BULGARIA POWER SECTOR: MAKING THE TRANSITION TO FINANCIAL RECOVERY AND MARKET LIBERALIZATION

FINANCIAL STABILIZATION TO RECOVERY: SUMMARY OF WORLD BANK TEAM WORK IN 2016

June 2017
CONTEXT AND SCOPE OF WORK

Context

- This presentation has been prepared by the World Bank (WB) in the context of the “Power Sector Financial Stabilization and Market liberalization” Reimbursable Technical Assistance undertaken by the WB and financed by the Bulgarian Energy Holding (BEH).

- The findings presented are high level findings and are intended to provide a platform for discussion among sector stakeholders in order to identify and assess options for the government to consider in implementing its reform strategy for the power sector.

Scope of work

- BEH has sought assistance from the WB to help develop a sector transition road map to achieve financial recovery and market liberalization.

- This presentation focuses on the financial assessment of the sector with the objectives to:
  (i) make a diagnosis of the current sector’s financial situation
  (ii) identify possible measures to achieve financial stabilization.
To do the analysis, the WB team specifically built two models:

**Market model**
- Dispatch/pricing model for wholesale market price analysis (GAMS)

**Sector financial model**
- Excel based model covering 2013–15 (historical) and 2016–20 (forecast)
- Data (most non-audited, some confidential) and assumptions provided by the sector’s stakeholders and thoroughly reviewed by BEH
- Provides a broad overview/framework to assess the sector’s financial situation. It only provides a high level indication of the financial situation for policy makers to consider policy options
MARKET MODEL

1. Partial equilibrium short-term mathematical model to determine the least cost solution to serve the Bulgarian electricity demand in period 2016-2022.

2. The model is a Unit Commitment and Economic Dispatch (UCED) model using GAMS as the programming language.

3. All generators in the wholesale market represented at the unit level, characterized by their capacity, forced outages and short-run marginal cost of production.

4. Fuel supply and hydropower availability are included as constraints to the system.

5. Historic load profiles are used to generate a load forecast for the future years including economic growth and weather uncertainty impacts.
MARKET MODEL: KEY ASSUMPTIONS

1. Net demand (including export driven demand adjusted for import) is projected to grow around 43 TWh by 2020.

2. Hydro energy availability is projected to vary between 4.1 TWh to 4.3 TWh over the same period.

3. Leaving vast majority of the demand to be met from Nuclear and thermal units.
4. Coal constraints – can severely limit the ability of the Bulgarian thermal sector to meet demand

5. As the bottom plot shows, total generation from thermal may be restricted on average below 16 TWh by 2020

6. With nuclear capacity also restricted to a max of 16 TWh, the total “inexpensive” hydro and thermal generation not exceed 36 TWh – well short of the 43 TWh needed by 2020
MARKET MODEL - TWO KEY SCENARIOS EXAMINED

Coal limits in place 27.5 mt/yr for 2016-2018 and increasing 1 mt/yr for 2019/2020

Reduced export from 9.5 TWh to 6.75 TWh and allow for further reduction when prices in regional market is favorable

Key variable: volume of import varied from 500 MW max (Base Case) and 250 MW (High Price) scenario

<table>
<thead>
<tr>
<th>#</th>
<th>Scenario</th>
<th>Pricing Rule</th>
<th>Exports Reduction</th>
<th>Coal Supply (Tons/yr)</th>
<th>Coal Constraints Time</th>
<th>Capacity Reduction TPP2</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Case</td>
<td>SRMC</td>
<td>2.75TWh</td>
<td>Field limits, ann + mo (27.5-29.7/3mill)</td>
<td>Annual</td>
<td>290MW</td>
<td>500 Import Limit</td>
</tr>
<tr>
<td>2</td>
<td>High Price</td>
<td>SRMC</td>
<td>2.75TWh</td>
<td>Field limits, ann + mo (27.5-29.7/3mill)</td>
<td>Annual</td>
<td>290MW</td>
<td>250 Import Limit</td>
</tr>
</tbody>
</table>
# MARKET MODEL - RESULTS

## QUARTERLY PRICES ACROSS SCENARIOS

<table>
<thead>
<tr>
<th>#</th>
<th>Scenario</th>
<th>Q1 Avg</th>
<th>Q1 Std</th>
<th>Q2 Avg</th>
<th>Q2 Std</th>
<th>Q3 Avg</th>
<th>Q3 Std</th>
<th>Q4 Avg</th>
<th>Q4 Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Case</td>
<td>84</td>
<td>±6</td>
<td>75</td>
<td>±1</td>
<td>75</td>
<td>±1</td>
<td>80</td>
<td>±8</td>
</tr>
<tr>
<td>2</td>
<td>High Price</td>
<td>92</td>
<td>±7</td>
<td>92</td>
<td>±8.74</td>
<td>92</td>
<td>±9</td>
<td>92</td>
<td>±11</td>
</tr>
</tbody>
</table>

*Quarterly average prices and standard deviation (STD) of prices [measures how variable prices are over individual hours in the year]*
SECTOR FINANCIAL MODEL – STRUCTURE

- **Inputs (e.g. losses, tariffs, inflation)**
- **Other inputs (Power balance e.g.)**
- **GAMS 1, 2, 3 (separate dispatch scenarios outputs)**

Physical quantities and revenues for each generator:

- IPPs
- RES & DH
- NPP
- MI2 (TPP)
- NEK (hydro, arrears)
- Others (TPP BobovD, Varna)
- ESO

Market model analysis outputs:

- CEZ (supply & distribution)
- EVN (supply & distribution)
- EP (supply & distribution)
- ZP (supply & distribution)

Outputs:

- Balance (power flows for supply & distr.)
- Measures (OBS, 5% tax, etc.)

Including sector financial position, energy balance, etc.
Large deficit in historical years

Recovery on a flow basis but need to amortize stock of debt

Note: Slight differences with September 2016 Summary Report due to adjustments made just after to reflect the reimbursement to energy intensive consumers for overpaid OBS.
Measures introduced by GoB/SWERC significantly reduced the yearly deficit.

- Reduced costs: lower quantities from DH, co-gen & RES, lower network fees.
- Increased revenues: obligation to society (OBS), tax on generators.
While the sector’s financial position is balanced in 2015-2016, without additional measures, the deficit will reemerge as the accumulated stock of debt gets repaid.

Estimated provision for repayment of stock of debt
<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Scenario 1 (High deficit)</th>
<th>Scenario 2 (Status quo)</th>
<th>Scenario 3 (Low deficit)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obligation to society</strong></td>
<td>No change</td>
<td>No change</td>
<td>+ 5% per year for all consumers(^8)</td>
</tr>
<tr>
<td><strong>Distribution fees</strong></td>
<td>No change</td>
<td>No change</td>
<td>Increase to be determined by regulator</td>
</tr>
<tr>
<td><strong>RES mandatory purchase</strong></td>
<td>Higher historical volumes</td>
<td>Latest levels set by regulator</td>
<td>Latest levels set by regulator</td>
</tr>
<tr>
<td><strong>Losses (prices)</strong></td>
<td>Market from 2017</td>
<td>Regulated</td>
<td>Half market, half regulated from 2017</td>
</tr>
<tr>
<td><strong>Losses (volumes)</strong></td>
<td>+ 0.05%/year (T)</td>
<td>No change</td>
<td>- 0.05%/year (T)</td>
</tr>
<tr>
<td></td>
<td>+ 0.25%/year (D)</td>
<td></td>
<td>- 0.25%/year (D)</td>
</tr>
<tr>
<td><strong>Stock of debt repayment</strong></td>
<td>2013 and 2016 bonds</td>
<td>2013 and 2016 bonds</td>
<td>2013 and 2016 bonds refinance with GoB guarantee at 3.5% over 20 years</td>
</tr>
<tr>
<td></td>
<td>refinanced without GoB guarantee at 6% over 8 years</td>
<td>refinanced without GoB guarantee at 5.5% over 10 years</td>
<td></td>
</tr>
<tr>
<td><strong>5% fee on generators’ revenues</strong></td>
<td>Not extended to ESO and Bulgartransgaz</td>
<td>Extended to ESO and Bulgartransgaz</td>
<td>Extended to ESO and Bulgartransgaz</td>
</tr>
<tr>
<td><strong>CO(_2) quantities and prices</strong></td>
<td>Stable at 2015 levels. 71% of revenues to the ESF</td>
<td>Revenues based on GoB forecast. 100% of revenues to the ESF</td>
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</tr>
<tr>
<td><strong>Market prices and dispatch quantities</strong></td>
<td>75 BGN/MWh on average in all scenarios and volumes from the base case scenario in the dispatch model.</td>
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\(^8\) For the first 10 years.
Results for high, status quo, and low deficit scenarios show risk of large ongoing deficit if measures are not implemented.

How do we pass from the status quo to the low deficit scenario?
POSSIBLE MEASURES FOR FINANCIAL STABILIZATION

- **Measure 1: Reduce the cost of repaying the accumulated debt by refinancing BEH bonds on better financing terms.** Given the large stock of debt in the sector, government could either issues bonds itself or provides a sovereign guarantee in line with EU’s State Aide rules to reduce the amount of debt repayment required by extending the tenor and lowering the interest rates. An important consideration for policy makers is an adequate time period for the sector to carry the burden of the accumulated debt.

- **Measure 2: Increase the Obligation to Society (OBS) fee for all consumers.** Assuming that the measures adopted by the government are fully implemented, a five percent increase of the OBS fee every year until 2019 would approximately close the financing gap. Because the OBS fee is only one component of the end-user tariffs (for regulated consumers) and prices (for consumers in the free market), the actual increase (estimated at about two percent per year for regulated consumers in addition to inflation). The specific adjustment to the OBS fee should be determined by the regulator, ERWC, based on more detailed and updated data.
Following the **Belene nuclear power plant arbitration**, NEK paid 601.6 million euro to Atomstroyexport on December 9, 2016, using a separate loan from the Ministry of Energy.

**NEK’s liabilities are still significant.** According to NEK’s financial statements, NEK’s current liabilities (excluding to BEH) have decreased from about 2 billion BGN to about 550 million BGN. However, non-current liabilities to BEH have substantially increased.

The **regulator is finalizing the regulatory decision for July 2017 - June 2018.**

**IBEX average prices are still in the range of market forecasts** prepared by the Bank team in 2016 and the volume continues to be low, albeit the volatility of prices around average has increased to some extent.

**Contract for Differences emerged as one of the key recommendations** to integrate the existing PPAs into the new electricity market. The IPPs are also known to have studied this option.

**However, this option will need to be examined carefully.** The termination of contracts with A&S Maritza East 1 and Contour Global Maritza East 3 would cost around BGN 3 B, Bulgarian Energy Minister Temenouzhka Petkova noted, addressing Parliament during Question Time last week.