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Can low electricity prices be a comparative advantage of Georgia?

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Executive Summary

For a resilient economic development Georgia should foster exports in higher-value added goods. We find that Georgia might be able to develop a comparative advantage in exporting certain higher-value energy-intensive products. One key enabler for such exports is access of corresponding industries to secure, low-cost electricity. According to projections of its electricity network operator, Georgia will indeed develop excess capacities of low-cost electricity in the next decade. The policy challenge is twofold. First, to create an environment conducive to attract the necessary investments - investments of more than half of Georgia's current GDP are required to meet the projected 9 GW of hydropower capacity; second, to ensure that enough competitively priced electricity remains available for energy-intensive domestic companies (and not exported). Meeting both targets at the same time involves a dilemma: On the one hand, attracting investments requires high prices and a stable regulatory environment, both of which can be best achieved by increasing market integration with Turkey. On the other hand, market integration leads to high electricity prices in Georgia, making the country less attractive of electricity intensive industries.

We suggest to continue the current ambition to build a Georgian electricity market in line with the European rules and to foster regional integration in order to attract investors in hydropower projects, but also to give more regulatory certainty to investors in electricity-intensive industries. Furthermore, the process of allocating hydropower sites should be made more competitive, to keep a higher share of the resource-rent in the country.

To promote the development of an energy-intensive industry in Georgia, we suggest to consider to further improve transparency of the rules, provide clear guidance on the future development of the regulatory framework and possibly consider policies to reduce the regulatory risk for investors.

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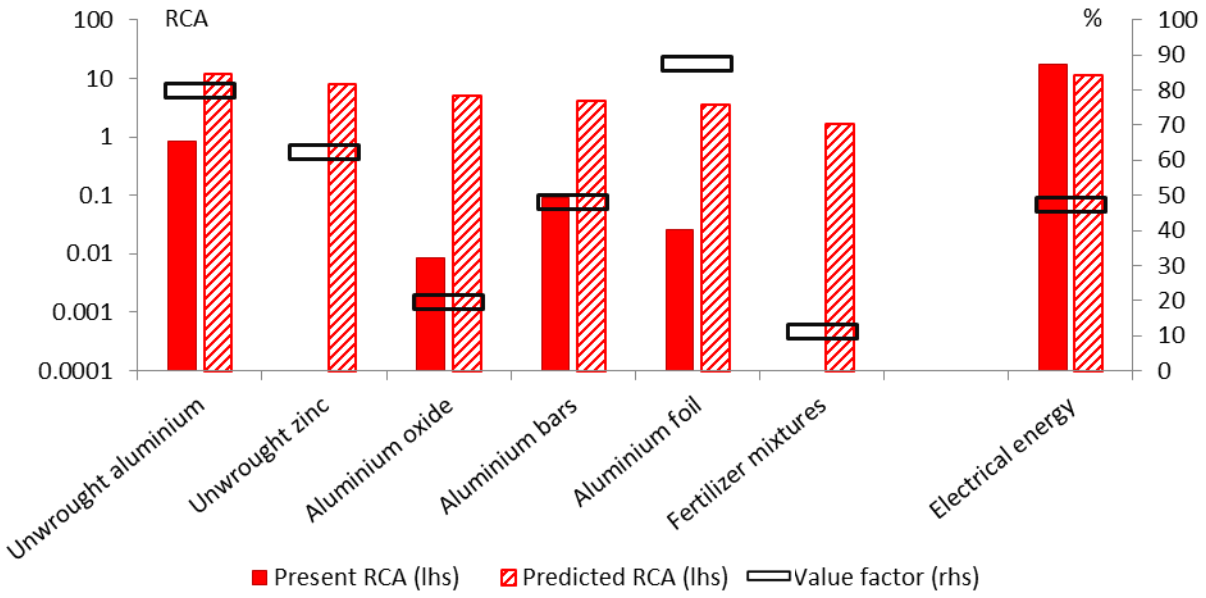
Contents

1 Introduction

Georgia's economic development hinges on increasing the amount, value and diversification of its exports. In Zachmann et al. (2015) we show that one promising sector are energy-intensive products. Certain energy intensive products (see Figure 1), in which Georgia is currently not specialised, entail a relatively high value. Based on extrapolating export patterns in other countries, we find that Georgia might well develop a competitive advantage in these products. This is intuitive, given that Georgia has relatively inexpensive electricity due to low domestic generation costs (mainly hydropower), electricity costs in neighbouring countries are also low, and Georgia has proximate access to competitively priced fuel from Azerbaijan. And indeed, we already today observe exports of certain energy-intensive products.

Figure 1

Current and potential comparative advantage of energy intensive products



Source: GET Georgia
Note: RCA is the revealed comparative advantage in exporting this product. Values larger than one indicate that the country has a higher share of its exports in this product than other countries. The value factor indicates whether this product is typically exported by richer or poorer countries.

Georgia's potential in energy-intensive exports will only materialise if a number of conditions are met. In addition to a conducive business climate (e.g., rule of law, fair taxation etc.), the right infrastructure (e.g., ports and roads), access to foreign markets and the availability of qualified labour, the key factor for successfully exporting energy-intensive products is access to secure and low-cost energy. Thereby, it is important to stress that competitiveness in energy-intensive exports should not be based on artificially inexpensive energy, i.e. on subsidised energy. Subsidising energy costs would burden the rest of the economy more than it benefits the energy-intensive sectors: truly competitive industries pay undistorted prices for their inputs[1].

In this paper we discuss whether Georgia could enjoy low electricity cost in the future and what policies it could and should pursue to this end.

[1] See e.g. Kosmo (1987)

2 Is there an excess Supply Potential?

The first question is whether Georgia has the economic and technical conditions to develop sufficient capacity in low-cost electricity generation to develop a comparative advantage in energy-intensive products.

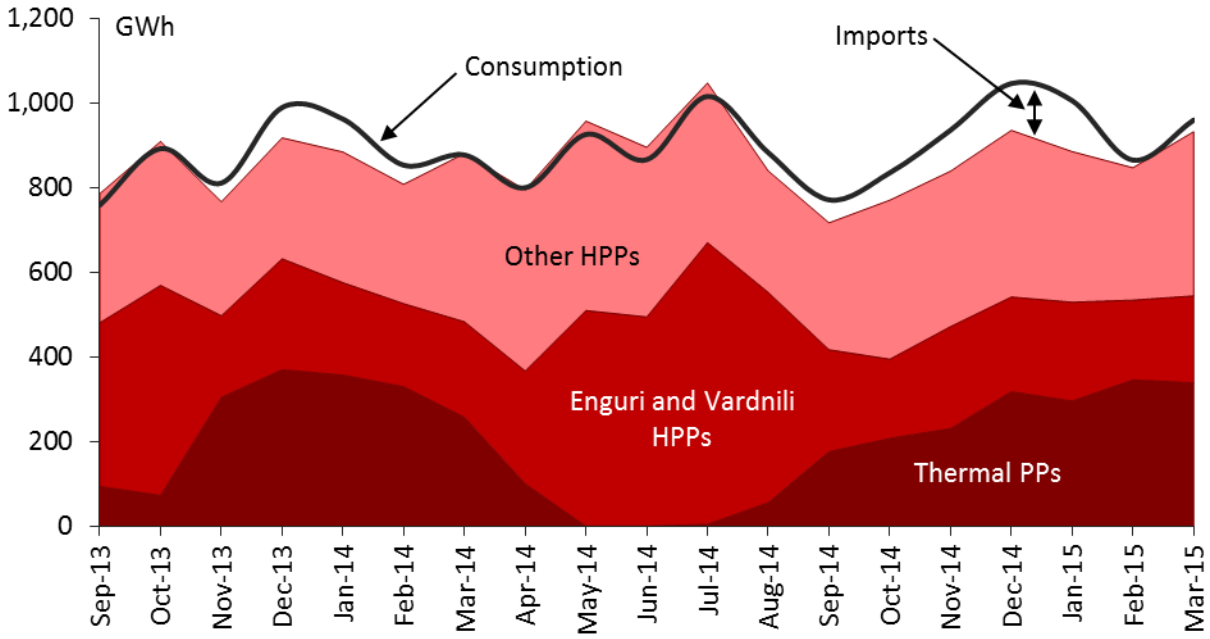
2.1 Current supply situation

Currently, Georgia is about self-sufficient in terms of electricity supply. Between 2007 and 2011 Georgia was a net-exporter of electricity, while it imported slightly more electricity than it exported in 2012-2014 (in the order of 1% of total consumption). Thereby, the net-export patter is highly seasonal. In winter, when the production of hydropower plants drops significantly, Georgia has to rely on its thermal power plants and some imports. By contrast, in summer Georgia exports electricity to Russia, Armenia and Turkey[2].

Consequently, increasing demand – unless it is concentrated in the summer months - would currently entail higher imports.

Figure 2

Electricity Balance by supply sources (Sep 2013 – Mar 2014)



Source: ESCO

Currently, electricity prices in Georgia are low by international standards (9.1 $ct/kWh[3]). On the one hand, this is due to low domestic generation cost[4]. The regulated tariffs of domestic generation from hydropower are 0.07 $ct/kWh for the Enguri HPP and Vardnili HPP, and 0.5-3 $ct/kWh for other

[2] ESCO (2015)

[3] IEA (2015) p.151

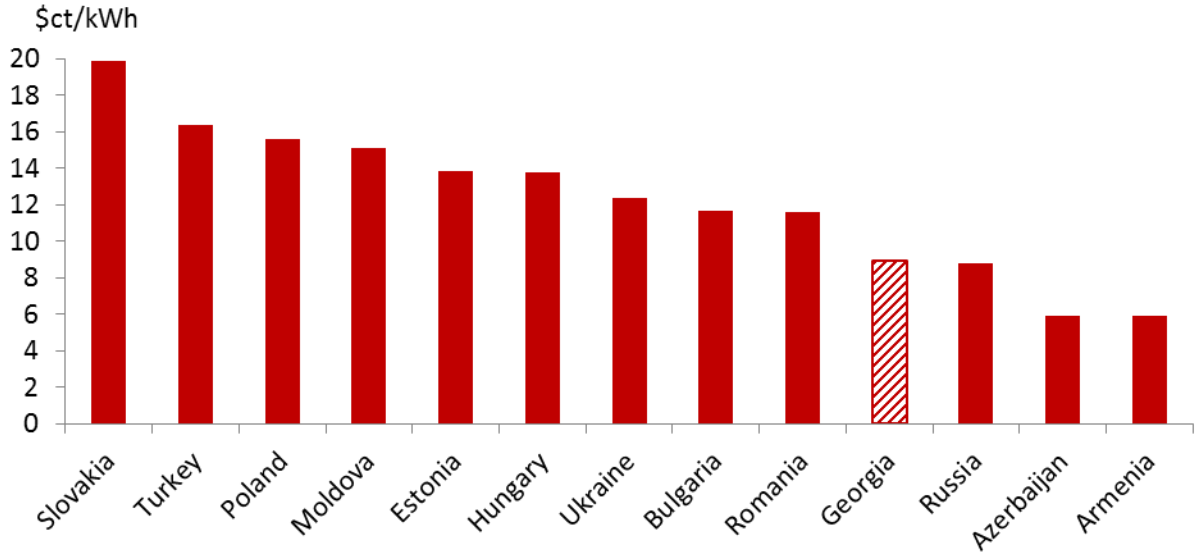
[4] According to AHK (2014) the average generation cast are at about 2 EURct/kWh.

regulated hydropower plants[5]. The thermal plants benefit from a comparatively low gas price and receive capacity payments; as a consequence the regulated tariff at which they sell electricity to the market is below 3 $ct/kWh.

However, low prices in Georgia are also due to low electricity prices in neighbouring countries with which Georgia trades electricity. Electricity prices in the main trading partner Russia are of a similar comparatively low magnitude as in Georgia. Prices in Azerbaijan are even lower, where gas-fired generators benefit from subsidised gas. Hence, a modest increase in imports is unlikely to translate into a higher energy prices.

Figure 3

Non-residential electricity tariffs including taxes in 2012



Source: ERRA

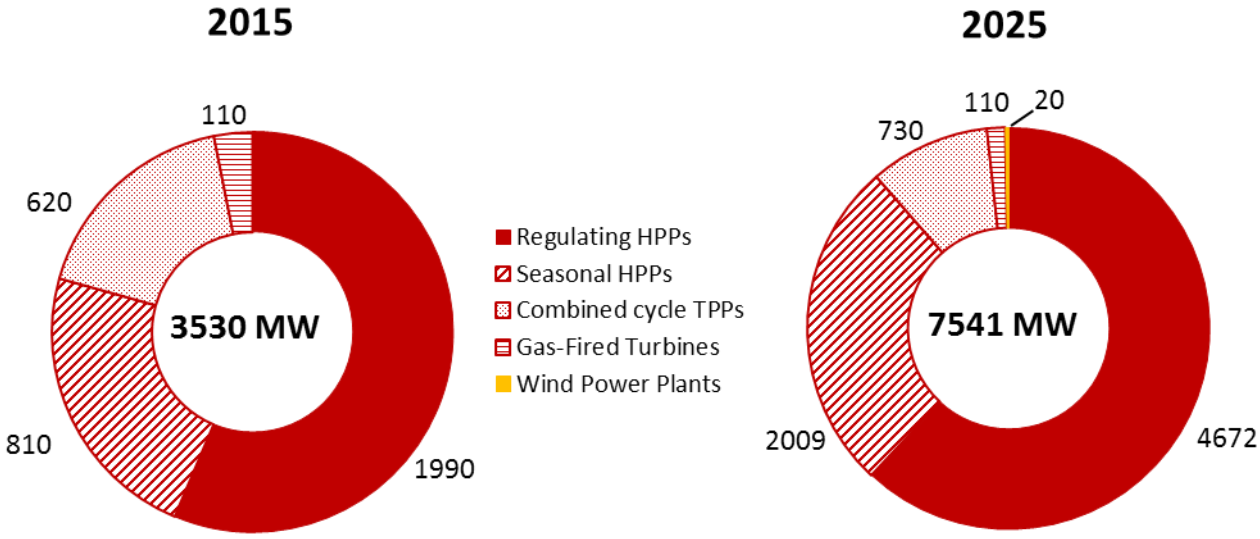
2.2 Supply potential

Georgia envisages significantly increasing its electricity supplies. The Ten Year Network Development Plan for 2015-2025 (TYNDP) elaborated by the TSO of Georgia JSC Georgian State Electrosystem is based on the assumption that the domestic generation capacity will more than double in this decade (see Figure 4). In the following we will rely on the TYNDP figures as those are the most recent official projections and as they are supposed to be used for system planning purposes. We caution, however, that the projections are based on quite optimistic assumptions and the successful management of important risks (e.g., continued access to Enguri hydroelectric power station). In a global context, the corresponding investments appear sensible. The increasing need for energy, in particular from low-carbon energy sources is acknowledged by the IEA (2014). And excess liquidity at international financial markets might make raising the necessary capital easier than in the past. The largest share of the projected increase will come from hydro-power investments that are projected to increase capacity from 2800 MW to 6700 MW.

[5] Georgian National Energy and Water Regulatory Commission, Resolution #33.

Figure 4

Generation capacity according to the TYNDP, 2015 and 2025



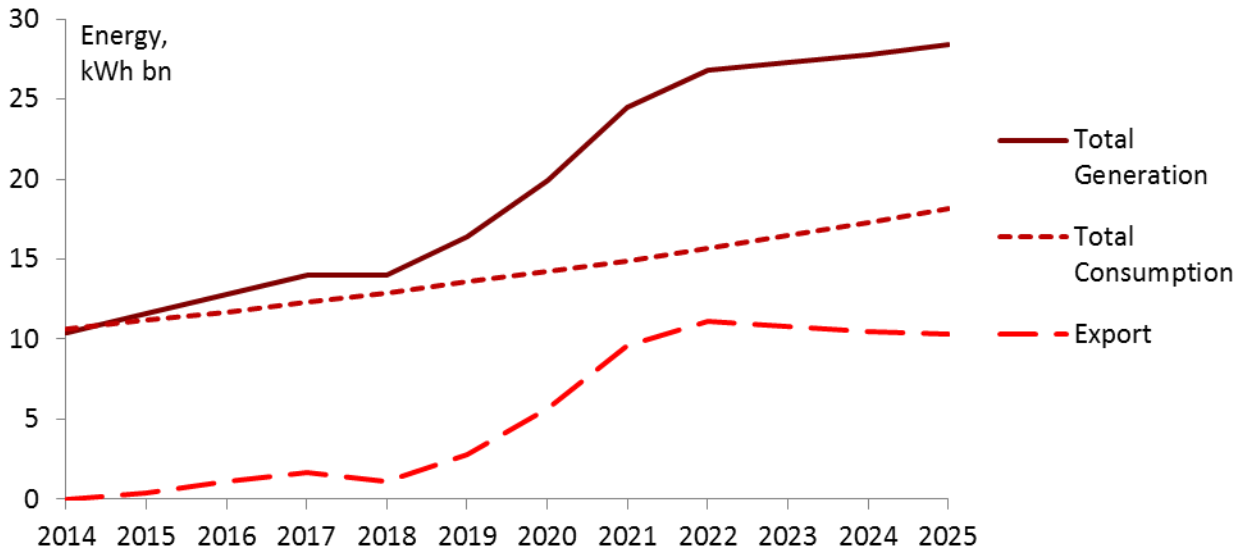
Source: TYNDP

This increase in capacity will be more than sufficient to compensate for the 62% increase in electricity consumption which the TYNDP projects between 2015 and 2025.

Consequently, Georgia would generate a significant excess electricity supply that would peak at 11 TWh in 2022 (about 40% of total generation). The TYNDP assumes that this electricity will be exported (see Figure 5).

Figure 5

Generation, consumption and exports 2015 and 2025



Source: TYNDP

The future cost of electricity will depend on the cost of new capacities. According to public project documents for five larger hydro-power projects, the average capital cost of these units would amount to about 6 $ct/kWh (assuming a 10% discount rate)[6]. This would indeed allow Georgia to maintain and expand relatively low-cost electricity generation.

Table 1

Capacity and cost of certain hydropower projects

	Annual generation in GWh/y	Construction cost in USD m	Electricity cost at 10% interest rate, $ct/kWh
Dariali HPP[7]	510	123	2.4
Shuakhevi HPP[8]	452	417	9.2
Shuakhevi HPP other source[9]	483	356	7.4
Paravani HPP[10]	409	160	3.9
Nenskra HPP[11]	1194	450	3.7
Nenskra HPP other source[12]	1194	1000	8.4
Koromkheti HPP[13]	464	305	6.6
Total*	**3066**	**1828**	**6.0**

Source: EBRD, IFC and others (see footnotes)
Note: Based on the average of the two assumptions for Shuakhevi and Nenskra

Conclusion: Low current generation costs, capacity to import electricity from low cost neighbours and a significant potential to increase low-cost domestic generation capacities give Georgia a significant comparative advantage in terms of electricity cost.

[6] This estimate is in line with AHK (2014). We would, however, caution that our estimate is based on currently planned projects. Future projects will tend to be more expensive, as the best projects are selected first.
[7] EBRD (2014) Dariali HPP
[8] EBRD (2014) Shuakhevi HPP
[9] IFC (2013) Shuakhevi HPP
[10] EBRD (2011) Paravani HPP
[11] IFC (2013) Nenskra HPP
[12] Patsuria (2015)
[13] UNFCCC (2012) Koromkheti HPP

3 Which policies to translate excess supply into low prices

Given the growing domestic electricity demand, guaranteeing low prices for a substantial energy-intensive industry will require significant investments in new generation capacities. The projected 3900 MW of additional hydropower capacity by 2025 would cost roughly USD 9 bn[14]. This is more than half of Georgia's GDP and can hence not be financed domestically, let alone through the state budget. So significant foreign investments would need to be attracted. This is the first condition for making sufficient low-cost electricity available for developing an energy-intensive industry in Georgia.

The second precondition is to ensure that not all low-cost electricity is exported. The dilemma is, that without the high and stable price signals that export markets can provide, some of the planned investments might not materialise. In the following we will discuss four approaches to organise hydro-power investments and cross-border electricity trade.

3.1 Regional market without congestion

The first approach is to create a regional electricity wholesale market (comparable to the market in the EU). This would be fully compatible with the EU *aquis communitaire* that Georgia is committed to implement as a member of the Energy Community. If credible, the growing Turkish demand and the high Turkish prices will drive investments in Georgian hydropower. In a perfectly functioning cross-border market with unlimited transmission capacity, Georgia (which in economic terms is a 'small' energy market) would end up having the same electricity price as Turkey (which is a much larger market). Foreign investors would repatriate the revenue from selling electricity abroad. So the main economic benefit for Georgia would be in the construction phase of the hydro-power plants, which with a potential volume of USD 9 bn over 10 years is of macro-economic relevance for the country. But a significant share of the construction services might, in fact, be imported. This is especially true for the higher value-added part such as planning and machinery, but also the Georgian construction labour supply might not be sufficient to meet such quickly rising demand. Beyond the construction phase, comparatively limited value would remain in Georgia (some taxes and some jobs linked to the operation of the plants[15]). Energy-intensive companies might prefer to locate in Turkey to benefit from the larger market and lower capital cost.

3.2 Regional market with limited transmission capacity

To ensure the supply of cheap electricity within Georgia the country might keep transmission capacity limited. The smaller the interconnector, the lower Georgia's electricity exports and the lower electricity prices in Georgia compared with Turkey. There are two problems with this approach: (i) determining the optimal size of the interconnector and (ii) incentivising investments. If investors know that the transmission capacity to Turkey is or will become a bottleneck they will be much less eager to invest. If the transmission capacity is auctioned, the arbitrage gain based on the price differential between Turkey and Georgia will entirely be distributed to the capacity seller (typically the transmission company). So investors that have not secured long-term transmission contracts will only get Georgian electricity prices, even if their electricity is exported to Turkey.

Determining the optimal size of the interconnector – to ensure that some cheap electricity remains in the country - is also difficult. The problem is that electricity demand and supply in both Georgia and

[14] This assessment is based on the cost of USD 2.4 bn per 1000 MW, deduced from the total cost of USD 1825 m for the 775 MW of all projects presented in Table 1.

[15] To give one example: for a 13 MW project in Uganda the number of jobs in the operation phase was estimated at 77: Scott A. et al. (2013).

Turkey change from hour to hour with strong seasonal patterns. So a 1 GW transmission limit might be binding only few hours per year– leaving the electricity price to converge in all other hours. But too small interconnectors might unduly lower the revenues of exporters and reduce security of supply.

Current planning in the TYNDP foresees to increase the net transfer capacity for electricity exports between 2015 and 2025 from 700 MW to 1400 MW for Turkey; from 700 to 1700 for Russia; from 150 MW to 700 MW for Armenia and to maintain the 1000 MW capacity towards Azerbaijan.

3.3 Vertical integration of electricity supply and energy intensive consumers

A classic way to benefit from the local availability of low-cost energy resources is through vertical integration. One example is the aluminium industry. Self-generation of electrical power in primary aluminium production worldwide accounted for approximately 25.6% of the power needed in that industry. Lucio et al (2013) argue for the example of the Brazilian aluminium industry that self-generation can be a competitive factor[16]. In principle, self-generation by large consumers is possible already today. However, investors shy away from such projects because they put substantially higher amounts of capital at risk. Financial markets will be wary about simultaneously assuming exposure for power plant investment and an energy-intensive companies' productive investment. In addition, vertical integration can make scaling an investment more difficult, as hydro-power projects only come at discrete (typically significant) sizes. Finally, there is a question on the 'market integration' of these vertically integrated companies. In some instances they might want to sell excess electricity to the market (e.g., when the production facilities are under maintenance) while in other situations, they might want to rely on the back-up from the Georgian power system in case there is a problem with the self-generation. So there is some market-risk associated to the structural and temporary mismatch between a self-generators electricity production and demand. Hence, also for self-generators the structure of the Georgian electricity sector is important. Particularly important aspects are how the network cost are structured (e.g., based on capacity or usage) and which market arrangements for such 'balancing' are in place.

A government could obviously support such vertical-integration in order to stipulate promote domestic energy intensive companies by, for example, preferring vertically integrated companies in hydro-power site tenders. We would advise against such preferential treatment, as they would lead to an inefficient development of domestic Georgian resources. If, for example, tenders for hydro-power sites require a prequalification the lower number of participants leads to significantly lower returns and less efficient companies winning the tender. Preferential treatment for self-consumers provides an incentive for possibly inefficient vertical integration. So, inefficient vertically integrated companies would be preferred over an efficient hydro-investor and an efficient electricity intensive company. Finally, the duration of the self-consumption requirement is an issue. If it is very short, it provides an incentive to game the system – if it is too long it might make sensible business decisions, such as selling or closing the electricity-intensive part impossible.

3.4 Regulated tariffs

Another approach is to require power plants to sell a certain fraction of their electricity at regulated tariffs to certain consumer groups (e.g., industrial customers). This is already partly the case in Georgia, where hydro-power licenses are linked to the obligation to serve the Georgian market in the winter period – when domestic supplies are short.

If regulated prices are set below the export price (which would be the aim of ensuring electricity supplies for the domestic market), some marginal generation projects might not be realised. But there may still

[16] Nilson Rogerio et al. (2013)

be excess capacity if the regulated tariff is higher than the market price in the isolated Georgian market. There are two problems with such an approach: First, it contradicts the idea of fully market-based pricing that is stipulated in the energy acquis of the European Union and, hence, binding for Energy community members such as Georgia. In this regard, however, there might be some space for interpretation, as long-standing EU members such as France continue to implement comparable schemes[17]. Second, the setting of a regulated price completely contradicts the idea of an electricity 'market' in which supply and demand drive investments. If the regulated price turns out too high there will be overinvestment in capacity. As there will not be enough demand for the excess supply at the regulated price, the regulated price will need to be reduced to match supply and demand. But then investors will turn to the government to request compensation for their 'stranded assets' (those that were only build based on the higher prices promised).

Conclusion: The dilemma for developing an electricity-intensive industry is, that without the high and stable price signals that export markets provide, the investment in additional generation necessary for the electricity intensive industry will not materialise. But if all projects are designated for the export market - there will be no low-cost electricity supply left for developing a Georgian electricity intensive industry.

[17] The tariff ‚ARENH' guarantees to French consumers a price of 42 Euro per MWh for power from French nuclear plants. Colombani A., Pina M. (2012).

4 Conclusion

Georgia has the geographic preconditions for low-cost electricity production. The main challenge is to encourage investments. If the target is to develop an electricity-intensive industry, the second challenge is to ensure that sufficient low-cost electricity is available to Georgian companies. Solving both challenges at the same time is a dilemma.

4.1 Investment-friendly framework for electricity industry

For a healthy development of Georgia's electricity and electricity intensive industry it is of crucial importance that the country develops a credible investment environment. Georgia has done important steps into this direction, by signing the Energy Charter Treaty, joining the Energy Community (which implies transposing the EU energy acquis into Georgian legislation) and committing to EU energy market rules in the Association Agreement[18]. This provides an important anchor for regulatory stability, which investors seek. Based on support by US AID and EU rules Georgia plans to introduce a day-ahead market coupling with Turkey which will add another layer of commitment to a stable regulatory framework for hydro-power investors in Georgia (this regional approach has advantages beyond the pure energy field[19]). The regional integration of electricity markets is enabled by significant investments in the regional transmission infrastructure. Georgia should continue along this path, keeping in mind that the long-term gains of a consistent market based electricity sector policy outweigh possible short-term gains from inconsistent policy intervention that unduly reduce the profits of investors already in the country. Obviously, this requires resilient policies that Georgia will have to renege on in the future. In short attracting investors with unfulfillable promises is not a good idea.

A second issue is the allocation of hydro-power sites. Here the government needs to make sure to define a transparent process in which the most efficient investor wins and a fair share of the resource rent remains in the country.[20] If the best sites are allocated without true competition, investors will not pay the fair price for using Georgian resources. Given the abundant site, there is currently limited competition for the build-own-operate licenses linked to the requirement to sell some electricity at regulated prices to Georgian consumers in winter. This scheme needs to be modernised, to avoid that foreign-owned hydropower plants export Georgian resources without leaving a fair share of the value in the country.

Conclusion: To attract investors, Georgia should continue to build a competitive electricity market in line with the European rules and connected to neighbouring countries. To attract the best investors and to make sure a fair share of the resource-rent remains in Georgia, the allocation of hydropower sites should be structured more competitively.

[18] E.g. Title IV Chapter 11.

[19] It is also a political project to increase mutual trust.

[20] Currently project selection follows based on an expression of interest to the Ministry (http://en.trend.az/scaucasus/georgia/2361039.html).

4.2 Attracting electricity-intensive industry with self-generation

To attract energy-intensive consumers the country should solve the chicken and egg problem that without industrial consumers all new electricity generation projects will be targeted at the export market, which reduces the capacity available for the development of domestic, energy-intensive industrial consumers. The first part of the strategy is to actively promote Georgia as a site for energy-intensive industries. The good business climate and the existing port infrastructure in Georgia are important arguments to this end. The Georgian government should highlight the possibility of self-generation and prepare a short and fair description of the corresponding regulatory environment to be circulated with the investor community. Clearly lining out the regulatory environment for self-generators will also help to identify remaining barriers (such as regulatory risks or excessive burdens) that the government should tackle.

Conclusion: To attract self-generating electricity consumers, Georgia should clarify the corresponding rules and better promote this possibility to corresponding foreign investors.

4.3 Attracting 'pure' electricity-intensive industry

The attractiveness for investors in 'pure' (i.e., without self-generation) energy-intensive industries in Georgia strongly depend on the future electricity price in the country. The future price will strongly depend on the future electricity policy of the country and its ability to attract the investments into the generation sector. So corresponding investments face significant uncertainties. This is particularly true, as Georgia lacks a track-record of consistent energy policy. This is somewhat addressed Georgia's international commitment to implement a competitive electricity market following the EU example. To go one step further, Georgia might explore ways to reduce the regulatory risk for investors in energy intensive industries[21]. One way of funding/guaranteeing such schemes might be to draw on the resource rents from auctioning hydro-power site described in 4.1.

Conclusion: To attract electricity intensive industries, Georgia should provide clear guidance on the further development of its electricity market.

[21] Such schemes should not be developed *ad hoc* for individual projects and they should be targeted to address the issue that Georgia cannot commit towards investors to a certain future energy policy. To avoid distortions, any scheme should be in line with EU state-aid rules.

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