, regulatory control over the wholesale market price, and the implicit preference given to non-cash payments in the allocation of revenues–proved to be major deterrents for lending institutions and equity investors. The European Bank for Reconstruction and Development (EBRD) cancelled a loan of US$62 million, and the World Bank suspended the disbursement of a loan of US$314 million to thermal power companies and NDC. EBRD and the World Bank also slowed down the preparation of new loans intended to finance additional nuclear and peaking hydro capacity. The willingness of strategic investors to purchase stakes in the thermal power companies that the government planned to privatize was weakened considerably.

Lack of a Privatization Strategy

Unbundling and demonopolization of the power industry was expected to be closely followed by privatization. But privatization has proven to be considerably more complicated than restructuring. First, there was disagreement between the

Government and the Parliament about the distribution of responsibilities in the privatization process. Second, the key players–the State Property Fund, Minenergo, Cabinet of Ministers and various Parliament Commissions–could not agree on the method of privatization and on the amount of shares to be kept in state ownership. These disagreements, coupled with a lack of a sense of urgency, resulted in very little progress in 1996-97 (apart from limited sales of shares to workers and managers).

By mid-1997, reformers in the central government and in the power industry recognized that the continued majority state ownership of the electricity companies undermined the autonomy of the Energomarket Board, and major improvements in payment collection were unlikely to happen without the privatization of oblenergos. Only strong, experienced, and independent operators could be expected to resist the political pressure placed on regulated tariff suppliers. The privatization plan adopted by the State Property Fund (SPF) in 1997, however, assigned a high priority to selling minority blocks of oblenergo and generation company shares to financial investors (after satisfying the demands of managers, workers and other holders of privatization certificates). The initial attempts to implement this plan in early 1998 were unsuccessful due to limited investor interest in minority stakes.

Recent Developments

In order to reduce the share of barters, NERC ordered NDC to take into account all barter transactions when allocating cash revenues among market participants in May 1998. Furthermore, as part of the implementation of a comprehensive financial recovery plan for the electricity industry, NERC increased the average retail price of electricity by 22% in May and by 3.5% in June 1998. The tariff increases combined with decreasing oil and gas import prices and reduced electricity demand made the liberalization of the wholesale market price possible by the Fall of 1998. These achievements, however, remain very fragile. A recent law passed by the Parliament, for example, has prohibited increases in utility tariffs for residential consumers until the Budget's wage and pension arrears are eliminated.[7]

New oblenergo privatization tenders issued in mid-1998 offered the right to manage remaining state owned shares for a period of five years to those investors who win the tenders for minority stakes and fulfill other tender conditions such as the injection of working capital to settle overdue payables. Due to deficiencies in the preparation process and the assurances offered to bidders, the tenders again failed to attract strategic investors. Local financial investors, however, acquired majority stakes in seven oblenergos by purchasing shares from workers, at the stock exchange, and through these tenders. There has been no change in the treatment of delinquent consumers and the acceptance of non-cash payments by these oblenergos so far. It remains to be seen whether Ukraine recognizes the need to adopt an approach to privatization that worked well in other countries that managed to sell distribution and generation companies to strategic investors (e.g., Hungary).

Lessons

Although the reform of the electricity industry in Ukraine is just entering its second stage (privatization), the events of the last four years have already generated a number of important lessons:

- The Ukrainian government and Parliament have been reluctant to give up day-to-day control over the electricity industry. The numerous manifestations of this desire to maintain control–de-facto and de-jure limitations on NERC's authority to set electricity prices, elevating decisions about the disconnection of non-paying customers to the political level, and keeping in state ownership the majority of the shares of electricity enterprises–seriously undermined internal as well as external confidence in the reform. While some of the recently made steps have sent positive signals, restoring the confidence of investors will require major and sustained changes in government policy.
- Contrary to the expectation of some observers, it was relatively easy (with adequate technical assistance) to put in place the basic facilities/systems for a functioning competitive electricity market. Dispatch center, generation and distribution company employees quickly learned to work with the new procedures, and demonstrated remarkable ability to adapt imported solutions to local conditions.
- A centrally managed "gross" pool is a key feature of the power industry model selected by the Ukrainian government in 1994.[8] In a country that was being pulled in all directions by culturally and politically different regions, the government placed a high premium on the cohesive force that a technically and commercially unified power system was expected to produce. It was felt that a "gross" pool would increase this cohesion. This feature, however, made the treatment of delinquent consumers more susceptible to political interventions by facilitating the spreading of the cost of non-payment evenly across all generators.[9] Although the establishment of a flexible "net" pool that can accommodate a wide range of direct contracts would have been technically more demanding, this extra effort might have created a more resilient market structure.
- Formal rules are necessary but not sufficient conditions for ensuring the independence of the regulatory body. Due to the lack of a tradition of independent regulation and the high importance attached to short term political benefits, the temptation to intervene in professional decisions is simply too large to resist. Even under the best of circumstances (e.g., legal guarantees, financial autonomy, high quality staff and substantial technical assistance), the ability and willingness of the regulators to balance short and long term interests and the interests of producers and consumers will increase only gradually.
- More generally, historically ingrained attitudes and reflexes are more difficult to change than the written "rules of the game". The re-emergence of old behavioral patterns during political, macroeconomic or sectional crises can threaten the sustainability of gains made earlier. The long time needed to achieve deep and irreversible changes places a high premium on stamina and patience for those supporting sector reforms in the Ukraine (and elsewhere in the FSU).

Footnotes

[1] Ukraine was the only Soviet Republic that had its own

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Ministry of Power. The first large hydropower plant as well as the largest nuclear power plant in the Soviet Union were built in Ukraine. The transmission lines exporting electricity to Central Europe were controlled from Kiev.

[2] Following its merger with Goskomatom in 1997, Minenergo's responsibilities were extended to the whole power industry. In addition to its policy making function, Minenergo continues to represent the state as the owner of key assets in the sector.

[3] The winter curtailment regime followed non-financial criteria, and equally affected paying and non-paying oblenergos and customers.

[4] According to the Market Rules, the system marginal price should be determined by the bid of the most expensive generation unit needed to meet demand.

[5] Non-cash transactions offered significant tax advantages, since cash received on the bank account of an enterprise was frequently confiscated by the tax service. Furthermore, the reduced transparency of non-cash transactions provided opportunities for personal gains.

[6] The Deputies were concerned about the planned utility price adjustments in response to a 40% depreciation of the hryvnia against the US dollar in September 1998. President Kuchma asked the Constitutional Court to annul the law in early October. The Court has not reached a decision yet.

[7] The Ukrainian "gross" pool determines the dispatch of all electricity generators according to their bids (subject to certain constraints). A "net" or residual pool accepts bilateral contracts as a basis for generator dispatch, and the bidding process is applied only to the generation of electricity needed to satisfy demand not covered by these contracts. Furthermore, payments for all electricity delivered to consumers flow through a "gross" pool, while a "net" pool handles payments only for the part of electricity deliveries that are not covered by bilateral contracts between generators and distributors/large consumers.

[8] Under a "net" or residual pool with an obligation to cover planned energy purchases through direct contracts with generators, those oblenergos who continue to provide electricity to non-paying consumers might have had more difficulty obtaining power since individual generators would have been reluctant to enter into bilateral contracts with them.

Future IAEE Events

June 9-12, 1999	22nd IAEE International Conference Rome, Italy *Hotel Parco dei Principi*
August 29-September 1, 1999	20th Annual USAEE/IAEE North American Conference Orlando, Florida, USA *Hilton at Walt Disney World Village*
September 20-21, 1999	BIEE Energy Conference St. John's College, Oxford, England
September 30-October 1, 1999	1999 European Conference Paris, France
June 7-10, 2000	23rd IAEE International Conference *Sydney Hilton* Sydney Australia
2001	24th IAEE International Conference Houston, Texas, USA

The Czech View on the Liberalisation of Energy Sector

*By Miroslav Pichal and Ivan Beneš**

For the Czech economy in transition it is very important to liberalise the energy sector in order to decrease the very intensive energy and electricity use in the Czech national economy.

The potential cogeneration utilisation is the most important tool to decrease the intensive electricity use in the next two decades.

To highlight this problem, CityPlan provided balance calculations for different options of electricity and heat supply. The calculation considers nine development options for Czech energy policy. It is supposed to replace about 6000 MWe of installed capacity in the next 30 years. This capacity will replace the Dukovany nuclear plant and the oldest coal plants.

The first scenario is referenced to the year 1996.Three scenarios focus on the high utilisation of coal (U), natural gas (P), or nuclear energy (J). The fourth scenario is a mix of the three primary energy sources. Four additional scenarios (K-U, K-P, K-J and K-S) are similar in primary energy utilisation, but they differ in the higher cogeneration development to the amount of 2000 MWe and more biomass utilisation for space heating. It represents an increase in cogeneration of 35% from the present. The last scenario (E) represents higher utilisation of heat pumps instead of direct electric heating and an increase in the number of solar collectors. This scenario represents a slightly higher investment, but the best benefit for the economy.

In this case study, the same demand for electricity and heat is assumed. That means that we calculated the differences for savings potential on the supply side. Saving potential on the demand side is also important. It helps show economic and environmental benefit from different scenarios more transparently, without dependency on the demand side.

The internal and external costs are calculated. Internal costs are calculated as Long Run Marginal Cost (LRMC) with a discount factor of 10,5%.

The next graph shows the investment cost for all nine

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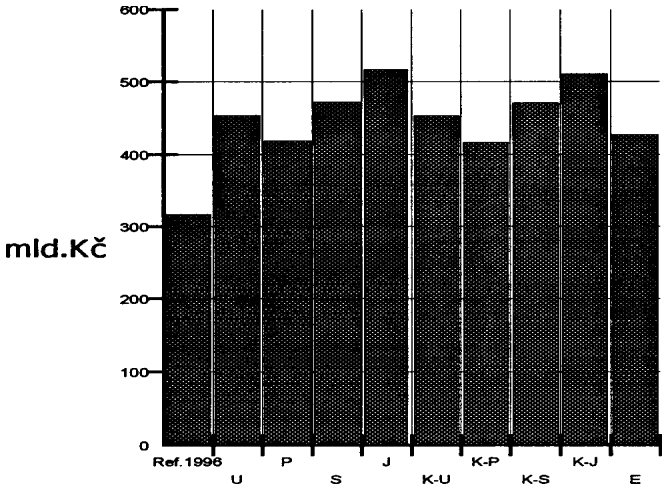


options:

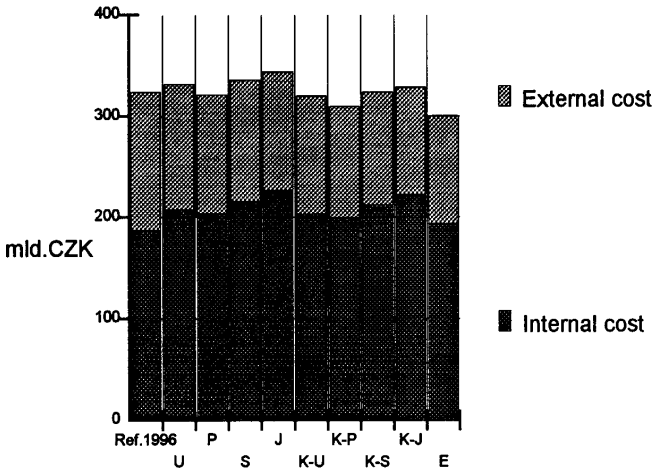
Utilisation of the cogeneration potential can save about 40 TWh/a of primary energy.

Primary energy consumption for electricity and heat:

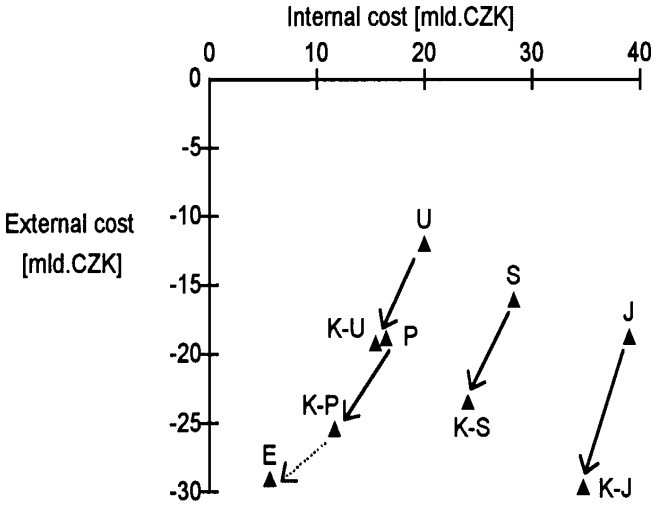
Scenario:	Ref.1996	U	P	S	J	K-U
TWh/r	372	342	336	356	368	338
Scenario:	Ref.1996	K-P	K-S	K-J	E	
TWh/r	372	332	353	360	321	

The economic benefit of cogeneration options represents approximately 7 billion CZK (200 million EURO) and 12 billion CZK (340 million EURO) of external cost each year.

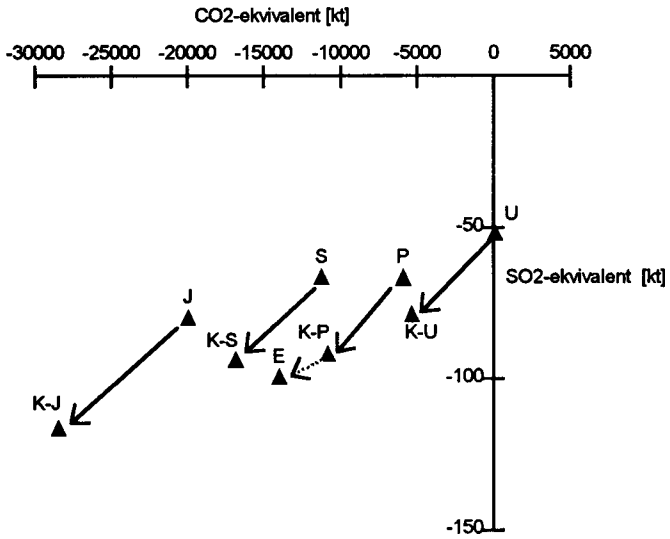
Scenario	Internal Cost	External Cost	Total (mil. CZK)
1 Ref.1996	187900	135800	323800
2 U	207900	123900	331800
3 P	204300	117000	321400
4 S	216200	119800	336000
5 J	226900	117100	344000
6 K-U	203300	116700	320000
7 K-P	199500	110500	310000
8 K-S	212000	112400	324400
9 K-J	222600	106200	328900
10 E	193500	106800	300300



The next graph shows the same figures as a "Trade Off." The arrows show the benefit from cogeneration options.



The impact on the environment follows.



The externalities are based on the German GEMIS dtatbase (Öko-Institute Darmstadt):

emissions CO_2	900 CZK/t
emissions SO_2	90000 CZK/t
emissions NOx	72000 CZK/t
emissions of particles	18000 CZK/t
radioactive waste	135000 thous. CZK/t

The results state that for the economic welfare of the Czech Republic it is important to prepare conditions for the utilization of cogeneration potential. It represents more than 2000 MW thermal capacity in heat only boilers.