NEWSLETTER

Issue No. 13 | November – December 2016

Meeting Georgia's increasing electricity demand

Georgia's electricity demand is expected to increase in the coming decade. To meet the demand Georgia has more than hundred power plant projects with a total capacity of 4,500 MW under consideration. Their total projected cost would amount to USD 7.7 bn – which is half of Georgia's current GDP. Thus, not all those plants can or even should be built. For keeping energy cost in check – but also for ensuring fiscal stability and supply security – it is important that the system is developed in a resilient and cost effective way.

To assess different extension programmes we model the cost of different combinations of power plants. Under our reference scenario, a massive built-up of hydropower would only be cost-effective, if the price at which unused power could be sold to neighbouring countries would exceed 80 USD/MWh. Under more realistic export price assumptions, a combination of one additional combined cycle gas turbine, additional hydro-power capacity, reliance on demand response and some imports would be among the most economic options.

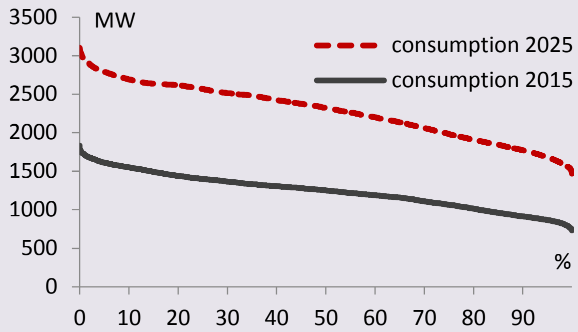
Existing generation

In summer Georgia is largely supplied by seasonal hydro-power plants that cover 33% of total annual generation and the large all-season Enguri and Vardnili hydro power plants, which are responsible for 36% of total generation. In winter, the later also contribute to meet the demand. But due to limited availability of seasonal plants more than half of winter demand has to be covered by thermal power plants (>40%) and imports (17%). Currently, the tariffs for each type of power plant are fixed by the regulator.

Increasing demand

The Georgian electricity transmission system operator GSE expects electricity demand in Georgia to increase steeply on average and even stronger in the hours with already high demand. GSE's rather bullish projections imply that consumption almost doubles from 10.9 TWh to 19.6 TWh between 2015 and 2025. Current generation capacities would only be able to meet this 2025 electricity demand in about a quarter of the hours. Consequently, new generation capacities would be needed.

Load duration curve* 2015 and 2025



Source: own calculations based on GSE
**Share of hours, in which demand is larger than value on y-axis; i.e., in 10% of all hours of the year, load is expected to be higher than 2,700 MW in 2025; while half of the time it is more than 2,300 MW*

Thereby, the main bottleneck is generation capacity that is also available in winter, when demand is highest and much of the hydro capacity becomes unavailable.

Electricity exports

During the last years, generation investments in Georgia were often justified by the prospect of electricity exports into growing markets – especially Turkey. This also encouraged significant investments into expensive transmission infrastructure. Those prospects have somewhat faded due to the declining outlook of Turkish electricity demand and changes in the Turkish electricity market design, that discriminates imports. Turkish electricity prices dropped by about a third since October 2014. Hence domestic demand in Georgia – which increased by 13% between October 2015 and October 2016 - is the main driver for generation expansion.

Meeting the increasing demand

To cover the rising demand and/or to increase exports, there are about 100 power plant projects with a capacity of about 4,500 MW and cost of about USD 7.7 bn under consideration. This corresponds to more than half of current GDP, which underlines that it is unrealistic to assume that even half of the projects could be realised in the next decade. In fact, for meeting the domestic peak demand in 2025, only 1,000 MW additional capacities will be needed.

We see five different technologies to fill the gap:
(1) additional thermal power plants (gas or coal),
(2) more seasonal hydro power plants,
(3) demand management, e.g. through interruptible contracts with industrial customers, that are only triggered in hours of extreme demand
(4) additional imports, especially from Russia but also from Azerbaijan,
and (5) other renewables, especially wind or solar.

The listed technologies are characterized by different generation profiles (hydro and solar might, for example, not be able to contribute during the winter peak); different fixed and variable cost as well as potential capacity constraints. In addition, different combinations of the aforementioned technologies are possible. In the table below we present five options that combine some demand management with different technologies. To enable a comparison between the different options we developed a model that estimates the annual cost of each option under a number of (modifiable) assumptions. We also take into account possible export revenues from selling excess electricity.

Results from modelling

Estimated annual cost of different options

Options to cover future demand	Annual net cost, USD m
Only hydro	680
Only coal	473
Only gas	457
Hydro + gas + imports	438
Hydro + imports	358

Source: own calculations
Note: in all scenarios we assume a certain amount of demand side response.

We find that building only seasonal hydro-power plants would be very expensive, as they will be largely unavailable in winter. Only relying on gas or coal would also be expensive – as these plants have high variable cost. So running them for many hours per year is not economic. In technical terms, Georgia could rely entirely on imports to meet its additional demand. This would be cheap in the short term, but carries probably unbearable political and commercial risks.

Hence we conclude, that under our set of assumptions, a combination of hydropower, a gas unit and imports has the most acceptable cost while ensuring a sufficient level of supply security. Thereby, gas plants are more appropriate for meeting peak-demand as they have the lower fixed cost than coal plants – the higher variable cost of gas plants matter little due to the limited usage of the plants.
Renewables might also be an interesting contributor to the Georgian power mix. Solar power would make sense in cases it is cheaper than seasonal hydro-power, while wind power could – depending on the production profile - contribute to meet the winter demand.

Author

Georg Zachmann, zachmann@berlin-economics.com

Note: A more comprehensive analysis of the topic is provided by the Policy Paper PP/02/2016 "Options for balancing Georgia's electricity supply and demand"

Available at: www.get-georgia.de

German Economic Team Georgia (GET Georgia)
GET Georgia advises the Georgian government on a wide range of economic policy issues since 2014. It is financed by the German Federal Ministry for Economic Affairs and Energy.

Editors
Dr Ricardo Giucci, David Saha

Contact
German Economic Team Georgia
c/o Berlin Economics
Schillerstraße 59
D-10627 Berlin
Tel: +49 30 / 20 61 34 64 0
Fax: +49 30 / 20 61 34 64 9
info@get-georgien.de
www.get-georgia.de