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Restructuring the Belarusian Electricity Sector: Setting the Agenda

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Restructuring the Belarusian Electricity Sector: Setting the Agenda

Executive Summary

The Belarusian electricity sector is faced with increasing demand, the effects of a long phase of underinvestment, low efficiency and comparatively high generation cost. These challenges can only be met by strong investment in generation, transmission and distribution capacities. According to our estimates, the investments requirements till 2020 will amount to USD 20 – 30 bn. In the current environment we think that neither the state budget nor BELENERGOs cash flow will be sufficient to meet the financing needs. Consequently, private and in particular foreign investment is needed. Foreign investors, however, will not engage unless the current regulatory environment (vertically integrated state owned monopolist and a poor legislative basis) is significantly altered. In this paper we therefore set the agenda for the implementation of such reforms.

We propose that the best results with respect to efficiency improvements, investments and privatisation revenues can be attained by a full scale restructuring. This should be implemented on the step by step basis, but in a consistent and decisive manner. Half-hearted approaches might completely fail as they are unable to provide investors with a credible long-term commitment. But we admit that a comprehensive reform is a complex and risky endeavour. Therefore, major issues and corresponding coping strategies from other countries are discussed. The critical questions to be solved for successful restructuring of Belarusian Electricity Sector are identified. These questions are: 1) the market model of the competitive electricity market; 2) the right of access to the wholesale trade; 3) the type of retail competition (is this competition necessary); 4) the price mechanism for wholesalers and retailers; 5) the investment mechanism after restructuring (how investments will work); 6) and the heat market organization (taking into account that Belarusian energy system is cogeneration-based).

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Contents

1. Introduction

In the last decade, the question of restructuring the Belarusian electricity sector has been intensively discussed by decision makers, energy sector actors and consultants. But so far, the discussions have not been conclusive. In addition, also the limited success of electricity sector reforms in neighbouring countries (namely Russia and Ukraine) supported the conservation of the post-Soviet status-quo. As, however, the Belarusian power industry is faced with new challenges the political will for reforming it increased recently. In contrast to some of their neighbours, Belarusian decision makers now have a very important advantage: Due to the late start, they can already rely on a wide international experience for the elaboration and implementation of a successful sector reform. This paper is devoted to the specification of the most critical questions for restructuring the Belarusian electricity sector and to elaborate policy recommendations concerning the reform strategy.

The paper is organized in five parts: In the next section the current structure of the Belarusian electricity sector and the challenges it faces are described. In part three the case for privatization/liberalization in the Belarusian electricity sector is outlined. In the fourth part the questions to be solved in a successful reform process as well as corresponding international experience are introduced. In the fifth section the most critical questions are identified and the sixth section concludes.

2. Current Situation

Structure of the Sector

The electricity sector in Belarus is dominated by the state-owned generation[1], transmission and distribution holding "BELENERGO" that amalgamates the six republican unitary regional power system enterprises (Oblenergo), the central dispatch unit (ODU) as well as a multiplicity of electricity-related businesses (construction, R&D, repair and maintenance etc.).[2] Belarus has no specially appointed Transmission System Operator (TSO). Functions of TSO are distributed between the holding BELENERGO, ODU and the Oblenergos. The transmission assets are in state ownership and the regional power companies are assigned the right of economic management.[3] There are no independent power plants[4] and BELENERGO serves as single buyer of all (including imported) electricity.

Installed generation capacities are geographically distributed and centers of electricity loads are not near to the generation centers. Taking into account that regional power companies (Oblenergos) have a franchise for electricity supply in the corresponding region of the country there are considerable electricity flows (exchanges) between Oblenergos. Thus, some of the Oblenergos are net-consumers (deficit of installed capacities) while others are net-suppliers (extra-capacities) (see Table 1). The tariff on electricity exchanged between Oblenergo is approved by the Ministry of Energy and does not reflect the real cost. The main target of the Ministry is to maintain the financial stability of the Oblenergos in accordance with the annual government plans and target values for social and economic activities.

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[1] Two condensing and 31 cogeneration power plants account for 97% of total installed electricity capacities in Belarus. The power system furthermore comprises 31 small hydroelectric plants with a total installed capacity of 12.9 MW (0.2%).

[2] See EnergyCharter (2007).

[3] EURELECTRIC & UCTE (2007).

[4] In January 2007, 7,654 MW of the 7,881 MW of total installed capacity were operated by BELENERGO. The remainder is in the ownership of municipalities and industry. These small power plants might be considered as independent, because they are allowed to sell electricity to the Oblenergos who have to buy it.

Table 1: Distribution of generation and supply of electricity between regional power companies in Belarus (2007)

Regional power company	Generation of electricity		Supply of electricity to final consumers*		Net deficit (-) or excess (+)
(Oblenergo)	bn kWh	% of total	bn kWh	% of total	bn kWh
Brestenergo	4.3	12%	2.1	7%	2.2
Vitebskenergo	17.3	48%	4.9	16%	12.4
Gomelenergo	2.9	8%	4.6	15%	-1.7
Grodnoenergo	1.1	3%	2.8	9%	-1.7
Minskenergo	8.7	24%	11.7	38%	-3.0
Mogilevenergo	1.8	5%	4.6	15%	-2.8
Total	36.1	100%	30.7	100%	×

*generation from independent power plants placed in the appropriate region included

Sources: Belenergo (2008) and authors' calculations.

There is no explicit "electricity law" in Belarus while laws on "trunk pipelines" and "gas supplies" exist. Sector regulation is carried out by the Ministry of Economy and the Ministry of Energy. While the former is responsible for electricity tariff regulation and the implementation of antimonopoly measures (in case of independent power plant construction)[5], the latter is concerned with investment policy and optimal development of the Belarusian power system. In general, electricity tariffs are regulated by the Ministry of Economy. Only one exception exists: Electricity tariffs for households are under regulation of the Council of Ministers of the Republic of Belarus (to protect households against tariffs increases). Tariff rates are adopted for each group of consumers. The classification of consumers for grouping has not principally changed since Soviet times[6]. Electricity prices in the residential, agricultural and commercial sector are subsidized while industry electricity tariffs are at (or above) cost recovering levels.

Currently, privatization of power grids and substations rated at 220 kV or more; power grids and substations rated at 0.4-110 kV etc. is forbidden by the Law of May 5, 1998 (as amended).[7] However, it is unclear to what extend the government itself feels bound to these rules as the sale of BELTRANSGAZ to GAZPROM in 2007 would have also fallen under this legislation.

Challenges

The Belarusian electricity sector currently faces various challenges. One of the most pressing concerns is how Belarus might meet the predicted generation capacity requirements. While today's capacity is still sufficient (in 2007 the maximum load was 6,200 MW and the generation capacity was 7,882 MW), the load forecasts (8,000-13,000 MW in 2020) as well as the fact that

[5] Consequently, on might conclude with caveats, that a certain department of the Ministry of Economy is a germ of an independent regulatory agency in the energy sector.

[6] There are ten groups of consumers: (1) Industrial and equated consumers with installed capacity 750 kVA and more; (2) Industrial and equated consumers with installed capacity less than 750 kVA; (3) Electrified railway transportation; (4) Electrified urban transportation; (5) Non-industrial consumers; (6) Electricity for heating and hot water supply; (7) Electricity for industrial needs of agricultural consumers; (8) Electricity for auxiliaries of the power enginieering; (9) Urban households; (10) Rural households.

[7] See EnergyCharter (2007 p.11f).

around 60% of the power plant fleet are worn out point towards a severely tightening capacity situation (see Table 2).[8]

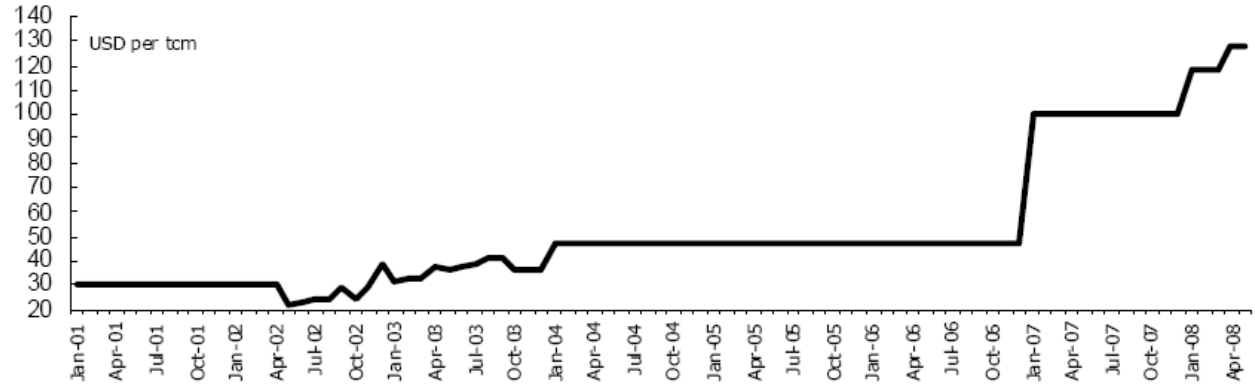
Table 2: Peak Load Demand Forecast, MW

Year	World Bank	London Economics	IAEA	BTPI (2007), Peak Load	BTPI (2007), Installed Capacity
2010	9,600-10,390	6,610-8,300	8,530	7,012	8,900
2015	10,970-11,760	7,450-9,360	9,670	7,814	9,900
2020	12,410-13,310	8,400-10,560	10,950	8,970	11,000

Sources: IAEA (2003) and Belarus Thermal and Power Institute (BTPI).

A second challenge for the Belarusian electricity sector is its unbalanced power plant portfolio. Currently, approximately 90% of Belarusian electricity generation capacities are fuelled with natural gas. In times of increasing prices for importing natural gas from Russia[9] and the related international energy policy concerns, Belarus is supposed to develop alternative fuel sources. The problem is aggravated by the fact that the efficiency of most Belarusian generation units is below Western standards. Thus, average generation costs in Belarus are significantly above the regional average. At a natural gas price of USD 200, the pure fuel cost of producing one MWh of electricity amount to USD 58/MWh and USD 65/MWh at the two big non-CHP facilities in the country. Those represent together 46% of the Belarus generation capacity. Thus, it is most likely that they very often act as marginal suppliers.

Figure 1: Natural Gas Price Dynamics



Note: Import price without VAT.

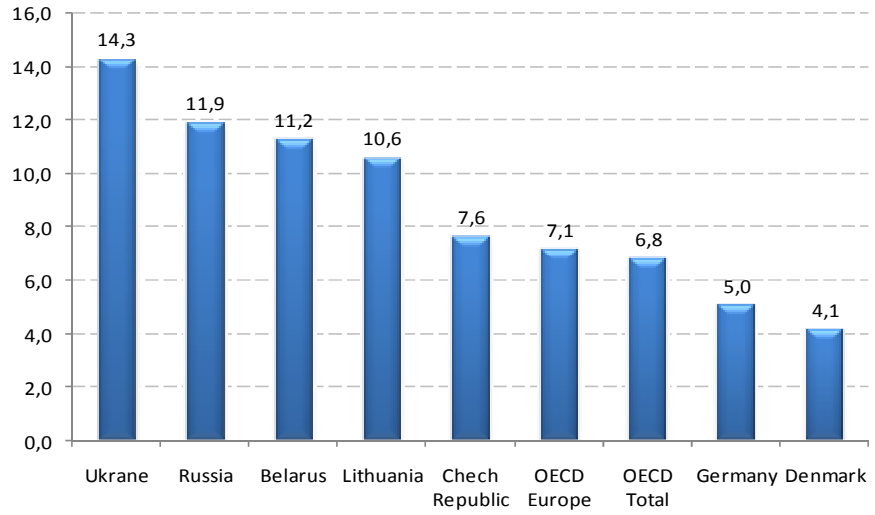
Source: Ministry of Statistics and Analysis.

A third challenge is the low efficiency of the infrastructure part of the Belarusian electricity sector. The Belarusian electricity grid has seen underinvested for more than 10 years which led to huge investment requirements and big electricity losses. For example in Belarus in 2007 the losses of electricity for transportation and distribution reached 11.28% (see Figure 2). While this value is lower than in Russia (11.9%) and Ukraine (14.3%) it is almost twice as much as the OECD average (6.8%). Thus, significant efficiency potential exists. Nevertheless, from 2006 to 2007 the loss rate slightly increased.

[8] On the capital depletion see for example: Hirschhausen and Rumiantseva (2006).

[9] According to a contract with Russia, natural gas prices for Belarus are expected to increase to "European level minus cost of transit" by 2011.

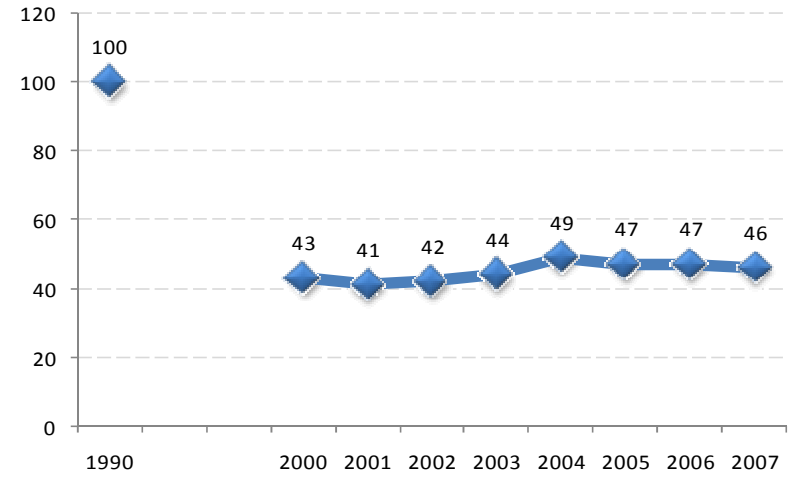
Figure 2: Transmission and distribution losses of electricity in different countries (2006)



Source: IEA (2008) /Electricity information.

A forth challenge is the low labour productivity in the Belarusian energy industry and the lack of incentives for energy supply cost reductions. One of the most important economic indicators to assess the efficiency in state-regulated companies is the labour productivity. The dynamics of the labour productivity index is presented in Figure 3. In 2007 the labour productivity was 46% of its 1990 value. But even in 1990 the efficiency of the electricity sector was not as high as in Western countries. Thus, significant efforts are necessary to reduce cost and increase labour productivity to attain best practice standards.

Figure 3: Index of labour productivity in the Belarusian electricity sector (1990 = 100)



Sources: Ministry of Statistics and Analysis, authors' calculations.

The fifth challenge is the lack of transparency. Due to the vertical and horizontal integration it is impossible to assess the cost of generation, transmission and distribution on an entity-by-entity level. This situation does significantly impede the efficient management of the Belarusian energy sector. Consequently, decisions on investments, scheduling and cost reduction programs cannot be based on an economic comparison of cost. Unstable and comparatively low profitability (see Table 3) discourages investors and barriers to cost reduction result in increasing tariffs. Furthermore, the non-transparent and outdated system of cost accounting does not allow identifying the centers of inefficiency in the electricity supply chain.

Table 3: Profitability and cost dynamic of the Belarusian electricity sector (%)

	2003	2004	2005	2006	2007
Profitability of sales	8.9	12.6	11.1	12.9	8.4
Decrease (-), increase (+) of cost to 1000 rubles of productions sold with respect to previous year	-7.7	3.7	-0.3	-0.9	6.9

Sources: Ministry of Statistics and Analysis, authors' calculations.

3. The Case for Privatization/Liberalization in the Belarusian Electricity Sector

Assuming that 60% of the generation capacity (60% of 7,894 MW = 4,700 MW) have to be replaced and additional 2,500 MW have to be installed by 2020, new power plant capacity in the size of 7,200 MW must go online. At an average unit cost of 2,500 USD/kW this would amount to an investment need of USD 18 bn. In addition, 60% of the existing transmission and distribution system have to be renewed. This implies an additional USD 4.8 bn (60% of USD 8.8 bn = USD 4.8 bn)[10]. Given these rough estimations the total investment needs will be in the environment of USD 20 bn - 30 bn from now to 2020.[11] The official estimation of investment needs tend to be closer to the half of the lower bound of our calculations mostly because a part of the outdated generation and network capacities are planned to be refurbished and not replaced.

The replacement of worn out infrastructure and the necessary capacity extension of the Belarusian electricity system will put significant stress on BELENERGOs budget. Given that the subsidized tariffs did not allow BELENERGO to accumulate sufficient reserves, the required investments cannot be self-financed. In fact, BELENERGO claims that they invested USD 480 m in 2007.[12] Extrapolating this number until 2020 would amount to less than USD 8 bn. As the USD 480 m include state budget funds, credits and are used for investments outside the electricity sector (housing, heat-networks etc.) the true replacement investments in the electricity sector self-financed by BELENERGO are supposed to be significantly lower.

Thus, some form of outside finance will be necessary to prevent a degradation of the Belarusian electricity infrastructure. This finance might either come from the state budget or might be provided by domestic or foreign investors. As the state budget is unlikely to be able to

[10] For the assumptions of the estimation see Table 4 in the Appendix.

[11] The estimate should be considered with caution. Though the official load forecasts tended to be too high in the past it might underestimate the true investment needs, as only the current replacement investments are considered. In the next 12 years an even larger part of the existing installations might require replacement.

[12] The sources of this USD 480 m are: own resources (52%), the state budget (31%) and credits (17%). As the state budget part consists (due to Belarusian accounting) mainly of reserves set aside by BELENERGO more than 80% of the investment sum is done out of the funds of BELENERGO.

accommodate the corresponding financing requirements of up to 50% of current annual GDP the most promising approach is to attract investors.

This, however, requires significant changes in the electricity industry. Private sector involvement will only occur in conditions where investments are not subject to extensive (regulatory) risk and can be profitably exploited. It is obvious that the willingness to pay for existing electricity infrastructure assets as well as the willingness to invest in this sector strongly depend on the commitment of the administration to provide (and maintain) an adequate set of rules. Changes in price regulation, taxation (of extraordinary profits) or even re-nationalisation are a threat to investors they can hardly insure against. As the break-even periods for electricity infrastructure investments are extremely long, administrative decrees on a case-by-case basis cannot provide the necessary long-term commitment. Rather, it has to be incorporated in the general legislation.

Consequently, an electricity industry reform that targets long-term private sector involvement should not aim to provide short-run profit opportunities for investors but to create a well balanced (and thus durable) compromise of all stakeholders (electricity industry, small and large consumer, environment, administration etc.). Thus, the objective of electricity market reforms is to create an efficient and sustainable electricity sector. Efficiency means that the best use is made of the existing infrastructure while sustainable signifies that the welfare-maximizing investments are carried out.[13]

In Europe, Belarus is one of the last countries that has not attempted to reform its electricity sector. While this might have meant lost opportunities in the past it also allows Belarus to learn from (the often very mixed) experience in other countries. Though, it quickly becomes clear that the "devil is in the details" (which will be discussed in the next section) some general rules are rather uncontested. Those should be presented here and provide a first outline for a possible reform in Belarus:

(1) First restructure, than privatize: As described above, liberalization (i.e., allowing competitors to enter the market) and privatization (i.e., selling state owned enterprises) are interwoven. Thus, each of them can only be successfully accomplished jointly with the other. Selling state owned companies in a fully vertically integrated market would create difficult to regulate private monopolists with low intrinsic investment incentives. Although, the efforts for unbundling would be lower and the privatization revenues might be higher (selling not only the assets but also a monopoly rent) total welfare will significantly decrease. On the other hand, opening a market in which a dominant incumbent is active will not create sustainable competition. New entrants would only enter the market if somebody (usually the government) could assure their profit against market power exercising strategies of the incumbent. Such guarantees are hard to implement without biasing incentives. Therefore, restructuring (i.e. horizontal and vertical unbundling of the business activities) of the incumbent should be followed by chunk wise privatization.

(2) State-owned transmission grid: So far, no country has (to our knowledge) be able to create proper competition based incentives for network extensions. Relying on merchant transmission investments (investors build a line out of their own pocket to generate arbitrage gains from buying cheap in one region and selling expensive in another) leads to significant underinvestment as the positive externalities of network enforcements are not remunerated. These positive externalities can only be centrally calculated which makes effective "competitive network extensions" unfeasible. As furthermore the transmission system is considered as a natural monopoly, either strong handed regulation of a private independent transmission system company or a transmission system under direct state control are sensible choices. The privatization of the transmission system suffers of the information asymmetries between the regulator(s) and the company. The corresponding cost might surpass the efficiency gains from the

[13] To illustrate this point one might look at international examples: In Chile labor productivity in Endesa's generation business increased from 6.3 GWh generated per employee in 1991 to 34.3 in 2002. (cited from World Bank (2004)). According to OFGEM distribution cost in the UK decreased by 50% in the last 16 years.

leaner organization of private companies. This is illustrated by the fact that allocating human capital to "regulation departments" often has higher payoffs for companies than allocating manpower to efficiency improvement measures. On the other hand state owned transmission companies might be faced with potential political involvement and inefficiently bureaucratic management structures. Regional policy (uneconomic lines to remote areas), labour policy (offer-staffing), industrial policy (subsidies to certain consumer), social policy (subsidies to the residential sector) as well as nepotism might be tempting playing fields for politicians to muddle in management decisions of transmission companies. Despite these caveats (that equally apply to the current situation of a state-owned vertically integrated model) many countries have demonstrated that a good regulatory framework and its enforcement are able to make state owned transmission companies a success (e.g., Nordic markets).

(3) Regulate distribution grids: In Western Europe (Germany, United Kingdom) good experience has been collected for regulating privatized distribution system operators (DSOs). Yardstick competition has been made operational with modern efficiency frontier methodologies and private investments in central Europe (Czech Republic, Hungary) demonstrate that companies are willing to invest in their quality of service if proper incentives are in place. The Oblenergo might for example be transferred into (well regulated) DSOs.

(4) Privatize horizontally unbundled generation: Privatizing generation not only provides funds for the state budget it also stipulates efficiency enhancement investments and generation extension. But privatizing the generation branch of the incumbent as one company would mean creating an incontestable monopolist. International experience shows that this monopolist will have lower efficiency investment incentives and higher prices and has thus to be heavily regulated (Belgium).

(5) No subsidies: A sustainable market is only possible if the cost of consuming electricity is signalled to the consumer via prices. Neither social and industrial policy nor artificial price smoothing should be carried out via electricity price (cross-) subsidization. Their existence hampers investments, distorts production and consumption decisions and gives additional power to the incumbents that organize them.[14] Price distortions for households, to give one example, imply incentives for switching from district heating to electric heating. This is not only inefficient (double conversion of energy) it also puts the district heating system (under usage) as well as the electricity distribution system (over usage) in danger.

(6) Do not wait to long: Currently the interested investors from Western Europe have very deep pockets due to the potential exercise of market power (Germany, France) as well as the windfall profits generated by the free allocation of emission allowances (Germany, France) and their low cost power plants (France). Thus, E.on, RWE, EdF and others are desperately searching for new investment opportunities to not exaggerate their annual profits which might increase political pressure in favour of horizontal (France) or vertical (Germany) unbundling or even (partial) expropriation.

[14] On the effects of replacing flat tariffs (a form of subsidizing peak-consumer) by time differentiation see Zachmann and Zaborovskiy (2008).

4. Questions to be solved for a successful Liberalization of the Belarusian Electricity Sector

Liberalization and privatization of an electricity sector is a large-scale and risky endeavour. Examples from other countries show that both, brilliant success (United Kingdom) and terrible failure (California) are possible. However, the high economic importance of the electricity sector makes failed reform-experiments an expensive undertaking. Therefore, the complexity of such a reform should not be underestimated - it is again highlighted, that the devil of electricity market restructuring is in the detail. Taken the general reform blueprint from the last chapter as given, the main questions to be solved for a successful electricity sector reform in Belarus should be outlined but not answered in this section:

Generation

(1) Number of Companies: Taken as given that the generation branch of BELENERGO will be vertically and horizontally unbundled the question arises how many generation companies should be created. This decision has to balance the scale efficiencies of fewer bigger units with the lower market power potential of a greater number of smaller units. Due to its high concentration - 3 condensing power plants account for about 50% of installed capacities and the 6 largest power plants account for more than 75% - the Belarusian electricity sector will remain concentrated. For a sensible decision, the potential of cross-border competition from Ukraine and Russia has to be taken into account. As scale efficiencies of power generation vanish above 4,000 MW, two to three companies might sustainably compete in the Belarusian market.

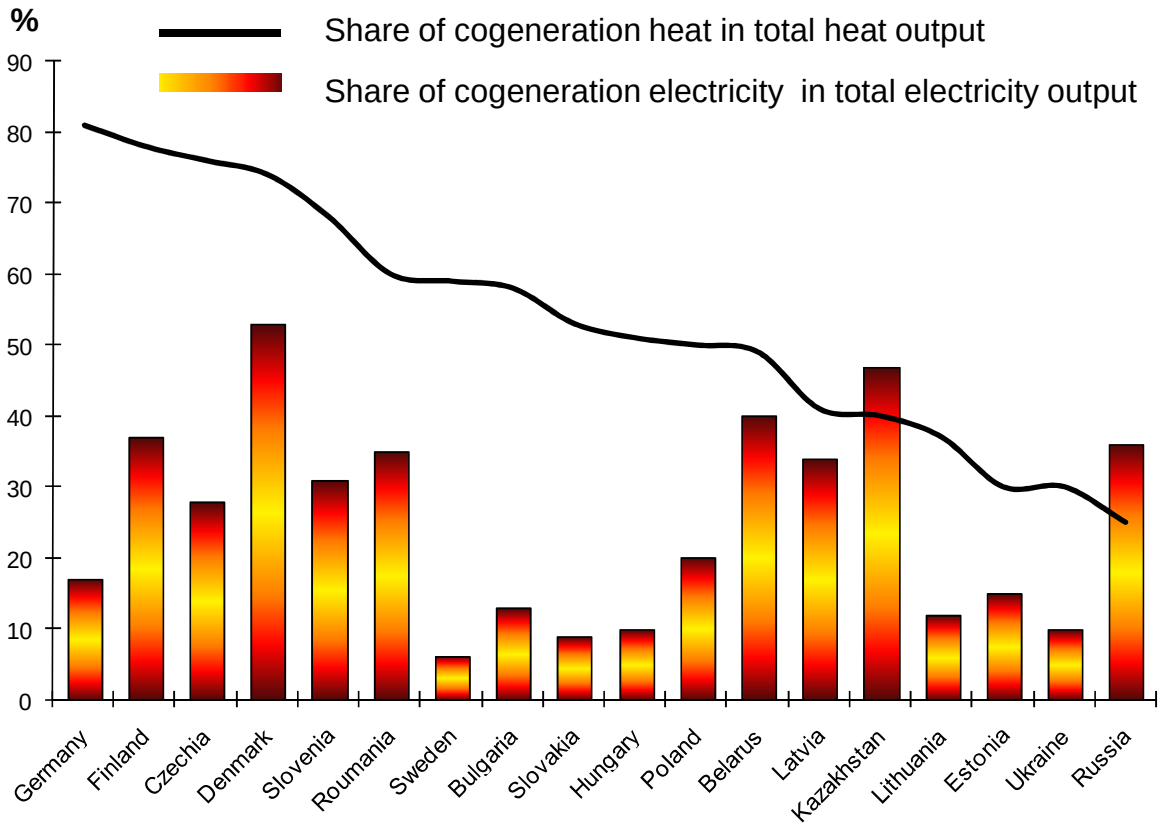
(2) Monopoly on the fuel side (natural gas): One difficulty for a fragmented generation sector in Belarus would be its dependence on Russian natural gas. If (what is not completely unlikely) one generation company is sold to GAZPROM (or its Belarusian affiliate BELTRANSGAS) this might create significant market power problems. GAZPPROM might have the ability to control the fuel prices of its electricity generation competitors in Belarus as those rely almost completely on natural gas imported from Russia. Consequently legislation should be prepared to circumvent the corresponding problems.

(3) Cost attribution of CHPs: In Belarus 52% of installed electricity capacity is situated in combined heat and power plants (CHPs). After restructuring the vertically integrated regional companies the "heating assets" will probably have to be split out (at least legally). But some of the CHPs are outdated and uneconomic. Due to local resistance and their role in centralized heating it will be very difficult to implement closing decisions even though they might be economically justified. Thus, a very significant challenge in reforming the Belarusian electricity sector is the handling of CHPs. This is especially important in an environment of shrinking heat demand (increasing energy efficiency, deindustrialization). Consequently, the development of a viable heat market model for Belarus is crucial. European countries with important shares of CHP might provide a role-model here. Denmark was able to set up viable cost-attribution schemes that took into account that heat markets are natural regional monopolies while electricity is sold in wider competitive markets.[15] Those were complemented by tools to discourage the installation of secondary electric and gas heating.[16]

[15] Note, that the elasticity of demand at the centralized heating systems is lower that at the wholesale electricity markets, so if generation companies can posses heating assets they will able exercise market power at the heat market establishing special margin to heat tariffs and lowering electricity price in competitive environment.

[16] Municipalities have the right to impose compulsory connection to DH networks and to forbid new electrical heating installations in DH areas.

Figure 4: Share of Heat and Electricity produced by cogeneration



Source: IEA (2005).

(4) Horizontal reintegration: For the government body who decides on the initial unbundling the number and size of new entrants, the extent of cross-border trade, the development of demand etc. are impossible to predict correctly. Thus, the unbundling decision might turn out suboptimal ex post. Thus, the question arises whether the initial choice might be revised and who is responsible for allowing companies to (partly) re-integrate. Therefore, a certain flexibility to revise ineffective structures has to be carefully weighted against a credible commitment of the legislator to defend the market layout. An independent merger control authority might thus be the right place to situate this responsibility.

Wholesale Market

(5) Cross-border trade: Belarus is and will be an electricity importing (and sometimes exporting) country. Therefore, the organization of cross-border trade with its closely linked neighbours (Russia, Ukraine) is of high importance. Currently, trading is carried out by BELENERGO. In periodic negotiations with Russia and Ukraine volumes and prices of baseload bands are agreed upon. This is not very efficient given the high variability of electricity demand and the differences in the generation portfolios of these three countries. Short-run scheduling of international flows based on hour-sharp price signals could be significantly more economical for both, exporters and importers. In situations, for example, where Belarus has problems to absorb all the electricity its CHP produce in a heating-period night or where its gas-fired condensing plants do not run at full capacity (and thus below their technical efficiency) in peak period it might consider exporting electricity if prices in Russia are sufficiently high. Organization of cross-border

trade depends on the selected market model. If the current model was maintained electricity trade could continue to be centrally organized. But even in this case BELENERGO might consider short-run scheduling of imports when Russian electricity prices are below marginal generation cost. If, however, a model with supply side bidding was chosen the question arises how transmission capacities are allocated. Experience from the Nordic markets and BELPEX shows that in highly interconnected markets, implicit auctioning of transmission capacities is a sensible choice. This is however only possible if market structures in the involved countries are sufficiently homogenized. (See also Box 1)

Box 1: Joining the Russian electricity market

Advantages:

- Belarus could rely on a readily established (and reality tested) set of rules.
- Russia is already the main electricity trading partner with strong interconnections.
- Joining the Russian marked would increase the number of competitors and the market liquidity at the relatively small Belarusian market.

Disadvantages:

- Loss of regulatory power over certain decisions
- Success and future of the Russian market is still unclear

(6) Market model: Another important question is the selection of an adequate market model. Single buyer models (See Box 2 on following page) as well as voluntary (United Kingdom) or obligatory pools (Spain, Italy) have been implemented in many markets around the globe.[17] The most common approach in Europe is currently voluntary pools. At those, the contracting is mainly carried out by a parallel system of power exchanges and over-the-counter (OTC) trading. But, it is unclear whether the relatively small Belarusian market (with its maybe three generation companies and some importers) might successfully accommodate a power exchange. The Slovenian and the Polish example show that either a certain number of generators or sufficient transmission capacities (to functioning neighbouring markets) are necessary to create adequate liquidity at the power exchange. Consequently, Belarus might be tempted to follow the Belgium and Danish example to join a bigger market area via implicit auctions (e.g. Russia). Or Belarus might go for an OMEL type (Spain) obligatory pool with strong handed market monitoring to hamper collusive behaviour.

(7) How to provide short-term and long-term price signals: To our knowledge the question of efficient investment stipulating long-term prices remains unsolved in all electricity markets. Second best solutions like long-term contracts or third best solutions like state guarantees and vertical integration are still discussed in Western markets. It is too early to conclude if capacity markets like those in the US and Russia are appropriate tools to assure efficient investment decisions at reasonable cost.

(8) Interrelation between market and system operator: Currently, ODU is a single system operator responsible for optimal scheduling the power plant fleet. In a new environment the functions of electricity trading and power system operation will be separated. Thus, a mechanism for an optimal interaction of these two services has to be developed.

[17] On the already existing quasi-fiscal deficits see Tochitskaya, I. (2007).

Box 2: Is the Single Buyer Model (SBM) an option?

The SBM consists of a (usually government-owned or guaranteed) entity that contracts the electricity of independent producers and potentially a state-owned incumbent. In many developing and transition as well as in some developed countries the SBM was considered as a valid solution for pressing electricity sector problems. The general perception is that the SBM might solve capacity problems relatively quickly, while the long-term cost exceeds those of a market approach.

Advantages:

- As no sector restructuring is necessary the SBM
  - does not require human capital
  - does not create political resistance
- Makes capital available relatively quickly
- Can be combined with numerous features of planned economies: subsidies, discretionary interventions in scheduling and investment decisions

Disadvantages:

- Usually manifests a non-market based electricity sector for the long-run (long term PPA are difficult to settle under market conditions)
- Excludes all the important "by-products" of market solutions (efficiency gains, subsidies, etc)
- Usually required government guarantees for the single buyer company implying long-term obligation of the state (quasi fiscal deficit). This might become crucial if electricity does not develop as expected
- Direct government interference in investment decisions and scheduling decisions are more difficult to rule out under the SBM and might produce unwanted results
- Tendency of the SB to over-invest on the expense of the consumers (or tax payers)

Transmission, Distribution and Supply

(9) How to handle transmission congestion: Internal congestion is not a big issue in Belarus. Thus it is unclear whether the effort to introduce local marginal prices (LMP) would be justified. Instead, unlikely cases of congestion might be for instance solved by the system operator and included in the transmission tariffs. But it should be noted that congestion handling will become an issue if vertical separation does not take place. In this case, their might be incentives for the incumbent to use congestion management to increase its generation market share by creating congestion for the new entrants.

(10) Vertical integration: While it is widely agreed that the transmission and distribution grid operations should be separated from the rest of the sector, there are two views on vertical integration of suppliers and generators. The first camp underlines the scale economies and risk-reduction of such a structure and the second one highlights its market power potential. As also in the most advanced market (the UK) the reintegration of suppliers into generators is allowed and actually carried out the potential benefits of integration outweigh the associated risks. A market oversight authority might be empowered to examine complaints of independent suppliers that feel discriminated by integrated generator-suppliers.

(11) Retail Competition: The question on what is a good threshold for market opening has been widely discussed in Europe. However, the different thresholds have had no dramatically different effects. In fact, commercial and industrial consumer do switch while residential consumer mainly

do not, even if allowed. Thus, no prohibiting switching is a sensible approach as it is a market based regulative for incumbent suppliers not to inflate prices.

Regulation Authority

(12) Responsibility: Electricity sector regulation encompasses different tasks: network price regulation, market monitoring, anti-trust, etc. A responsible institution for each task has to be determined. These duties might either be merged into a one-stop agency or be established in independent organizations. In the latter case it should be assured that tasks among different agencies do not overlap to a large extend as this generates costly regulatory uncertainty.[18] The obligations and powers of all oversight institutions have to be clearly defined and match their responsibilities. It should be assured that adequate powers are given to the regulators to allow them to bargain with the electricity industry. Furthermore, regulation without sufficient information is impossible. Therefore, regulators should have the right to obtain the relevant data while assuring the privacy of commercially sensible information.

(13) Independence: It is important to assure independence from government, political pressure and industry while providing the agency/ies incentives for proper work. The implementation of corresponding incentive structures and legal hierarchies is a challenging task. Obtaining and maintaining skilled, motivated and independent personal is another critical issue for regulatory authorities especially in countries with underfinanced public sectors.

(14) Future of the Ministry of Energy: After restructuring the Ministry of Energy will be transformed and its functions will be changed significantly. A clear understanding of the possible transformation is necessary.

Other Issues

(15) Supply Security: For final customers it is important that clearly defined delivery targets, and penalties for failure to meet them are determined.

(16) Balancing: The establishment of liberalized markets creates the necessity for determining balancing requirements for certain market participants. In the reform process it has to be decided who is responsible and by which means (physical, financial) he can meet its obligations. Furthermore it must be decided who provides balancing and other ancillary services, how the corresponding cost are calculated and who has to pay them.

Process of privatization

(17) Tender, auction or "beauty contest": Privatizing large infrastructure assets is a legally complex matter. Obtaining the maximum revenue for the state while assuring the compliance with certain side-conditions (e.g. employment guaranties) can be attained by different procedures. The World Bank has in 2007 identified the following lessons for a transaction strategy, which emerged from the privatization experience in the power sectors of Eastern Europe: "(1) Privatization through transparent international competitive bidding among prequalified investors results in the most sustainable privatization deals. Negotiated privatization does not even save time (for example, Estonia) and often leads to unsatisfactory terms to the sellers. (2) Offer majority shares to attract strategic investors in a manner that enables them to implement prudent investment and operating decisions. In any case, the strategic investor must have management control.

(18) Evaluation of the potential value: In the process of privatization it will be important to know for both, the government and the investors, what the value of the corresponding assets is. Otherwise, overly optimistic expectations might delay privatization or (intentional) underestimation might result in state property being sold below value. Thus, a transparent estimation of the asset value is also helpful to prevent corruption.

[18] Like in Germany, where we see a coexistence of regional and central regulation authorities, an anti-trust authority as well as regional and central ministerial powers with respect to electricity price setting.

(19) Treatment of existing debts and obligations: When unbundling BELENERGO the question must be solved to which party existing debts, obligations and arrays are attributed. The more clear this question is solved in advance, the lower the legal uncertainty and thus the higher the potential privatization revenues.

(20) General feasibility of privatization: Before all privatization attempts, a general question has to be answered positively: Could the current Belarusian administration credibly commit to a long-lasting sector restructuring and insure investors against expropriation under potentially changing political circumstances?[19] If this is not the case, investors will only acquire assets at a significant discount with respect to their true value. This discount will represent a risk premium.

(21) Existing legislative and non-legislative barriers: Laws are, as a rule, complemented by decrees, ordinances, rules and other normative acts that establish procedure and conditions of application. Those often introduce additional burdens on investors and a considerable uncertainty. Thus Belarus should strive to continue its effort towards streamlining procedures and regulations which is already showing first results.[20] Examples include way-rights, land ownership, taxation etc.

Social cost of liberalization/privatization

To complete such a large scale reform will necessarily produce winners and losers. Thus, decision-makers will have to make sure to have sufficient support for the reform to not to be interrupted at the half-way.

(22) Identification of potential loser: On important step to increase the political acceptability of such a large-scale reform is to identify the potential loser. Resistance to the reform is usually expected from potentially redundant employees in the overstaffed electricity industry, currently subsidized customers and certain political actors that might lose responsibilities in the process.

(23) How can they be compensated: The subsequent question is then, how these losers can be compensated to not jeopardize the success of the reform. Social tariffs and subsidization of certain industries can be replaced by lump sum transfers; former employees might obtain some compensation etc.

(24) Emission Reduction: To reduce regulatory uncertainty the administration should endeavour to credibly commit to an emission reduction target and scheme. Otherwise investment decisions might be distorted or postponed.[21]

5. Identification of Critical Questions and Outlook

All considered questions are very important for a successful restructuring of the Belarusian electricity sector. And the list is far from being comprehensive. Each of these subjects must be carefully studied at some point in time. However, one can select six questions that should necessarily be addressed first as they are decisive for the subsequent analysis.

These questions are: 1) The model of competitive electricity market; 2) The right of access to the wholesale trade; 3) The type of retail competition (if this competition necessary); 4) The price mechanism for wholesalers and retailers; 5) The investment mechanism after restructuring (how investments will work); and 6) The heat market organization.

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[19] For certain central European countries the (planned) membership in the EU provided, despite volatile political leadership, a credible commitment.

[20] Doing Business Report of the World Bank 2008.

[21] The „Atomausstieg" (nuclear phase-out) of the German government is a good „bad example". As the electricity industry is unsure whether this decision is credible it postpones investments in other (less economic) generation technologies to see what happens first.

To answer these questions, and more importantly to gain broad support for the answer found to be optimal, a quantitative assessment of the following scenarios is required:

(1) Status-quo conservation: This scenario is necessary to be able to compare all reform scenarios to the current situation. Moreover, it is required to demonstrate the necessity of restructuring the Belarusian electricity sector.

(2) Regulated single buyer: This scenario implies vertical integration of the incumbent with possible long-term contracts for independent suppliers. Special guarantees for foreign and domestic investors are assumed.

(3) Unregulated single buyer: Competition at the supply side only. Retail consumers are not allowed to purchase electricity at the wholesale market and regional companies have franchise for electricity supply in the corresponding region.

(4) Competition at the supply and demand side at the wholesale market, but monopoly at the retail market: At the demand side operate electricity distribution companies to have franchise for electricity supply in the corresponding area. The third party access to the transmission (high-voltage grid) is established.

(5) Fully competitive model: Third party access to the transmission and distribution grid, competition at the wholesale and retail markets.

The task for the future is thus to test the models described above in order to obtain quantitative answers that can be use in the decision making process.

6. Conclusions

Restructuring and privatization is necessary to assure future electricity supply at reasonable cost. The success of privatization is mainly dependent upon prior restructuring, which is needed to provide a legal background, transparency, and appropriate market conditions for investors to enter the market. Credible long run political commitment is essential to stimulate appropriate investments. Therefore, the initial electricity market design should reflect best international experiences, i.e. a "trial and error approach" is not suggested.

The above outlined questions should be addressed in close cooperation of Belarusian stakeholders and international experts. Starting with the general problems one can subsequently address the more specific technical questions. Ignoring the rich international experience provided by dozens of successful and failed electricity sector reforms would be an expensive waste of public funds.

As a first step to overcome political resistance the general economic favourability should be demonstrated quantitatively by comparing the potential outcomes of certain reform options with the status quo.

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Appendix

Table 4: Transmission and Distribution network replacement value

	Existing lines in km	Assumed cost in USD/km	Replacement value of existing network in US dollar
220-750 kV transmission lines	6,950	500,000	3,475,000,000
110 kV transmission lines	16,570	150,000	2,485,500,000
35 kV transmission lines	11,920	20,000	238,400,000
Air-voltage power lines 0,4-10 kV	204,250	10,000	2,042,500,000
Cable lines	28,540	20,000	570,800,000
Total	**268,200**		**8,812,200,000**

Sources: Own calculations.

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