

ISSUE BRIEF

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DINU PATRICIU EURASIA CENTER

The Energy Sector of Bulgaria

MAIN CHALLENGES

Energy security in Central-Eastern Europe and the Black Sea region is fraught with risks. By virtue of its geography, Bulgaria finds itself in a difficult nexus, drawn into Eurasia's contentious energy geopolitics and as a European Union member, involved in the Union's fragmented energy policy and complex regulatory, energy efficiency and climate change objectives. That position is challenging, but it also presents decision-makers in Sofia with opportunities.

The EU-backed Energy Community, of which Bulgaria is a member, seeks to foster regional cooperation in the Balkans and around the Black Sea, but is stymied by geopolitical questions such as Turkey's EU membership prospects and Russia's assertive energy strategy within the EU. On the other hand, Bulgaria is actively involved in geopolitics due to the country's almost 100 percent dependence on imported gas from Russia through one pipeline, which forces it into seeking answers to the questions. Bulgaria imports about 75% of its primary energy resources (oil, gas, nuclear fuel, coal) from Russia.

Bulgaria's energy markets remain heavily monopolistic at all levels and there is virtually no price discovery on free markets in the country. Prices are regulated, reference or formula-based, indicating the very low levels of competition in the energy sector. In 2008 the Bulgarian government drafted an energy strategy, which professed sustainability, competitive markets, achieving energy security via diversification, and development of renewable sources. However, the strategy failed to provide a firm ground for energy policy and decision making and was never approved in Parliament. Key decisions affecting the energy future of the country have subse-

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quently been made without a clear vision. A new strategy is currently under development. The government now in office has taken a more resolute stance about weeding out corruption, providing adequate transparency, and assuring competition in the energy sector, but decision-making and procedures regarding major projects and policies remain opaque and may be swayed by interests.

SECTOR REVIEW

Oil

Proved domestic oil resources are very limited (about 15 million barrels) and production is marginal. Import, export, and trade in crude oil and refined products are completely liberalized. All of the crude oil and considerable quantities of refined products are imported from Russia. Russia's imports from Bulgaria, on the other hand, are marginal, leading to a

substantial imbalance in bilateral trade and in Bulgaria's external accounts. Net imports of mineral fuels, oil and electricity run at about €2 billion per year.

Crude oil imports currently stand at around 7.5 million tons per year, processed at Lukoil's Neftochim refinery and petrochemicals works located on the seaside near Burgas. Since acquisition under a privatization deal, Lukoil cut back the refinery's capacity by scrapping two atmospheric distillation units. Down from 220,000 barrels per day (bpd), the refinery's capacity now stands at 145,000 bpd, but the facility is still the largest one on the Balkans.

Bulgaria's plans to participate in the Burgas-Alexandroupolis crude oil pipeline have been significantly delayed. Seemingly, failure to implement the project would reduce the country's ability to access alternative sources of crude oil. However, under the terms of the tri-party intergovernmental agreement between Bulgaria, Greece, and Russia, operational control over the pipeline will be in the hands of Russia's Transneft, which has so far failed to secure the required volumes of crude oil. Taking into consideration the high environmental sensitivity of the project, which has already attracted considerable public attention and has alerted EU policy makers, it is highly unlikely that its benefits will be greater than the costs. For these reasons, the project remains ambiguous and is unlikely to materialize in the foreseeable future.

- There is extremely high concentration of market power in the crude oil and refining sectors;
- Quality of refined products is often suspect, with product adulteration and imports of products that fail to meet specifications most likely the cause;
- There is an extensive "gray" sector in the industry, estimated at a third of the market or more. Various estimates put the size of the "gray" market at €800 million to €2 billion.

Natural Gas

Bulgaria's natural gas industry salient features put it somewhat in a league of its own. Almost devoid of proved indigenous resources and with a domestic market that is only 2.5-3.5 billion cubic meters (bcm) per year, the country has an extensive system of main gas pipelines that serves its own needs and those of neighboring Turkey, Greece, and Macedonia. The inflow of natural gas at Bulgaria's border (about 22 bcm per year) is comparable on a heat content basis to the

entire domestic primary energy supply (production and imports). About 85% of the gas is transited.

Attempts to develop domestic gas resources have so far failed to produce significant results, although some small fields have been put under production and depleted. The best prospects for new discoveries are located offshore, most of which has yet to see a well drilled. No deepwater wells have ever been drilled. Some depleted fields are being considered for construction of underground gas storage (UGS) and there are plans to expand the only existing UGS located at Chiren. Unconventional gas development is yet to be looked at.

Natural gas is imported to Bulgaria by a single public supplier, Bulgargaz EAD, a fully-owned subsidiary of the 100% government-owned Bulgarian Energy Holding (BEH). Bulgargaz is the only holder of a license for public provision of natural gas. Under long-term contracts which will expire at the end of 2010 and 2012, Bulgargaz imports gas from subsidiaries of Gazprom and intermediaries (Overgas Inc., Winter-shall, and Gasexport).

Bulgartransgaz is the owner and operator of the high pressure gas pipelines and the Chiren UGS. Bulgaria has declared EU-backed intentions to construct interconnections to Greece, Romania, Turkey, and Serbia, which would improve system flexibility and gas supply security, and has injected more gas in UGS during the summer of 2009. For the time being, however, supply is still precariously hooked entirely to the two parallel lines that come from Russia via Ukraine, Moldova, and Romania.

Natural gas distribution is carried out by Bulgargaz which supplies larger clients directly from the "national" ring of high pressure lines via branch lines, and by private distribution companies which have exclusive rights over their districts assigned on the basis of a license. The largest private gas distribution company is 50% controlled by Gazprom. Natural gas demand is mostly in the industrial and power generation sectors. Natural gas production, import, export, transport, transit, distribution and trading are governed by the Energy Law (2003) which established the State Energy and Water Regulatory Commission. Bulgaria has adopted, but not yet fully implemented EU's acquis (gas directives) including the Third Liberalization package which requires gradual market opening and defines eligible customers.

- Extremely high concentration of natural gas imports, all of which are via a single route;

- Extremely high concentration of market power in the oil and gas sectors (monopolies);
- Complete domination of the “transit” natural gas pipeline system by a single customer (monopsony) which is also significantly present on the domestic market in gas distribution;
- Absence of leverage in negotiating adequate terms of trade in the gas business with the dominant foreign supplier who is also the only user of the transit pipelines.

Coal

Low grade lignite is Bulgaria’s only significant indigenous proved resource of primary energy. Coal-fired plants produce around 55% of the country’s electricity. The largest coal supplier is the 100% state-owned Maritza East Coal Mines Co. (MECM, part of BEH), which sells almost all of its output to the power plants located at the mines. The coal market is completely liberalized.

Bulgaria’s lignite is moist and high in ash and sulfur content. With a new EU directive in the making now, most of Bulgaria’s coal plants will have to close down unless considerable investment is made to enable them to meet stricter flue gases and ash emission standards. Some power plants already fail to meet current EU environmental regulations and Bulgaria has been warned about impending fines unless urgent measures are taken.

- There is high concentration of market power in the coal industry, both on the supply and the demand side, with 85% of coal produced in the country sold to only three plants located at the mines;
- The competitiveness of coal-based power generation in Bulgaria depends on its ability to meet environmental standards. In the longer run, the future of coal-fired power plants depends on climate change mitigation policies and the eventual application of yet-to-be-proved CO₂ abatement technologies such as carbon capture and storage (CCS). However, there is little understanding in the country in what reservoirs and at which sites CO₂ can actually be stored, and the legal and regulatory framework for CCS is not complete, making the CCS option in Bulgaria unrealistic;
- Coal-based power generation in Bulgaria is mostly base load and competes with nuclear and coal-fired thermal power plants in the region.

Renewable Energy Sources

Bulgaria’s policy and strategy regarding renewable energy sources (RES) is defined along the lines of EU’s “green” regulations in the context of the Union’s sustainable development policies. According to EU’s Energy Package and the Directive on Renewables, renewable electricity (RES-E) should account for 20% of EU’s final electricity consumption by 2020 (in 2005 it accounted for 8.5%). Bulgaria received two 2020 targets: for electricity, 16% of final electricity consumption should come from RES-E (11% by 2010), and for transport 10% of fuels should be biofuels (5.75% by 2010). The government of Bulgaria is planning the achievement of the targets in the draft National Action Plan for Renewables (due in June 2010).

Bulgaria has witnessed a fair increase of RES in total power generation and is likely to reach its target of 16% of RES in total electricity consumption unless grid connection uncertainties take a toll. RES accounted for about 7% of power generation in 2009, of which only about 1% was wind and the remainder hydro.

Bulgaria has approximated EU’s sustainability and green energy legislation by adopting legislative acts though their implementation remains arbitrary. Development of RES has been supported by financial incentives, such as feed-in tariffs, preferential contracts, credit lines for RES, green certificates trading (not yet in use), and percent of revenues from carbon trading. However, actual project implementation is overshadowed by a number of technical and administrative issues. These, along with bad practices and lack of transparency in pricing and granting environmental permits, are seen as the main cause of concerns and discouragement of investors.

- Wind farm construction applications total about 12-14 GW, exceeding the total installed capacity in power generation in 2009. Only a small fraction of the projects, probably up to 2 GW, will be implemented due to grid technical limitations and the absence of adequate sites;
- Extensive delays in the construction of major hydropower projects have been caused by poor governance and inadequate project management;
- Stability of terms for investors is suspect, particularly regarding grid connection and pricing of “green” energy.

Electricity

Bulgaria's net installed generating capacity stands at 9.7 GW (2009), of which 2 GW nuclear, 2.7 GW hydro (including 1.4 GW pumped storage at three sites), 4.9 GW conventional thermal and about 0.1 GW wind. Most of the gross electricity production in 2008 was at thermal power plants (57.7%) and the nuclear power plant at Kozlodui (35.5%), with hydro contributing 5.5% and wind around 1%. Net production stood at 40 GWh (56% thermal and 36.8% nuclear), and after adjustments for exports (8.4 GWh), imports (3.1 GWh) and pumped storage consumption (0.6 GWh), electricity available for the inland market was 34 GWh.

The Bulgarian electricity market, like the gas one, falls under EU liberalization rules, but so far only about 20% of the market has been liberalized. At market currency exchange rates, electricity prices in Bulgaria are still among the lowest in Europe, which has often been pointed out as a reason for the inefficient use of electricity by households, particularly for heating. On purchasing power parity (PPP) basis, electricity prices in Bulgaria are in the upper tier of European prices. Regardless of the way one counts, however, GDP energy intensity in Bulgaria is by far the highest in EU. With no significant capital markets of its own and faced by the triple jeopardy of energy inefficiency, the need to invest in comprehensive system upgrades, and the necessity to eradicate extensive layers of corruption and red tape, Bulgaria's electricity sector policy hesitantly stands in front of a test that it has no alternative but to take and succeed in.

Nuclear

The Kozlodui NPP on the Danube River has six units, of which four WWER-440/V-230 reactors and two newer WWER-1000/V-320 units. By 2006, all four WWER-440 units were permanently shut down in line with Bulgaria's commitments regarding accession to the EU. The newer units (#5 and #6) are fully operational. The plant is owned and operated by NPP Kozlodui EAD, a 100% owned affiliate of the National Electric Co. (NEC).

In 1987, work started on a second site located at Belene on the Danube. The first unit (out of four initially planned WWER-1000/V-320 reactors) was partially built by 1990 when construction was suspended due to lack of funds and public opposition. In 2002, the government commissioned a feasibility study and in 2005 decided to restart construction on a scaled-down plant with NEC acting as the project developer. In October 2006, NEC awarded a €4 billion

contract to Atomstroyexport for two WWER/AES-92 units. In 2006, the Bulgarian nuclear regulator licensed the Belene site for two reactors. The Minister of Regional Development and Public Works issued a construction permit in July 2008. Construction was supposed to begin in 2009-2010 with both units becoming operational in 2013-2014, but has not yet started due to serious governance, economic, environmental and security concerns. So far, procurement has been limited to the clearing-up of the construction site, but has nevertheless resulted in some €600 million of spending and possibly abuse.

The structuring of the Belene project failed to make clear which company or government entity is in charge for investment decisions and which entity is the project owner. The government re-started work on the project before signing a contract with the chosen strategic investor (RWE) and was left in a limbo when RWE pulled out of the project in 2009. The main contractor, subcontractors and consultants have been chosen despite concerns about violations of public procurement rules, bidding procedures, and clarity of the terms of reference, giving ground to claims that competition has been limited. The terms of the contract with Atomstroyexport (including subsequent amendments) are not in the public domain and have not been reviewed by the Bulgarian parliament, obscuring the true cost of the project which has been initially put at €4 billion (later estimates claim a cost of €8-10 billion). The Bulgarian Nuclear Regulatory Agency, EU and international regulatory bodies have not always been properly notified about the project's advancement, which has "helped" scare off all private investors along with BNP Paribas, the financial advisor. At this time, only the Russian government has indicated that it may extend €2 billion worth of loans for keeping the site live or take up to 80% share in the project.

The Bulgarian government is expected to make a final decision on Belene in 2010. One factor that adds to the layers of uncertainty that wrap Belene is the wide margin of variation in estimates of generation capacity that would adequately serve Bulgaria's electricity market. It is unlikely that Belene's 2 GW capacity will be needed before the closure of units 5 and 6 (total 2 GW) at the existing NPP Kozlodui. Their decommissioning is expected by 2017-2020, but operation could be extended to 2027-2030 if the units meet safety requirements. Besides, demand in Bulgaria has been flat over the recent years and could be dampened down by improving energy

efficiency, for which a wide open field exists. Belene's market has been portrayed as national and regional one, but prospects for electricity exports are far from certain. Defining the size and the value of the market for electricity produced at Belene remains an urgent critical task for the Bulgarian government and NEC as the project developer.

Concerns regarding Belene have also been voiced because of the absence of a long-term nuclear waste storage and management strategy. At this time, spent fuel is shipped back to Russia, but the agreement has to be renegotiated in 2010. It is not clear to what extent the potential higher spent fuel management costs have been accounted for in the project. The absence of long-term or permanent nuclear waste storage facility in Bulgaria is yet another factor increasing the country's already excessive dependence on a single supplier of energy - Russia.

- The future role of nuclear energy in Bulgaria is not clear because there is no transparency about three key issues: desired primary energy mix in power generation, a modicum of independence from Russia in primary energy supply, and the modality of participation in the nuclear project by various stakeholders;
- There is a great overburden of sunk costs that affects public perceptions and government decision-making regarding the Belene NPP, to the extent that optimal decisions regarding the entire future of nuclear energy in Bulgaria may be completely dislocated;
- Failure to make a transparent and economically sound decision regarding nuclear energy in Bulgaria may risk squandering the substantial know-how and technology potential now available in the country.

Thermal

Thermal power generation features prominently in Bulgaria's energy mix because the only significant domestic primary energy source is low-grade lignite. Natural gas based thermal power generation is marginal. The backbone of thermal power generation is the Maritsa East coal basin where three major power plants are located. TPP Maritsa East 1 (670 MW) is owned by AES. Currently under construction on the site of an eponymous power plant that has been scrapped, Maritsa East 1 is due for commissioning in 2010. TPP Maritsa East 2 is owned and operated by Bulgaria's NEC. It is the largest TPP on the Balkans (1,460 MW) and produces about 30% of

Bulgaria's electricity. The 900-MW Maritsa East 3 TPP is owned by a joint venture of NEC (27%) and Italy's ENEL (73%). In March 2010, ENEL announced that it intends to sell its interest in the plant.

Other large TPP plants are located at Varna (1,260 MW, owned and operated by CEZ), Bobov Dol (600 MW, owned and operated by a private Bulgarian company), and Ruse (400 MW, owned and operated by Slovenske Elektrarne). The plants at Varna and Ruse use imported coal and the one at Bobov Dol burns domestic lignite.

Total apparent energy conversion efficiency at coal plants in Bulgaria is below 30%, a very low rating by modern standards. The plant at Bobov Dol does not meet EU environmental standards and is due for decommissioning in 2014, and the plants at Maritsa East emit excessive quantities of SO₂ and fly ash, prompting warnings from EU about impending fines unless corrective action is taken. The plants at Varna and Ruse are also in need of upgrades.

- Coal-based power generation in Bulgaria is hostage to several major uncertainties:
 - Ability to assure adequate investment needed to meet environmental standards;
 - Competitiveness vs. nuclear-based generation for base load service in case of adoption of climate change mitigation policies that would increase the costs of coal-based power generation;
 - Demand-side uncertainties, including those caused by the wavering implementation of rules about competition and liberalization and slow progress in energy efficiency;
 - Competition vs. the "complete unknown" in Bulgaria: natural gas-based generation in plants utilizing modern technologies such as combined cycle generation.
- There may be reasonable ways to increase coal-fired generation load factors by using better quality imported coal.

MARKET STRUCTURE

Pricing: Cost Coverage, Transparency and Fairness

Prices charged to the final energy consumer in Bulgaria remain among the cheapest in Europe if compared on market exchange rates basis - electricity had a price tag of €0.059 per kWh and gas price was €8.20 per GJ in 2008. However, at PPP rates Bulgaria's gas is the most expensive in EU and electricity ranks near the top.

Gas and electricity consumer prices are set by the national regulator. On the regulated electricity market companies often have to sell at sub-cost prices. The loss is partially compensated by higher prices on the unregulated market, but most of the electricity is sold on the regulated market. In 2008, NEC sales on liberalized markets were less than a quarter of total revenues. Besides, NEC has to purchase electricity generated from RES at feed-in tariffs that far exceed regulated prices. Bulgaria also lags in terms of implicit tax rate on energy compared to the rest of EU. The implicit tax rate on energy¹ in Bulgaria is €66 per ton of oil equivalent, while the EU-27 average is above €150.

The burden of energy bills is considerable for a large number of customers, especially in the context of the ongoing financial crisis. Many of Bulgaria's consumers are 'energy poor'. Households spend approximately 14%² of their income on water and energy bills. Some 360,000 households (out of about 2.9 million) rely on social support for their energy needs. Other needy consumers who do not fall into the energy poverty bracket and are not supported by the government appear on the growing 'bad accounts receivables' lists of power distribution companies. Collection rates have been deteriorating and are dismal at some companies – at Toplofikacia Sofia EAD (the capital's cogeneration district heating company) the collection rate has at times been as low as 50%.

- The conundrum of low electricity prices and low incomes of consumers deters investment in rehabilitation of old generating plants, construction of new capacity, and improvement of the grid;
- There is no clear government policy aimed at resolving the low prices / low incomes juxtaposition, which is admittedly difficult at a time of general financial crisis and strained government budgets;

- Excessively generous subsidies provided to RES-E generators risk creating a bubble and additionally skewing a market that is ailing anyway.

Market Liberalization

Electricity

In July 2007, Bulgaria formally completely liberalized its electricity markets. In theory that allows all consumers to choose their supplier and to have access to the electricity network in compliance to EU's Electricity Directive. In practice, the markets are only partially liberalized and consumers are not able to choose providers. Only about 18% of the electricity is traded at freely negotiated prices (2008). In July 2007, the regulator set quotas for producers, ostensibly to assure that electricity is available to all 'protected customers' (all households and businesses with less than 50 employees and annual turnover of up to BGN 19.5 million).

The current model is transitional and will be amended with the adoption of new electricity trade rules that are being developed by the system operator. Substantive changes would include the definition of 'balancing groups' as well as the development of an electricity exchange, either national or regional one. The platform should allow NEC to increase its participation in electricity exports.

Gas

Compared to electricity, the gas market is even less "free": it exhibits full legal, but zero actual liberalization, despite the issuing of dozens of licenses to private distribution companies, many of which are operational. In practice, they are all regulated regional or municipal monopolies. Bulgargaz, the sole importer of gas and the only company licensed as a public supplier of gas, also acts as a distribution company for several hundred larger customers (industries, power plants, etc.) across the country.

Bulgaria seriously lags behind EC-27 and its neighbors in developing gas distribution networks and household gasification. Only 15% of municipalities have access to gas, even though 50% of the municipalities are either licensed or in the process of acquiring a license. Less than 1% of households have access to gas.

¹ Calculated by Eurostat as the ratio between energy tax revenues and final energy consumption over a calendar year.

² National Statistical Institute (2008).

- The domestic gas markets liberalization is an example of how difficult introducing competition on a market can be when the entire market is supplied from one source and by one foreign supplier located outside the reach of both Bulgarian and EU laws and regulations. True market liberalization, opening, and competition on the gas market of Bulgaria are likely to only emerge after actual diversification of gas supply by source, route, and supplier.
- There is little - if any - interest on behalf of the dominating gas supplier to Bulgaria to price gas competitively to other types of energy, so that consumers (particularly residential) would be interested to switch to gas, since the supplier monopoly is maximizing its profit by maintaining prices at above free market equilibrium levels.
- The high border price of gas drains Bulgargaz (the importer) and Bulgartransgaz (the system operator) of their ability to charge good margins. In fact, both companies have been repeatedly asked by the regulator to absorb the impact of high and rising import prices, to the detriment of their capacity to upgrade services and invest in the development of infrastructure. The effects of this policy reverberate throughout the gas industry in Bulgaria and stymie the plans of the distribution companies to expand service to households and commercial customers, who do not see a point in making an investment to switch to an energy source tagged with a price that is both expensive and widely fluctuating in tango with oil (import gas is formula-priced to oil).

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