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Policy Paper [PP/03/2009]

# The Belarusian Electricity Sector: Financing Sources for Investments

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Berlin/Minsk, July 2009

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# The Belarusian Electricity Sector: Financing Sources for Investments


## Executive Summary

Until 2020 Belarus will need to invest between USD 10–30 bn in its electricity sector. Under the current strategy only USD 675 m are to be invested annually in the entire energy industry (including heating). We argue that the planned financing mix, especially the high budget finance, is not sustainable. Thus, we analyze whether and how the shares of different financing sources in the finance mix should be scaled up or down. In particular we study self-finance, government grants, loans and private sector participation.

According to the current strategy, in 2010 almost half of the investments would have to come from state funds. This massive scale up could hardly be supported by the government budget that is already under significant stress. Furthermore, increasing the state involvement in the electricity sector is unlikely to provide the necessary boost in efficiency.

Financing investments from cash-flows is the most suitable way of financing investments. Current prices in Belarus are, however, not sufficient to satisfy the financing needs. Thus, increasing electricity prices is a straightforward approach. By a 1 US ct/kWh tariff increase an additional USD 300 m could be collected, allowing to scale back state subsidies to reasonable levels. By sequentially reducing cross-subsidies this could be achieved without harming the competitiveness of the Belarusian industry. Furthermore, this would lead to a reduction of domestic electricity consumption and thereby help to reduce investment needs to an economically viable level.

While preferential loans (e.g., from international donors) will be a welcome, though temporal, supplement to financing investment in the Belarusian electricity sector, commercial loans will be too expensive to be economically. This is due to the high risks that commercial creditors associate with loans to Belarus' state companies.

Private sector participation in the electricity generation sector is a financing source that should definitely be scaled up: The inflow of technical, organizational and commercial know-how will increase the profitability of the target company and knowledge transfer will stipulate efficiency in the entire sector. However, we also note that the framework for private sector involvement has to be carefully designed to capture the benefits and control the cost (This complex issue is discussed in section 5). Otherwise foreign investments might turn out being equivalent to expensive commercial loans. The implicit interest rates of ill-designed contracts might easily exceed 25% per year.



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## 1. Introduction

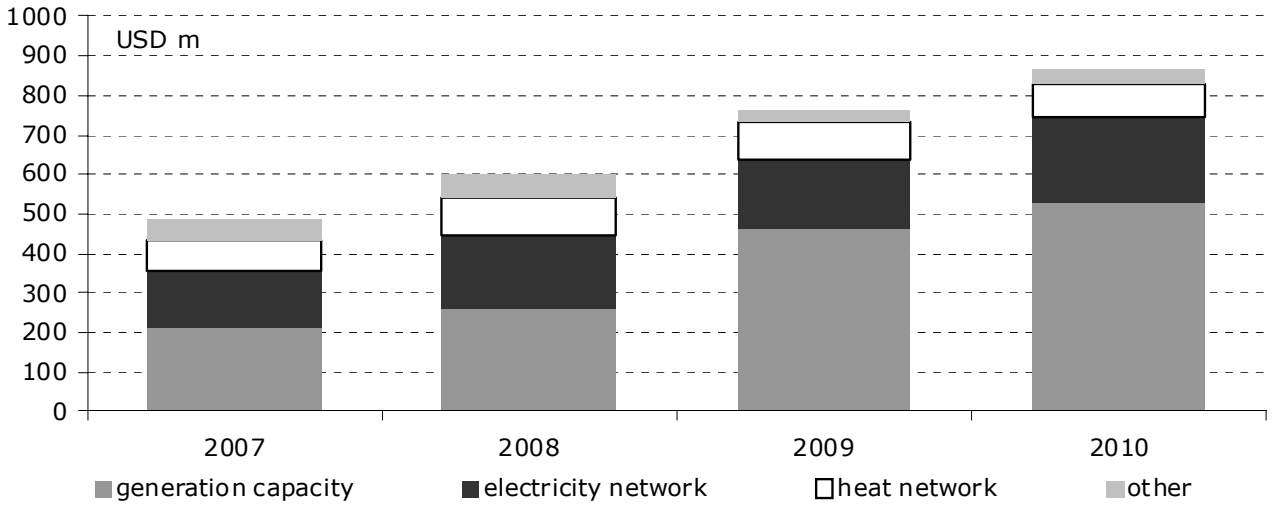
According to the Belarus Thermal and Power Institute (2007) electricity consumption in Belarus is expected to increase by 35% until 2020. Annual generation and installed capacity is expected to grow accordingly (see Table 1). Despite the fact, that these figures might be exaggerated[1] it is well acknowledged that the Belarusian electricity industry is in need of significant investments. The total volume of the official investment programme for 2007–2010 (approved by the President of Belarus in 2007) is USD 2.7 bn (see Figure 1). In 2007 and 2008 Belenergo was able to realize its investment programme according to the approved plan. In 2007 the total investment summed up to USD 480.3 m (the planned amount was USD 489.4 m) and in 2008 total investments of USD 659.1 m were realized (USD 601 m were planned). Most of the money is dedicated to power generation: 54.2% of total investments until 2010. This implies a significant ramp up of generation investments (+150%) with the biggest jump due to be in 2009 (+80%).[2]

**Table 1: Forecast (medium scenario) of the Belarusian electricity industry development till 2020**

| Item | Unit | Year | | | |
|---|---|---|---|---|---|
| | | 2005 | 2010 | 2015 | 2020 |
| Electricity consumption | bn kWh | 35.00 | 39.30 | 42.50 | 47.10 |
| Net import of electricity | bn kWh | 4.04 | 5.10 | | |
| Generation by Belarusian power fleet | bn kWh | 30.96 | 34.20 | 42.50 | 47.10 |
| Installed capacity | MW | 7900 | 8900 | 9900 | 11000 |
| Peak load (maximal load) | MW | 5871 | 7012 | 7814 | 8970 |

*Source*: Belarus Thermal and Power Institute (2007).

**Figure 1: Official investment program of Belenergo in 2007–2010 (in m USD)**




*Source*: Belenergo.

About 26.5% of the investment programme for 2007 – 2010 funds is to be allocated to the electrical supply networks. The planned cyclic investment scheduling – the increase of investment by 28.5% in 2008 is followed by a 5% reduction in 2009 and another increase by 24.2% in 2010 – is not optimal.

Further 13.3% of total investments in 2007–2010 are dedicated to the heat networks. The respective programme envisages an increase in investments by 18.3% in 2008, that is followed by two reductions of 8% in 2009 and 2010. Thus, investments in heat networks in 2010 (USD 84.3 m) will be of the same nominal order as in 2007 (USD 83.1 m , i.e. a reduction in real

[1] Taking for example into account the electricity demand reductions due to the current economic downturn.

[2] Taking into account the negative influence of the global financial crises on the Belarusian economy the planned investment jump in 2009 seems to be not very realistic. It means that planned efficiency targets outlined in the State programme of the Belarusian power engineering modernization might not be achieved.

terms). Taking into consideration the current state of the heat network this investment policy will not be sufficient.

One evident question, when analysing the structure of the planned investments is, why there is so much emphasis on modernizing generation assets. One answer could be that generation investments will reduce the cost in exactly that part of Belenergos value chain that might be opened to competition one day (i.e., generation), while the network part of Belenergos business will certainly remain a (regulated) monopoly.

Another question concerns the sustainability of the investment program. In Zachmann et al. (2008) we calculated the replacement cost based on estimates of the current assets status. This rough approximation indicated an investment need of USD 20–30 bn until 2020. While the corresponding USD 2 bn per year might be exaggerated the official programs average USD 675 m per year (that not only consider the electricity industry but the entire energy sector) might fall short of demand.

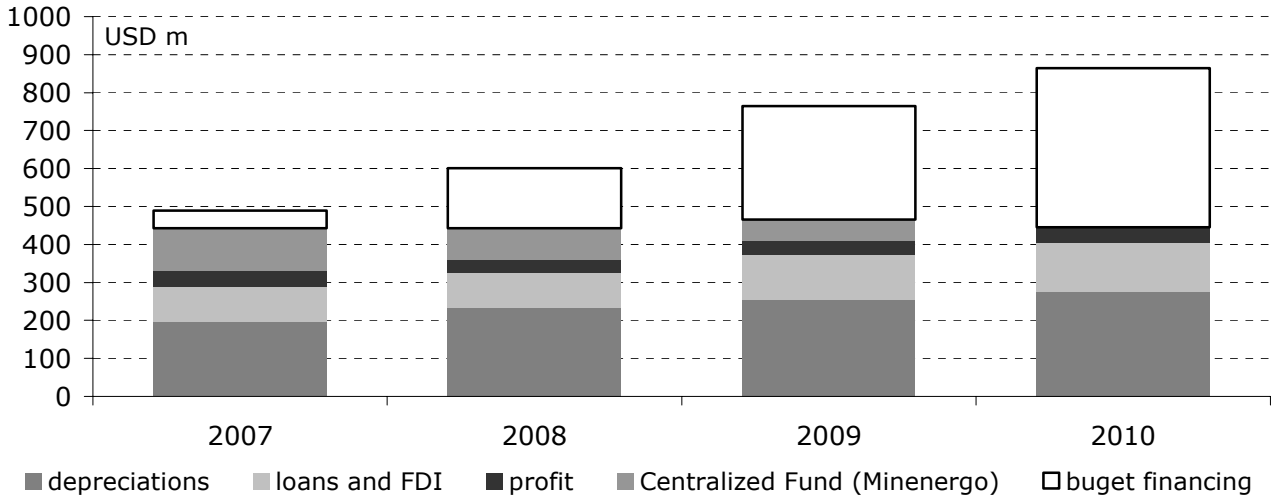
The main source of investment in the power sector in Belarus is currently the cash-flow collected from electricity and heat energy sales (48.7%). According to a request of Belenergo the presented investment program should be financed according to the numbers given in Figure 2. The share of the budget allocation in the total investments volume would increase from 10% in 2007 to almost half of the power industry investments (48.5%) in 2010.

**Table 2: Real and planned sources of financing of the Belenergo's investment program (%)**

| | 2007 | | 2008 | | 2009 | 2010 |
|---|---|---|---|---|---|---|
| | planned | realized | planned | realized | planned | planned |
| Own recourses | 48.7 | 52.0 | 45.0 | 41.9 | 38.0 | 36.6 |
| State budget | 32.6 | 31.2 | 40.0 | 40.9 | 46.4 | 48.5 |
| Loans and FDI | 18.7 | 16.8 | 15.0 | 17.2 | 15.6 | 14.9 |

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

**Figure 2: Estimated sources of financing of the investment program of Belenergo (in USD m)**




*Source*: Belenergo.

This desire for state funding is understandable, for two reasons: First, Belenergo in the current environment (vertically-integrated state owned monopoly) can neither attract significant private sector involvement nor loans, as its cash-flow entirely depends on political decisions on the electricity and heat tariffs. As the current pricing scheme neither allows for full self finance (see section 2) Belenergo will either need direct budget subsidies or state guarantees to attract external money. Second, by requesting subsidies from the government the top-rank management of Belenergo might transfer responsibility of under investment to the government. This is a potentially harmful development as, especially in the current episode of global economic crisis, the state budget is not a sustainable source of financing.

The share of loans and foreign direct investment (FDI) is projected to be 15.8%. This money will have to mainly come from loans, as the legal and regulatory framework for FDI in the electricity sector remains unclear and portfolio investment is unlikely (due to lack of an attractive stock market).

The investment fund of Minenergo, which was the main investment source in the 1990s, will be liquidated by 2010. The fund was fed by contributions from regional electricity companies (Oblenergo) and other enterprises controlled by Minenergo. The liquidation of the fund, that contributed 23% to the investments in 2007, can thus only partly justify the projected growth of the budget financing.

The only certain investment sources during the whole period are depreciations and profits. But those can only ensure a little more than 40% (35.4% and 5.7%) of the planned investments. Between 2007 and 2010 the share of own sources (profit and depreciation) is declining from 52% to 36.6%.

There are essentially four modes of financing investments that might be combined: cash-flow based finance, loan finance, private sector participation and government budget finance. These four options, as well as their advantages and disadvantages for the Belarusian electricity industry are discussed in the next three sections.

## 2. Financing investments from cash-flows and the government budget

Belenergos cash-flows and grants from the government budget will be the two major sources of finance for investments according to the financing proposal by Belenergo presented in the previous section. Under the terms of this plan the share of state grants in the financing mix of electricity sector investments is set to increase from 10% in 2007 to 48% in 2010. Consequently, energy sector investments will make up for 1.5 % of the state budget in 2010. Given (i) the commitment of Belarus to achieve a zero deficit state budget, (ii) the current economic crisis that decreases revenues, (iii) the devaluation that will make the importation of energy technology more expensive, (iv) and the adverse effect of hard currency outflows due the importation of energy technology on the current account it is uncertain whether this strategy is sustainable in the current political/economic environment.

**Table 3: Share of energy sector investment program in the GDP and the total state budget**

| | Unit | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Nominal GDP | BYR tn | 96 | 128 | 152 | 166 |
| | USD bn | 45 | 60 | *71* | *78* |
| State budge revenue | BYR tn | 37 | 51 | 56 | 61 |
| | USD bn | *17* | *24* | *26* | *29* |
| Investments from state budget[3] | USD bn | 0.05 | 0.16 | 0.30 | 0.42 |
| Energy investments from state budget by total budget | Percent | 0.3% | 0.7% | 1.1% | 1.5% |
| Energy investments from state budget by GDP | Percent | 0.1% | 0.3% | 0.4% | 0.5% |

*Sources*: IMF, Belenergo, authors' calculations.

Financing investments from cash-flow means that the difference between the income from selling electricity and the operational cost for producing (fuel cost, labour cost, maintenance cost etc.) or importing this electricity are used to finance investments. To make a pure self-finance sustainable, electricity prices must be above the average cost for a certain time such that the cumulated annual contribution margin is bigger or equal to the annual depreciation of the capital stock. In this context it is irrelevant, if the cumulated contribution margin comes from modest constant mark-ups to the average cost at all times, if it is due to high mark ups at certain times (e.g. marginal cost pricing) or if a completely different price scheme is used. Therefore, also the Belarusian pricing scheme with its price differentiation according to user groups and its lack of intertemporal price differentiation is no obstacle to cash-flow finance when average prices are high enough.[4] In market driven electricity industries new investments are

[3] State budget revenue and nominal GDP values in *italics* are converted into USD according to the exchange rate assumed by IMF for 2008: 1 USD = 2133 BYR.

[4] Of course the current Belarusian electricity price system does neither provide the right incentives for consumers (overconsumption of residential and underconsumption of industrial customers, overconsump-

usually incentivised by marginal pricing and in certain countries some form of capacity payment.[5] In the centrally planned Belarusian electricity industry, investment incentives are not necessary. Thus, for stipulating investments under the cash-flow financing the pricing scheme has only to assure, that the contribution margin is sufficient for covering the investment cost. To see, whether pure self-finance is a sustainable option in the current environment we have to calculate whether the expected cash-flow from selling electricity at the current prices is sufficient to cover the investment cost. Thus, we have to figure out the annual cash-flow.

In 2008 29.2 bn kWh of electricity and ~30 m Gcal of heat were sold to final consumers for a total of USD 4 bn. The average electricity price has been 9.7 ct/kWh (compared to ~12 ct/kWh in the EU average). The electricity production and distribution cost in Belarus were assumed to be 7.43 ct/kWh by the Ministry of Energy. This should leave Belenergo with a contribution margin of almost 2.3 ct per kWh or USD 672 m per year.[6] This would be sufficient to cover the investment expenses of USD 659 m in 2008.

The alleged cost of 7.43 ct/kWh are likely to be very optimistic when taking into account the low labour productivity, the unbalanced and expensive fuel mix as well as the comparatively low efficiency of Belarusian production and distribution assets. It would, thus, not be unrealistic to assume that average cost might well be in the region of European final consumer electricity prices (that include emission trading, market power and renewable energy mark ups). Furthermore the cost for the main fuel, natural gas, will continue to increase according to the 2007 agreement with Russia. Consequently, the contribution margin might well be negative (other estimates suggest that the generation and distribution cost of one kWh are in the region of 10.3 ct). On the other hand, the electricity price increase in April and September 2008 (that implied 13% to 25% price increases) will remain valid in 2009 and thus improve Belenergos income situation. Based on official data, it is thus virtually impossible to conclude on the sustainability of the proposed self-finance share.

One fact, however, is rather certain: if Belarus would want to substitute the planned budget funding in the electricity sector investments in 2009 (USD 281 m) by cash flow funding, the average electricity price will have to increase by 0.9 ct/kWh (assuming electricity sales of 30 bn kWh). For 2010, the corresponding price increase (with respect to 2008) to substitute the planned budget finance of USD 372 m would amount to 1.2 ct/kWh.

Nevertheless, there are severe doubts that even the modest self finance share assumed in the investment program (between 37% and 49%) could be reached at current price levels.[7] This is regrettable as financing the needed investments from cash-flow features five big advantages: first, self-finance does not imply payment obligations for future generations. Second, it is cheap compared to external borrowing (of Belenergo or the state) or transferring future profits to foreign companies. Third, it implies hard budget constraints for Belenergo and thus provides incentives for both cutting cost and investing in assets that quickly pay off. Fourth, pushing for a higher share of self finance would also imply to reduce (cross-)subsidies which in turn would increase overall welfare. And fifth, a high share of self finance of investments is a strong signal to potential partners / investors that the business model is healthy. Thus, this leads to lower risk premia (on the profits companies expect for investments) and/or higher privatization revenues, in case more private sector participation is envisaged.

Having said that, we acknowledge that in its current position pure self-finance of Belenergo is not realistic and would lead to an investment trap, where the significantly higher prices necessary to finance investments would lead to lower demand (and/or non-payments) and thus to higher cost due to reduced capacity utilization. To smooth the transition to a sustainable self-finance, external funds will be required.

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tion in peak periods and underconsumption in off-peak) nor would an independent investor be able to find the socially optimal investment when she were geared to the prices.

[5] There is a broad discussion among the scientific community which (combination of) arrangement(s) provides the socially optimal investment incentives.

[6] Taking into account the 20% devaluation of BYR in Jan 2009 the tariffs hard currency value was reduced correspondingly. Thus, increases in tariffs in domestic currency would be necessary to maintain the margin.

[7] Taking into account that Belarus imports almost all generation equipment a self-financing strategy will put significant stress on the current account. That is a very sensible issue for Belarus especially in the present (2009) period of significant current account deficit.

### 3. Financing investments with loans

A second source for financing infrastructure investments are loans. As shown in Table 4 the amount of attracted credits is low in comparison with investment needs. In 2007 foreign credits became dominant in the total amount because during this (pre-crisis) period foreign credits were cheaper than domestic credits.

**Table 4: Structure of investment credits of Belenergo**

| | 2006 | | 2007 | | 2008 | |
|---|---|---|---|---|---|---|
| | USD m | % | USD m | % | USD m | % |
| Domestic credits | 21.5 | 79.6 | 20.7 | 25.6 | 37.5 | 33.0 |
| Foreign credits | 5.5 | 20.4 | 60.1 | 74.4 | 76.2 | 67.0 |
| Total | 27.7 | 100.0 | 80.8 | 100.0 | 113.7 | 100.0 |

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

For investments in the Belarus electricity sector three different types of loans can be distinguished: Commercial loans, loans by exporters or export supporting organizations and loans by international financial institutions.

In most European electricity sectors, financing investments with **commercial loans** is common. In general, a profitable electricity sector (e.g., most Western world electricity sectors) could rely entirely on self-finance. Nevertheless, private electricity companies generally prefer to have a certain share of outside finance as borrowing provides a leverage effect to increase the profit margins of the shareholders. RWE for example has capital cost of around 9% while its return on capital employed is around 16%.[8] Thus, increasing the share of borrowing increases the expected profits for the shareholder. This, leverage effect, however, only arises when the returns of the financed projects are significantly higher than the loans interest rates. In case of project failure, the leverage effect applies to the downside.

In Belarus, foreign commercial loans played a certain role for financing investments in the electricity sector in 2007–2008. This was due to the fact that the conditions of these foreign loans were considered advantageous compared to domestic loans at that time. With the crisis, however, capital constraints and risk perceptions of foreign banks changed. Thus, unless the state (as the owner of Belenergo) would guarantee for the payback of loans, commercial banks will ask for substantial risk premia.[9] While state guarantees would lead to quasi fiscal deficits, no state guarantees will imply very high interest rates, making unguaranteed foreign commercial loans an uneconomic option.

In contrast to commercial loans, **loans by exporters or export supporting organizations** do often not feature market interest rates and might be available for unusually long maturities. Consequently, such trade credits appear to be more economic to finance investments than commercial loans. Belarus has made use of such loans: Currently financing of the Minsk CHP-2 and CHP-5 modernization is carried out by the Chinese Corporation for Overseas Collaboration that won the corresponding tenders. In this context, two credit lines were opened:

- EUR 52 m for CHP-2 modernization (final stage of construction – end of 2010);
- EUR 260 m for CHP-5 modernization (final stage of construction – July of 2011). This credit is bound and covers costs of Chinese generation equipment and engineering services.

As indicated by Belarusian officials the construction of the Bel-NPP (project of a Belarusian nuclear power plant) should be realized by Rosatom. After a mutual agreement between the Belarusian and the Russian government a long-term credit line (at probably preferential interest

[8] The ROCE for the RWE holding in 2008 has been 17.2% (16.5 in 2007). For RWE Power the continental energy branch of RWE the ROCE has been 24.2% (19.6%) while it has been 10.1% (11.3%) for nPower, RWEs UK branch.

[9] See for example the downgrade of Latvenergo by Moody: "On 27 April 2009, Moody's downgraded Latvenergo's long-term rating [from Baa1] to Baa3 with negative outlook following the downgrade of the Latvian government's long-term rating to Baa3 with negative outlook." In the explanation it became clear that even so the law states that "the state bears no responsibility for the obligations of the company" high government support is assumed by Moody because of the "strategic importance".

rates) could be linked to this project. This variant is believed to be the most probable way to finance the capital-intensive construction of a nuclear power plant.

Finally, external borrowing from **international financial institutions** is considered. In May 2009 Belarus was looking to attract a USD 125 m loan from the World Bank for energy system modernization and a USD 200 m development policy loan. In the near future EBRD might also become interested in lending to the Belarusian electricity sector. Preferential interest rates, the desire by international financial institutions to not only stipulate technical but also organizational improvements and their huge experience makes borrowing from them a seminal road to finance investments in the Belarusian electricity sector. But Belenergo should of course be aware that loans from international financial institutions are no gifts that allow the survival of the current structure: the loans have to be paid back with interest and the organizational changes demanded might be unpopular.

As Belenergo is a state owned company all three types of loans have in common that the government will be the final guarantor for the loans. Thus, external loans to the electricity sector represent national debt. To conclude, loans by international financial institution feature preferential interest rates and are often linked to sectoral changes. If Belarus does not feel ready for such reforms, trade credits might allow for the finance of certain projects at comparably low interest rates. But as the linked conditions usually assure a market based rate of return for the lender they are rarely "cheap". Finally, commercial loans, due to their high cost and high financial risk would be strong drivers of efficiency but are unlikely to be economic in the current sector structure.

### 4. Financing investments through private sector participation

Private sector investments in the electricity industry have been taken place in virtually all European transition countries (see Figure 3). While some countries saw full scale privatizations with foreign investors buying controlling shares of generation and distribution companies (Bulgaria) other countries only allowed for new independent power producer in a rather "unfriendly" environment (Latvia). In European transition countries foreign direct investment has been carried out by international organizations (e.g. EBRD), portfolio investors (e.g., Deutsche Bank), infrastructure funds (e.g., Macquarie European Infrastructure Fund), and transnational electricity companies (e.g., RWE). Transnational electricity companies, that are incumbents in their domestic markets, have accounted for the highest share of foreign direct investments in the electricity sectors of transition countries in Central and Eastern Europe. Distribution companies in the Czech Republic, Slovakia, Hungary, Romania, Bulgaria and other countries, for example, have been sold to German (RWE, E.on), French (EdF) and Italian (ENEL) incumbents. In contrast to the investments in the aforementioned transition countries, the amount of FDI in the Belarusian electricity sector has been negligible (see Table 5).

**Table 5: Structure of foreign investment in Belarusian power engineering (m USD)**

| | 2006 | 2007 | 2008 |
|---|---|---|---|
| Foreign direct investment | 0.0 | 0.011 | 0.024 |
| Foreign portfolio investment | 0.0 | 0.0 | 0.0 |
| Foreign credits | 102.7 | 257.9 | 241.5 |

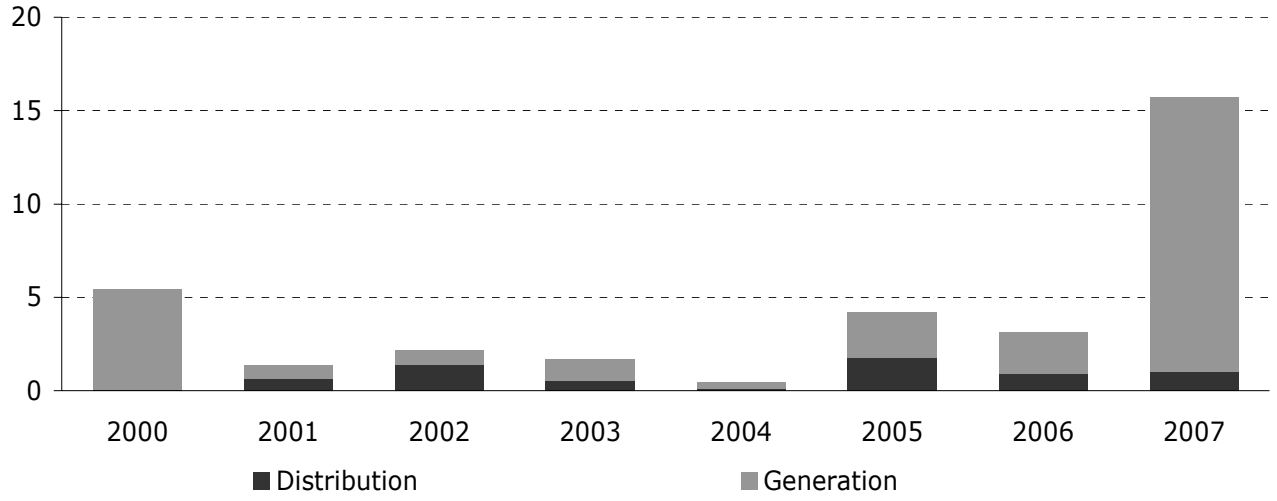
Sources: Ministry of Statistics and Analysis.

This is regrettable, as FDI, although implementation is complex (see section 5), entails considerable advantages over loans, government funding and self finance. First, foreign investors will bring new money to the Belarusian electricity sector. This will relieve the government budget and might free resources of Belenergo for additional investments. The long-term capital inflows through private investment in the infrastructure sector are also appreciated from a macroeconomic perspective.

Second, investors not only bring along the needed money but they also offer their commercial, organizational and technical experience to the target company. Apart of the direct effects on the target companies efficiency this also creates positive externalities. Experiences gained by employees in the target company might be also used in other companies. Collaboration of the target company with other companies in the electricity sector will lead to knowledge transfer. And the target company might serve as a benchmark for its competitors, thus motivating them to become more efficient and as an example on how to do so.

And third, big foreign investors might feature significant economies of scale, thus allowing them to produce certain services significantly cheaper (and/or at better quality). While this might be less the case for electricity, intermediate goods (like software services) might be centrally provided.

**Figure 3: Sum of investments with private participation in the electricity sectors of low and middle income countries in Europe and Central Asia**




*Source*: World Bank and PPIAF, PPI Project Database.

Opposed to these advantages, however, three difficulties have to be mentioned: First, certain contracts for foreign investors imply quasi fiscal deficits of the state. If, for example, an investor agrees with the state owned single electricity buyer company to build a power plant whose output will be bought at certain terms, the contract can be considered as a form of borrowing. Due to the corresponding risk, the implicit interest rates of such a contract might be substantial (see section 5.5). From the governments perspective, another drawback of private sector involvement might be the loss of control. If not laid out in the contract, decisions that are beneficial form a welfare economic point of view but hurt the investor (e.g., disconnecting the generator in times of low demand) could no more be concluded by simple government decrees. This leads to the third drawback of FDI in the electricity sector: the need for complex contracts.

Especially in the utilities sector a wide variety of contract types for private sector involvement emerged. While some forms only include the management of the facilities, others imply temporal or even definitive ownership transfer. The big variety of contract types is explained by the desire of the contract parties to reduce transaction cost, create congruent incentives and avoid opportunistic behavior for the typically long time-horizon. Thus, the selection of an appropriate contract for a given project has to deal with the enormous complexity of the corresponding legal questions. In Belarus, the absence of a comprehensive legal framework for private sector participation and the lack of comparable cases leads to a significant amount of legal uncertainty. Thus, a detailed examination on which contract type is suitable in which circumstances is beyond the scope of this paper. Therefore, we focus on the economic aspects of the contracts (that have to be implemented in the corresponding contracts). Thus, risk sharing, expected profits, etc. are discussed in the next section.

## 5. Designing fair contracts for private sector participation

To understand commercial FDI in the electricity sector one has to take the perspective of potential investors, namely West European incumbents.[10] Those will base their decision on purely commercial interests, that is the relation of expected profits and associated risks. To increase the probability to attract FDI Belarus might thus either improve its offer with respect to ex-

[10] Most of the investments in Central and East European Transition countries were made by a limited number of West European incumbents. In addition, some investment funds with a special interest in infrastructure assets and some American electricity companies participated in the privtization of the electricity systems in Central and Eastern Europe. (see PwC 2008)

pected profits and/or reduce the risks beard by the investors. While the former is always costly for the Belarusian administration, reducing the risk not necessarily implies a disadvantage for the Belarusian side. This is because, risk for the investor cannot only be reduced by shifting risks from the investor to the Belarusian side (e.g. Belarus guaranteeing a certain load factor for a power plant). It might also be reduced by ex ante ruling out opportunistic behaviour after the contract has been concluded. The difficulty is to credibly commit to such a policy for the long time horizon necessary for power sector investments. The three contract dimensions – expected profit, risk sharing and ex post commitment – are discussed in the following three subsections. An overall dimension to be kept in mind is the absence of perverse incentives for either side to inefficiently operate to the detriment of global social welfare.

*5.1. Expected profit*

In negotiating the contract, the target country will try to achieve the lowest rate of return while the investor will try to obtain the highest rate of return. Thereby, investors and target country will generally have different perceptions on the "rate of return" of a given contract. This is due to the fact that their information are asymmetric and that they value different "outputs" of the project differently:

- While the investor has more information on the efficiency gains he might achieve and the business strategy he will follow after the investment, the target country has better information on the condition of the assets and the future development of the legal and the economic system.
- The rate of return should take into account all cash flows associated with the contract itself over the lifetime (e.g., investment cost, electricity sales etc.) plus additional costs/savings that are linked to the contract (e.g., tax benefits for other investments of the private partner or reduced government spending on subsidies for public services).
- Finally, the timing of profits adds a certain layer of complexity. Actually, the investor will generally prefer early profits, while the target country prefers late ones. It is, however, unclear whose preferences are stronger.

Asymmetric information will complicate negotiations as both parties will want to obtain conditions as close to the other parties reservation price as possible. Thus, the investor (that generally has the harder budget constraints) will try to avoid overbidding by significantly discounting the official profit predictions (especially if they sound very optimistic). Assuming full rationality, credible transparency could in this case even increase the willingness to pay of the investor.[11]

One of the above listed transactions implies an additional layer of complexity, as it involves a definitive transfer of state property to private ownership: Privatization. Thus, finding a fair price for existing assets is an important part of negotiating a private sector involvement. In case of perfect information the price will be situated between the sellers reservation price and the buyers maximum willingness to pay. Economic (auction) theory has shown that the selling mode can have a significant impact on the sellers revenue. For complex transactions like privatizations four modes have practical relevance:

- Sale by offering of shares;
- Closed or limited tender (sale by private treaty);
- Sale by public auction;
- Leasing of firm assets.

The first option requires a functioning legal basis for stock corporations, especially a clear definition of who controls the management. If for example "golden shares" exist no investment in shares of electricity companies would take place (at reasonable prices).[12] This is because only

[11] There might, however, be reasons for bounded rationality. For example, the decision-preparing department in the investing company might push for the deal as this will improve the importance of their department. Thus, they might be willingly overconfident in overly optimistic figures provided by the target country.

[12] According to the Strategy for the Development of the Equity Market 2008-2011 trade will start only in 2011 for shares of companies where the state is a minority shareholder. For 150 strategic companies (comprising energy companies), stock trading will be completely prohibited.

investor driven changes in the management could make the companies profitable enough to compensate for the riskiness of buying Belarusian electricity assets.[13]

Closed and limited tenders are often quite intransparent. Furthermore, the pre-selection of candidates as well as the selection of criteria for the final decision are highly subjective. Without effective control this might lead to corruption and "horse-trading" deals, i.e., agreements that mix different subjects (e.g., the contract is awarded to a company that will offer the most preferential electricity tariffs to certain sectors, even though its total bid is not competitive).

Sales by public auction might be the most suitable way to sell (parts of) large state-owned companies for several reasons: First, the award criteria are public and equal for all bidders. Second, the results of public auctions are transparent. And third, designing the criteria requires the seller to make clear cost/benefit considerations. This would be especially important in the privatization of Belarusian state-owned companies as they often provide public goods, social services and subsidies. The rule of thumb for decision makers should be, to maintain the "public service" obligation only if it does not result in a reduction of the selling price that exceed the cost of providing this "public service" by another state organization (e.g., should the privatized company really provide 2000 Kindergarten places even though those have higher unit cost than the corresponding communal service).[14]

In any transaction type, the seller will want to know the "true" value of the assets he intends to sell to adjust his negotiation strategy accordingly. But this "true" value does not exist, as the assets values are highly subjective. This is due to the fact, that the government obtains benefits (e.g., "public services") different from those a private owner values (mainly future dividends and betterments). The value for the government thus depends strongly on policy priorities and alternatives. This makes it very difficult, if not impossible to quantify the corresponding subjective value. For private owners, the value could essentially be calculated either based on the replacement value or based on discounted future cash flows. The replacement value method does, however, not provide realistic results in electricity markets that are characterized by oligopolistic structures, large sunk cost and strong dependence on regulation because same size newcomers might feature completely different cash-flows. Applying the discounted cash-flow approach to an unrestructured sector is also rather tricky as simple extrapolation of current cash-flows would significantly understate the potential efficiency gains of new management. To demonstrate this effect we calculate the discounted cash-flow value of Belenergo under four sets of assumptions.

**Table 6: Discounted cash flow of Belenergo under different assumptions**

| | **High** | **Low margin** | **Low demand** | **Low** |
|---|---|---|---|---|
| Efficiency (constant) | 45% | 45% | 45% | 45% |
| load forecast | Constant | Constant | BTPI | BTPI |
| annual tariff increase | 15% | 10% | 10% | 10% |
| interest rate | 15% | 15% | 15% | 15% |
| natural gas price in USD/1000 $m^3$ | 158.67 | 200.00 | 158.67 | 200.00 |
| electricity price USD/ MWh in 2010 | 103.4 | 75.0 | 103.4 | 75.0 |
| non-fuel cost mark up | 50% | 50% | 50% | 50% |
| gas price increase | 10% | 10% | 10% | 10% |
| **Discounted Cash Flow (m USD)** | **59.790** | **5.380** | **24.861** | **5.042** |

[13] Legal Guidelines of the World Bank for Privatization Programs „A public offering of shares requires as complete a disclosure as possible of relevant financial and business information concerning the assets and liabilities of the enterprise, its profitability history, business activities and future prospects. This disclosure should be in the form of an offering document or prospectus containing a description of the new shares and the terms on which they will be allocated. The offering document is prepared by the management of the enterprise and approved by the board of directors. It is then registered with the relevant capital markets authority and is a public document open to inspection."

[14] Clearly countries need to avoid the sort of dishonest and collusive equity for debt swaps and asset stripping which characterized some of the Russian privatizations that have had such significant and long-running political consequences. (Pollitt 2008)

The above calculations assume the persistence of the vertically integrated monopoly. Thus, the cash flow stems from both: the generation and the transmission/distribution business.[15] Consequently, the retail tariff is considered in calculating the cash flows. The tariff is assumed to be USD 75 per MWh in the low tariff scenario. This value was deduced from the year 2007 figures on sales revenues and sales volumes of Belenergo. In the high tariff scenario the tariff is assumed to be USD 103 per MWh, the price Belenergo officials consider cost covering. We assume in the high scenario that the prices will increase by 15% annually which reflects the average annual tariff growth rate for industrial consumers in the last 5 years (6.02 ct/kWh in 2005 to 12.08 ct/kWh in 2009). In the three other scenarios, a more moderate growth of 10% is assumed. The price development is impossible to forecast as it is unclear whether the market power of such an entity will lead to higher/quicker tariff increases or whether regulation (e.g., price caps) will slow down price increases.

The electricity sales of Belenergo are assumed to either remain constant (i.e., the GDP growth is offset by higher energy efficiency and declining population) or to develop according to the forecasts of the Belarus Thermal and Power Institute (BTPI, see **Table** 1).

The initial natural gas price is assumed to be USD 159 per tcm in the high margin scenario, i.e. the currently paid price. In the low margin scenario, it is assumed to be USD 200 per tcm, i.e., the price paid by Ukraine, which more closely reflects a free of subsidies price for Russian natural gas in Belarus. The gas price is assumed to grow at the past inflation rate, i.e., 10%.

The nominal interest rate is assumed to be 15% in the low scenario and 20% in the high scenario which in the first case reflects a mean value on the return on government bonds with B rating (e.g., Belarus, Ukraine) and in the second case adds some business risk augmentation on top of the bond return.

We include labour cost, operation and maintenance cost and rental fees as well as the cost for renewing, maintaining and extending the network by a 50% mark up on the spark spread. As the true non-fuel cost that cannot be deduced from Belenergos balances we chose 50% because it is in the region of the mark up to be found for West European vertically integrated electricity companies (e.g., Nuon and RWE[16]).

The obtained results (see Table 6) tend to be rather optimistic as this mark up probably underestimates the non-fuel cost for Belenergo. Furthermore all tax payments are excluded as taxation in Belarus tends to be highly complicated and subjective, making it an important issue for the privatisation contract negotiation. In addition, the above analysis assumes that the current assets of Belenergo are in good shape. Additional investments necessary to bring the assets into shape would have to be deducted from the discounted cash flow.

According to Table 6 the possible discounted cash flow (DCF) of Belenergo ranges from USD 5 bn to 60 bn. The results are most sensitive to the very uncertain future spark spread.[17] The difference between the "high" and the "low margin" DCF is entirely due to the different initial electricity and natural gas prices as well as the assumed electricity price growth. This demonstrates, that forecasting realistic tariff levels is essential for analysing the value of Belenergo. While, the interest rate (in the low demand scenario, an increase of the interest rate by one percentage point, decreases the DCF by 8%) proved to be another important factor; the electricity demand expectations were less crucial. This is due to the fact that we assumed, that demand increases will create higher turnover but require additional investments, thus only allowing for limited additional cash-flows.

If the investor calculated its offer price assuming an electricity tariff of USD 75 per MWh (case "low margin") he will pay USD 5.4 bn. If he is unexpectedly allowed to increase the tariff to 103.4 after his acquisition, he would obtain a windfall profit of USD 16 bn (or 3 times the initial

[15] This assumption was necessary, as no data on the composition of the retail prices (the only available price information) are available. To calculate the values for individual branches, tariff compositions of comparable countries might be applied.

[16] NUON states in its 2007 Annual Report that "costs of energy, raw materials and supplies" make up for EUR -3,073 m out of the "total gross operating expenses" of EUR -4,752 m. In 2008 for RWE it has been EUR 28,660 m for raw materials etc. and EUR 14,090 m for other cost.

[17] The spark spread is defined as the electricity price per MWh minus the gas prices times the amount of gas necessary to generate one MWh of electricity.

value). Thus, to allow the seller to capture this rent, it is important to raise prices to economic levels before privatization.[18]

*5.2. Risk sharing*

Investment in power generation comprises a large and diverse set of risks, which include (IEA/NEA, 2005):

- Economy-wide factors that affect the demand for electricity and the availability of labour and capital.
- Macroeconomic risk like inflation risk and exchange rate risk.
- Factors under the control of the policy makers, such as regulatory (economic and non-economic) and political risks, with possible implications for costs, financing conditions and on earnings. An example of such risk is the cost of additional emissions controls.
- The price and volume risks in the electricity market.
- Fuel price and, to a lesser extent, availability risks.
- Financial risks arise from the financing of investment. They can to some extent be mitigated by the capital structure of the company.
- Factors under the control of the company, such as the size and diversity of its investment programme, the choice and diversity of generation technologies, control of costs during construction and operation. These risks differ among power generation technologies. Therefore, the discount rates should take into account technology-specific risks and uncertainties for different power investments.

According to economic theory, the risk should be beard by the party that can mitigate them at the lowest cost. Thus, political and regulatory risk should be beard by the state while technical risk should be beard by the company. The difficulty in the Belarusian situation is that certain risk, that are typically beard by companies, are significantly state-driven in Belarus. In the absence of an electricity market, for example, electricity prices are political decisions and the corresponding risk should thus be beard by the state. The same holds true for the load factor, the fuel price and to a certain extent even the labour cost.

Corresponding risk mitigation mechanisms can be implied in the form of government guarantees:

- Load factor guarantee;
- Price guarantee;
- Profit guarantee.

One risk that has to be beard by the company and that thus is reflected in a risk premium is the risk of a breach of contract, either due to the financial inability of the state or due to political will.

*5.3. Complexity of contracts*

A difficulty widely experienced with FDI projects has been the high complexity of contracts. This complexity is due to the fact that infrastructure projects are designed for a very long time horizon and that the outcomes for both contract parties depend on many, often quickly changing external factors. Thus, creating "complete contracts" that account for all eventualities is unrealistic. Consequently, non-partisan arbitrators must be in place to settle potential disputes.

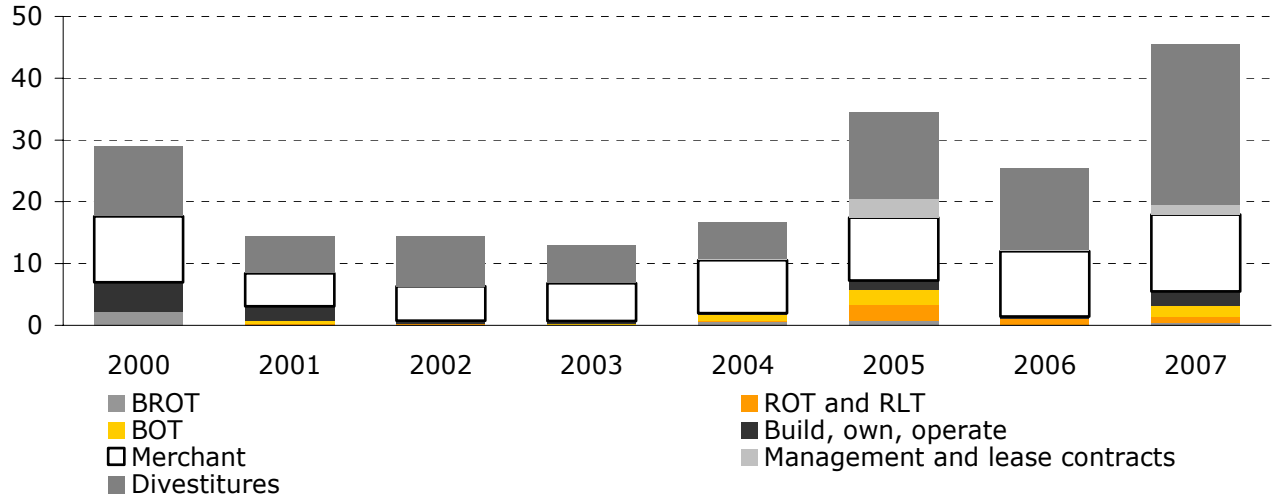
Complexity also refers to the necessity for complicated mechanisms to align incentives of the two parties. In this context, certain project types proved to be more complex, thus implying higher transaction cost, than others. Greenfield projects, for example, are easier to put into practice than refurbishment contracts. The cost of complexity should not be underestimated. Thus, going for less profitable but simpler contract constructions might prove cost efficient.

[18] Unrealistically high assumptions would create suspicion among investors on the political sustainability of such tariffs.

International experience shows, that contracts that feature full ownership transfer to the investor stipulate the highest investment sums (see Figure 4).

Another way to attract foreign investments for an unrestructured company is pre-privatisation. This scheme implies that an international financial institution (IFI; e.g. KfW or EBRD) buys from the government a minority share of a company that is to be restructured and privatized. According to an agreement with the government, the company is then restructured. If this restructuring is successful, both, the IFI and the state sell their shares to private investors. Otherwise the government might have to take back the shares of the IFI. The advantages and disadvantages of this mechanism are discussed in Kirchner and Giucci (2009).

**Figure 4: Contract types used in infrastructure investments with private participation of low and middle income countries in Europe and Central Asia**[19]




*Source*: World Bank and PPIAF, PPI Project Database.

*5.4. Ex post commitment*

A second difficulty is the susceptibility of large sunk investments to so called "hold up" situations. A "hold up" situation is a situation where an investor has made a significant upfront investment whose payoff depends on the host countries behaviour after the investment is in place. Ex post opportunistic behaviour of the host country might include nationalization of assets, profit squeeze through tax increases or renegotiation of contracts (e.g., the natural gas pipeline through Ukraine that has been subject to repeated renegotiations).[20] Investors are aware of the possibility of such ex post opportunistic behaviour. Thus, they demand higher risk premia or reduce their willingness to invest. Therefore, even if the host country does not intend to behave opportunistic, both contract parties worse off. To overcome this problem different tools have been developed by which the host country can commit not behave opportunistically (and thereby reduce risk premia and increase investment willingness):

- **Signalling:** a convenient way for a host country to self-commit is by implementing irreversible decisions that will be costly if the country behaves opportunistically. One example could be the construction of linked specific investments by the host country (e.g., gas storage facilities).
- **Independent regulators:** establishing regulators is a strong signal to investors as case studies have shown that the existence of independent regulators reduces the probability of contract renegotiation.[21] This effect is partly due to the possibility to shift responsibility

[19] BROT = build, rehabilitate, operate, transfer; ROT = rehabilitate, operate, transfer; RLT = rehabilitate, lease, transfer; BOO = build, own, operate.

[20] FDI in utilities has been hurt in Argentina by policy changes that have led to an abrogation of market contracts dictating the costs of utilities. Citing risks of possible policy contagion, some large FDI investors in the utilities sector wish to scale back their exposure to EMCs, in particular to countries in Latin America.

[21] Guasch et al. (2003) further find that concession contracts – including in the electricity sector - in Latin America were less likely to be renegotiated if a regulator was in place at the time of contracting. Given the fact that increased likelihood of contract renegotiation raises the riskiness of investment, this constitutes evidence that appropriate ex ante regulation improves the investment environment.

for unpopular but necessary price decisions from policy makers to regulators.[22] Consequently, countries that established independent regulators tend to attract significantly higher amounts of FDI.[23]

- **Guarantees:** a possible way to self commit is by means of guarantees. Corresponding clauses (e.g., guaranteeing lease rates, property rights, etc.) are usually laid down in contracts. To make those clauses effective the corresponding punishment must, however, be credible.[24]
- **Restructuring:** restructuring a market is a strong (i.e., expensive) signal of the host country to investors. If a country restructures its electricity sector it commits to stick to certain rules (e.g., no political interference in the scheduling), thus assuring potential investors.
- **Settle legislative issues:** By resolving existing legal questions, establishing clear rules and introducing non-partisan arbitrators legal uncertainty can be greatly reduced, benefitting both, investors and the host country.[25] Investors confidence could be increased significantly by setting general legislation instead of discretionary decisions.
- **Sustainable rate of return:** Realistic price assumptions are an important signal. If an investors profits turn out to be excessive in a favourable economic climate, there might be strong political pressure to renegotiate contracts. If tariffs are high during a downturn, the host country might be unable to fulfil excessive commitments.[26]

*5.5. Examples*

In this section we present a stylized example of an investment projects from the catalogue of information on investment projects: the construction of a new 450 MW Steam and Gas Unit. For this case, we can calculate the electricity tariff a potential foreign investor will expect by computing the operational margin (electricity price – fuel price x fuel consumption) that is necessary to pay the risk-adjusted expected returns (country risk x exchange rate risk x extraordinary business risk x expected rate of return). Country risk is the risk linked to the default of the state. It is important for an investment project in the Belarusian electricity sector as state owned Belenergo will be the contractual partner for the private investor. To quantify this risk, we assume the country risk to be reflected in the return difference between government bonds. As Belarus has no traded bonds but a Fitch rating (B), we can deduce the country risk by the difference between a B rated bond and an AAA rated bond. As returns have been quite volatile in 2009 (between 8% and 15% for UKRAINE 03/13 REGS) the country risk premium is somewhere between 5–10% (i.e., 8–15% for a B rated bond minus 2–5% for an AAA rated bond). In the calculation we take the lower bound, assuming 5%.

The exchange rate risk is due to the fact that cash-flows are collected in BYR while the investor values its profit in hard currency (USD or EUR). The exchange rate risk can be approximated

[22] Infrastructure, by its very nature, and due to social and political preferences is frequently subject to public intervention. Such intervention adds to the risky nature of infrastructure from a corporate perspective. (UNCTAD 2008)

[23] See Zhang et al. (2008).

[24] The attraction of investment requires security of property rights both via the judicial system and regulatory process. Governments can reduce regulatory uncertainty and commit to cost reflective tariffs for electricity companies. Power purchase agreements can help to offer a degree of certainty to generation investors but do potentially lock in high prices (this was the case in Northern Ireland where a single buyer model with long term power purchase agreements was followed to ensure the success of privatization, see Pollitt, 1997).
Bergara et al. (1997) state that proper incentive regulation and competitive wholesale markets can help to ensure that private sector investment does flow. Cubbin and Stern (2005) find that better regulation increases electricity investment by 15–25% for their sample of developing countries.

[25] Krishnaswamy and Stuggins (2003) provide a roadmap to privatization. This involves sorting out labour agreements, fuel supply agreements and rights of way before privatization.

[26] A number of foreign investors engaged in activities relating to utilities and infrastructure note that FDI is affected by political economy considerations, since contracts - sometimes based on unrealistic price of utilities relative to what consumers are used to paying - risk being reneged upon when governments change.

by the difference in the inflation expectations of Belarus and the Euro zone. Assuming an inflation rate of 7% in Belarus and 2% in the Eurozone, the exchange rate risk is around 5%.

The extraordinary business risk an investor will take into account when valuing an investment project would be the difference between the business risk related to this investment project and the typical risk (i.e., the risk inherent in its present ROCE). We assume, that project risk in Belarus are not higher, thus the extraordinary business risk is zero.

**Table 7: Construction of a new 450 MW Steam and Gas Unit (example from the catalogue of information on investment projects of Belenergo)**

| Measure | Source | Value | Unit |
|---|---|---|---|
| Return on capital employed | RWE and E.ons ROCE in 2007 | 15% | % |
| Country risk premium | Difference of interest for B loans (BY,UKR) and AAA Loans (D) | 5% | % |
| Exchange Rate mark up | Inflation expectation Belarus minus inflation expectation Germany (2%) | 5% | % |
| Investment | Assumption of Belenergo | 490 | USD m |
| Annual expected Profit | Calculations based on the above assumptions | **122.5** | **USD m** |
| Annual electricity sales | Assumption of Belenergo | 2.252.000 | MWh |
| Efficiency | Assumption of Belenergo | 41% | % |
| Natural gas price | 2009 natural gas price | 159 | USD/1000m$^3$ |
| Non-fuel cost mark-up | Assumption based on corresponding values for RWE and NUON | 50 | % |
| Expected electricity tariff | Calculations based on the above assumptions | **149.46** | **USD/MWh** |

Furthermore, we assume the absence of an extraordinary political risk (e.g., risk of nationalization). Thus, according to Table 7 an independent power plant would require a guaranteed electricity price of almost USD 133 per MWh to be incentivised to construct the proposed 450 MW Steam and Gas Unit. This is significantly more than current residential customers are paying for electricity supplies that include transmission and distribution charges.

There is only a limited number of companies that might be able and willing to invest in large generation assets in Belarus. In most Central European countries, such projects were usually executed by the big national incumbents from Western Europe that have huge experience and deep pockets. But, EdF, E.on, RWE, Enel, Vattenfall, Electrabel and others would – for investing in "green-field" generation projects – expect wholesale prices that significantly exceed the Belarusian electricity tariffs. Thus, in order to attract foreign investments, mechanisms to guarantee a certain profitability must be in place. The two main strategies in this context are: Either Belenergo acts as a single buyer, buying electricity from investors at a guaranteed price above current tariffs, or a market-driven price mechanism would be implemented that would lead to cost-reflective electricity tariffs.

Another project that was envisaged by Belenergo to be supported/completed by (foreign) investors was the construction of a 110 kV transmission line. This proposal does not seem to target commercial investors as there are currently no schemes to remunerate transmission asset holders in Belarus. Thus, the necessary means for renewing the transmission and distribution grids will have to come from the state budget, Belenergos cash flows, loans or financial assistance

These examples highlight the fact that private investments either require significant sector restructuring or they will be linked to substantial cost.

## 6. Conclusion

In this paper we have compared different modes of financing investments in the Belarus electricity sector. The current strategy envisages to finance the growing investment needs by increasing the share of government money. This scale up of state budget grants is a short term fix and will not solve the long term underfunding of the Belarusian electricity sector. The same is true for domestic and foreign commercial loans, that will negatively affect the long-term profitability of the electricity industry. Therefore, we argue that price increases should improve the income situation of Belenergo and would thus allow for a higher share of self-finance of investments. In addition, structural and legal reforms in the electricity sector should be quickly implemented, to pave the way for private sector participation in a reliable regulatory environment. These to measures allow to avoid excessively increasing state grants.

The paper demonstrates that the electricity tariffs foreign companies would expect for investing in "green-field" generation projects significantly exceed the Belarus electricity tariffs. Thus, in order to attract foreign investments, mechanisms to guarantee a certain profitability must be in place. The two main strategies in this context are: Either Belenergo acts as a single buyer, buying electricity from investors at a guaranteed price above current tariffs, or a market-driven price mechanism would be implemented that would lead to cost-reflective electricity tariffs.

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