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# THE IMPACT OF THE ELECTRICITY TRADING MECHANISM ON THE ELECTRICITY POWER SYSTEM IN GEORGIA

NOVEMBER, 2012

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DELOITTE CONSULTING LLP

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**This document was prepared by**


| Author | Organization | Contact Details |
|---|---|---|
| Gergana Stoitcheva, PhD | Deloitte Consulting LLP | gstoitcheva@deloitte.com |
| Neli Danelia | Deloitte Consulting LLP | ndanelia@dcop-hipp.ge |
| Sopio Khujadze | Deloitte Consulting LLP | skhujadze@dcop-hipp.ge |
| Nikoloz Sumbadze | Deloitte Consulting LLP | nsumbadze@dcop-hipp.ge |
| Ivane Pirveli | Deloitte Consulting LLP | ipirveli@dcop-hipp.ge |
| **Reviewer** | **Organization** | **Contact Details** |
| Adrian Rouse | Deloitte Consulting LLP | adrouse@deloitte.com |

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# 1 EXECUTIVE SUMMARY

- The Georgian Ministry of Energy & Natural Resources (MENR) is committed to facilitating private sector led development of Georgian hydropower resources. This strategy requires that Georgian hydropower plants have access to an Electricity Trading Mechanism (ETM) that provides transmission paths, trading tools and risk mitigation options so they can sell their electricity into the Turkish and regional electricity markets.

- The MENR has asked USAID HIPP to develop a Cost Benefit Analysis for the implementation of the ETM. This report describes the results of this analysis.

- While the ETM has been designed to minimize the extent of change and investment required within the Georgian energy sector, its implementation will incur costs. Capital expenditure includes an estimated 20 million USD for a new IT platform and another 10 million USD for metering. Additionally, GSE, ESCO and GNEWRC will all need to learn new skills as the Georgian power system becomes increasingly compliant with EU competitive market principles and harmonized with Turkey's power market rules and procedures, changes that will require the promulgation of rules on Transmission System access and use (Grid Code,) as well as regulations that impose the minimal essential technical requirements to enable efficient operation of the electricity system.

- However, the benefits far outweigh the cost, and include:

- The ETM has an estimated Net Present Value (NPV) of 1.2 billion USD to Georgia, between 2015 and 2025 alone. This translates into a reduction in domestic cost-based tariffs of over 10% for the nation's retail electricity consumers.

- By enabling Georgian hydro plants to sell large volumes of their output at the higher prices available on regional markets, the ETM will allow private developers to secure a return on their investment in Georgia from external sales, rather than relying heavily on domestic consumers.

- The ETM will also enable Georgia to leverage its natural resource base to turn the energy industry into Georgia's leading export sector. As well as increasing energy security through reduced gas import dependence, the ETM will help Georgia reduce its large trade deficit.

- By attracting more private capital to the energy sector, the ETM will free up the Government's limited budgetary resources for investment in other areas, such as social development, health and education.

## 2 TERMS AND ACRONYMS

Terms and abbreviations used in this document have the meanings below. For purposes of harmonization with European law, a number of terms that are used in the EU are used in place of present terms used in Georgian legislation.

1. "Bilateral Contract" - agreements between and among various market participants for the selling and buying of electricity (energy and capacity) and ancillary services.
2. "CMS" - Current Market Scenario performance with no ETM implementation.
3. "Distribution Company" - the entity with the license for carrying out the functions of the Distribution System Operator and (presently) of Retail Public Supplier.
4. "Distribution System" - a low voltage (110 KV or below) electricity distribution network comprising lines, cables, poles, substations, transformers, control and telecommunications facilities, and associated equipment.
5. "Distribution System Operator" or "DSO" - an operator of a Distribution System.
6. "Economic Dispatch" - optimal output of a number of electricity generating facilities to meet the system load, at the lowest possible cost, while serving power to the public in a robust and reliable manner.
7. "Electricity Market" - the exchange of demand and supply for the purpose of efficient selling, purchasing and supplying of electricity.
8. "Electricity Market Law" - a new law describing the functioning of the GEMM and the ETM.
9. "Electricity System" - an interconnected system, made of generators producing electricity, lines, substations and transmission and distribution equipments, for the transmission of electricity for users and the distribution of electricity for users and customers.
10. "ETM" - Electricity Trading Mechanism.
11. "Eligible Customer" - a consumer that has the right to choose from whom to purchase electricity that will be used for its own consumption.
12. "Energo-Pro" - Joint Stock Company Energo-Pro Georgia that owns 10 HPPs in Georgia and provides distribution and supply services throughout its service area.
13. "Energotrans" - EnergoTrans Limited Liability Company.
14. JSC "ESCO" - Electricity System Commercial Operator.
15. "Existing Market Operating Rules"- Order of the MENR No. 77 dated 30 August, 2006, On Approval of The Electricity (Capacity) Market Operating Rules, as amended and supplemented.
16. "Exporter" - the entity having licenses to export electricity produced in Georgia to the neighboring or/and regional electricity market.
17. "Flow of Electricity" - the amount of power going through the electricity networks of transmission and distribution.
18. "Flow of Funds" - the exchange of monetary values as payments for the performance of contractual obligations among Market Participants.
19. GEMM 2015 - Georgian Electricity Market Model 2015.

20. “GNEWRC” - the Georgian National Electricity & Water Services Regulatory Commission.
21. “GoG” - the Government of Georgia.
22. “GSE” - Georgian State Electrosystem JSE.
23. “Guarantee of Origin” or “GO” - the certificate required to be provided pursuant to EU Directives that provides certainty as the origin of electricity generated and sold into the European Union as Renewable Energy.
24. “HPP” - Hydroelectric Power Plant.
25. “IFIs” - International Financial Institutions.
26. “Single buyer” - a single wholesale buyer of electricity.
27. “Transmission System Operator” or “TSO” - the operator of a Transmission System.

# 3 INTRODUCTION

The ETM is designed to support the Government of Georgia's policy of lowering long term electricity tariffs by enabling the potential benefits resulting from Georgia's geographic location and natural resources to run directly to domestic electricity consumers, as well as electricity sector investors. By creating a trading mechanism that properly allocates risks among market players, that provides dependable cross-border transmission capacity rights, and that is harmonized with Turkish power market rules and procedures, the ETM will enable Georgian Hydro Power Plants (HPPs) to sell their electricity into the Turkish power market, and, eventually, other regional markets. By ensuring the Georgian electricity market operates according to clear rules and procedures, the ETM will also bring the certainty and level playing field that private investors and lenders are looking for.

> Since the ETM is compliant with EU competitive market principles, it will enable the GoG to take a major step forward in achieving its goals[1] with regard to development of a competitive electricity market, which international experience shows can significantly reduce system costs and increase performance. This is why many European countries have, followed Directive 2009/72/EC ('the Electricity Directive'), to remove any conflicts of interest between producers, suppliers and transmission system operators.
>
> [1] see State Resolution on Energy Sector, updated 2011.

Furthermore, by reducing the country's fuel import dependency, and by increasing electricity exports, the ETM is expected to help improve Georgia's balance of trade. Additionally, it will support a general expansion of foreign investment and economic activity, including possibly attracting value chain investors looking to leverage the country's hydro resources to develop value adding processes in the country.

While the ETM has been designed so its implementation requires the minimum possible modifications to Georgia's current power market design, it will require a lot of effort, most notably from energy sector institutions such as GSE, GNEWRC and ESCO. For example, the ETM requires the promulgation of new rules on Transmission System access and use, as well as the development and introduction of regulations that impose the minimal essential technical requirements to enable efficient operation of the electricity system. The ETM will also require some capital investment, including in new meters and an IT platform.

This study seeks to compare the outcomes of the proposed ETM to those of the existing system, or so-called current market scenario (CMS), by considering quantitative and qualitative assessments.

The quantitative analysis delivers the findings of an economic assessment of the ETM's long-term costs and benefits to the market and the individual consumer of the electricity system in Georgia. The analysis highlights how the ETM will affect tariffs, the cost of start-up investment and the socio-economic characteristics of the population. The qualitative assessment identifies the costs and benefits that flow from the ETM but are not amenable to objective quantification. Recourse is made to international experience, as required.

# 4 CURRENT SITUATION IN THE ELECTRICITY POWER SECTOR

In this section, we present the current situation in the electricity sector in Georgia and its characteristics, which we term Current Market System (CMS). The indicator of annual per capita consumption of electricity reflects the level and potential of the country's economic development. It is also indicative of the power sector's ability to benefit from economies of scale in the sector. According to World Bank statistics, from 2008 until 2011 electricity consumption per capita in Georgia grew by an average 4% per year (Figure 4.1). Between 2010 and 2011, demand grew by 8%.

In 2011, gross electricity generation in Georgia was over 10 TWh, representing the highest output in recent years. The share of total installed capacity by technology is shown in Figure 4.2. As can be seen, most of the electricity generation (79%) in the country is based on hydro production.

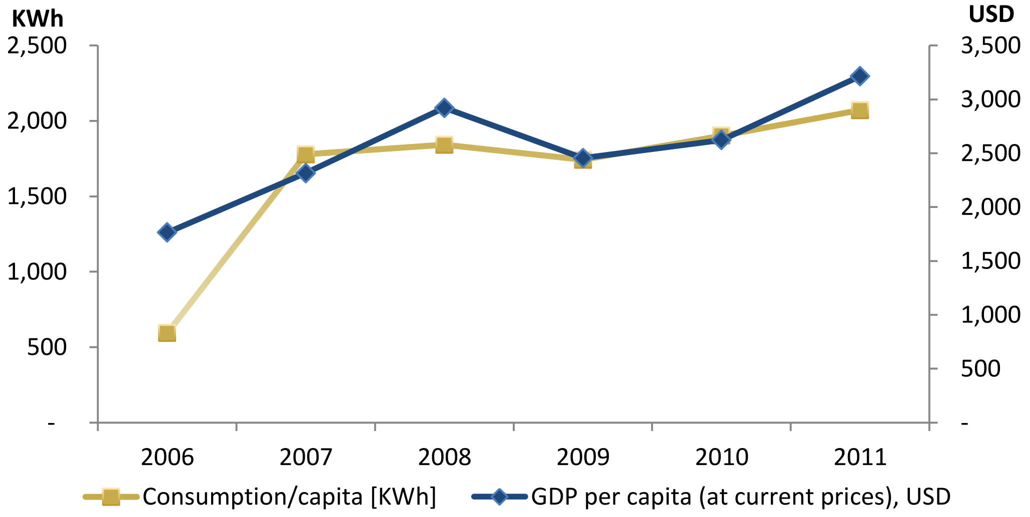



**Figure 4.1. Electricity consumption/capita vs. GPD/capita**

Currently, Thermal Power Producers (TTPs) generate electricity from September to April, accounting for 21% of total installed capacity in 2011.

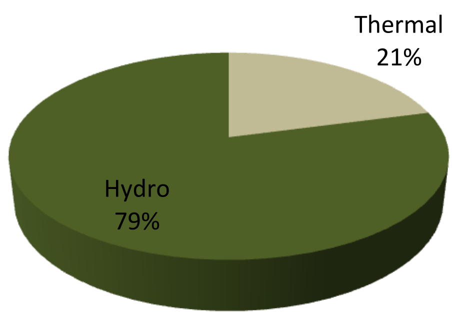



**Figure 4.2 Total Installed capacity by source in 2011, Georgia**

This also reflects the seasonality effect of Georgia's hydro-system. While variations in hydrology throughout the year impact the generating capacity of Georgia's largest hydro units, such as Enguri and Vardanalli, their ability to store large amounts of water protects them somewhat. Output from run-of-river hydropower plants, on the other hand, which account for an important part of installed generating capacity, is almost entirely determined by rain or snow fall in each plant's hydrological basin and on seasonal availability of water. This leads to diversion of excess water during summer (under utilization) and almost no power generation during drought conditions. As a result of this mismatch between the availability of water and its national load profile, Georgia is forced to import energy supplies during the winter period. Figure 4.3 shows the seasonality monthly effect for 2011 in GWh.

Because Georgia imports natural gas, the electricity price generated from TTPs is relatively expensive. The country's TPPs have a higher tariff in comparison with hydropower generation, e.g., 5.6USc/kWh for January of 2012, according to ESCO's web page statistics. This compares to a weighted average tariff for regulated and partially regulated HPPs of 1.16 USc/KWh in 2011, including the Enguri HPP that has a fixed tariff of 0.7 USc/KWh (Figure 4.4), reflecting a much lower marginal cost.

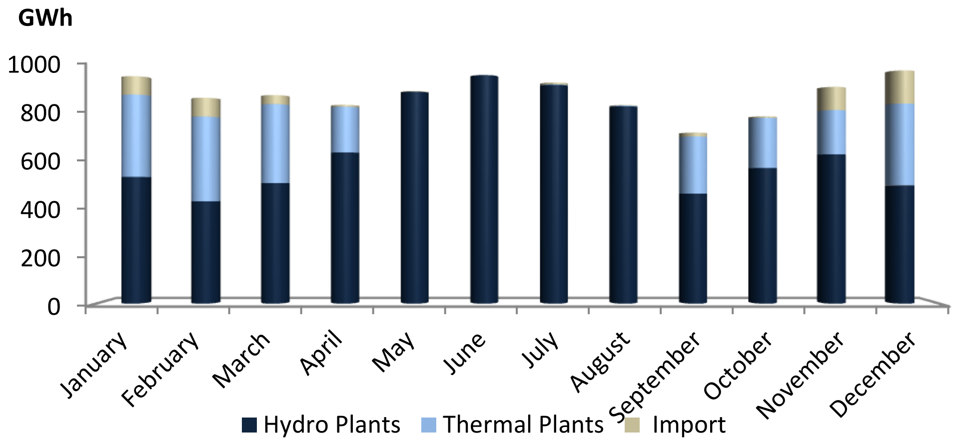



**Figure 4.3: Supply of local electricity consumed in 2011, Georgia**

The price of generation by TTPs is over 10% more expensive than the deregulated small HPPs and over 40% more than the regulated HPPs.

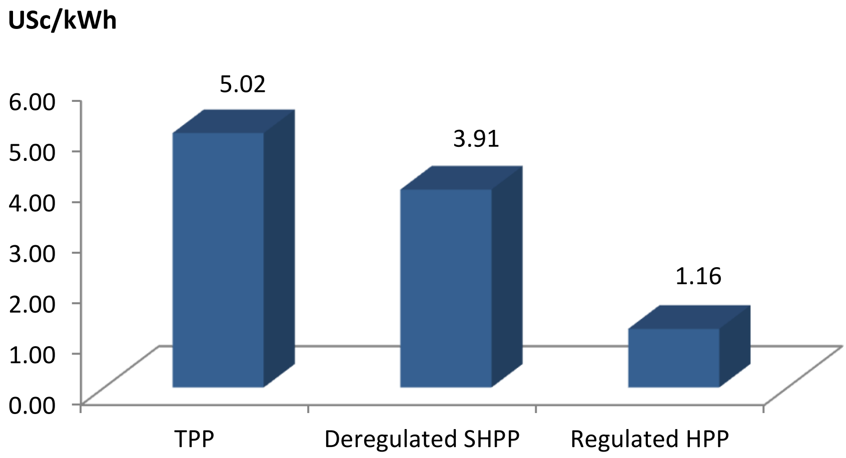



**Figure 4.4: Average electricity price generated from TTPs and HPPs[1]**

[1]Avarage exchange rate of 1.6513 USD

This undesirable situation creates a clear need to establish a way to decrease gas imports to Georgia by exploring the abundant hydro resources of the country.

The need for a solution is made more pressing due to the fact that Georgia's low-cost gas supply agreements with Azerbaijan (which afforded TTPs gas at approximately 140 USD/tcm in 2011) will not last forever. Indeed, many observers believe that natural gas prices in the region will move towards Western European levels in the medium term, most likely resulting in significantly higher gas input costs for power generation in Georgia.

These developments arise at a time when local growth trends indicate thermal power generation will need to increase by almost 4 times by 2020, in order to satisfy demand during the winter season.

Furthermore, end user rates are regulated in Georgia. While they have almost doubled in USD equivalent terms since 2003, peaking in 2008, they are still not defined on cost-based performance. Since 2003, tariffs have been differentiated to households and industry (Figure 4.5). Since 2010, a slight increase can be seen in both. In general, they are higher than the average in the region and high on a GDP per capita basis. For instance, since 2008, end-user tariffs in Turkey have been adjusted quarterly to take into account input prices, inflation and exchange rates. According to OECD energy price statistics, Georgia along with Armenia, have the highest electricity tariffs in the region (close to or over 10 USc/kwh for 2012), which are quite close to the electricity tariffs in Bulgaria, the country with the lowest tariffs in the European Union. Tariffs in Kazakhstan, the Russian Federation and Belarus have increased and now exceed 5 USc/kwh.

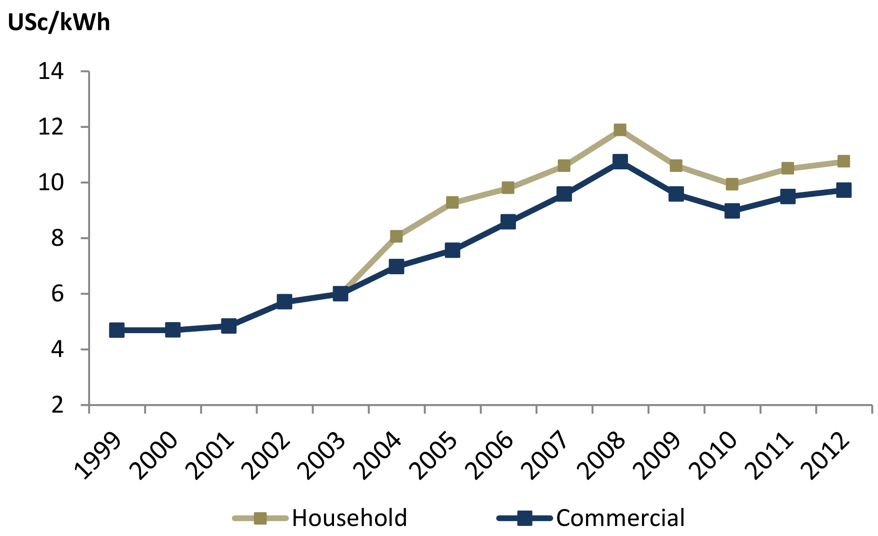



**Figure 4.5: Retail electricity tariffs per KWh, Georgia**

With respect to the market structure, ESCO is functioning as a "single" buyer of electric power from the independent power producers and as a single supplier to the distribution companies and clients.

# 5 QUANTITATIVE ASSESSMENT OF ETM IMPLEMENTATION

## 5.1 OBJECTIVES AND INTENDED BENEFITS OF THE PROPOSED ETM

The objectives of the ETM can be defined as:

- **Use Georgia's resources to create a cost effective power system:** enable the potential benefits resulting from Georgia's natural resources and geographic location to run directly to domestic electricity consumers, and to help grow the economy.
- **Improve Reliability of the System:** refers to adequacy and security of supply. This includes helping facilitate sufficient investment and ensuring dependable electricity supply.
- **Minimize design risks:** minimizing the design risks of ETM implementation and insure compatibility with regional market policies.

**Use Georgia's resources to create a cost effective power system:**

The cost-effectiveness objective ensures that the market operates efficiently by:

- Developing and implementing a mechanism that is feasible;
- Enforcing mechanisms that favor reducing barriers for foreign investments to entry to the competitive market;
- Consumer impacts: Avoid over-paying generators at the expense of consumers and derive cost effective tariffs.

**Reliability of the System:**

System adequacy relates to the existence of sufficient facilities within the system to satisfy the customer demand. These include the facilities necessary to generate and the associated transmission and distribution facilities required to transport the electricity to the actual customer load points. Adequacy is correlated with long-term investments in the market. The security of supply objective can be considered as:

- Ensure enough generation capacity is in place to meet peak demand levels and avoid blackouts and brownouts as a results of resource inadequacy;
- Ensure providers of capacity have optimal incentives to be available at time of scarcity; and
- Encourage all forms of capacity – including interconnection and storage in ensuring security of supply.

In addition, the security of supply has an important impact on the establishment of a competitive electricity market. If the system is adequate and secure and all demand is satisfied through secure conditions then the system is defined as reliable.

**Minimize design risks:**

Minimizing the design risks of the ETM implementation and insuring compatibility with regional market policies ensures that:

- The ETM mechanism is applicable to the electricity market in Georgia;

- The mechanism will have a crucial, facilitating impact on cross-border electricity trading initiatives within the region to the benefit of Georgia, and its citizens.

Therefore, the main questions this analysis aims to answer are:

- What are the overall welfare effects of electricity market developments: to be precise, does empirical evidence on electricity market recommendations support or verify the logic of developments;
- How do these proposed implementations affect quality of service, efficiency and foreign direct investment in the electricity market in Georgia;
- What is the impact of moving from the current electricity market structure towards a competitive one on the allocation of risks amongst market participants.

To appraise the costs and benefits of the ETM, our goal is to compare a scenario where the ETM is implemented against a CMS in which we assume the existing system is maintained without any significant change. We have used a 13 year time horizon from year 2013 until year 2025 to estimate costs and benefits in these two scenarios. The year of 2013 is when we assume the first practical change towards the ETM implementation occurs (TSO is created) and 2017 is the time when we assume the ETM is fully implemented. This horizon reflects a reasonable lifetime for a new market design function.

In principle, measured against CMS, the costs and benefits of the ETM that reflect the objectives of the proposed changes fall into two main categories:

- *Non-market impacts*: costs of implementing and operating the new market system compared with the costs of maintaining the current system; and
- *Market impacts*: costs and benefits of changes in wholesale market outcomes, which result from changes in economic dispatch, investment decisions, and market prices.

Overall, the implementation of ETM should benefit the society. In particular, the net benefits of the ETM (or the “social benefits”) are equal to the amount of any savings in the resources used in the electricity supply industry, i.e., to any net cost savings. From the point of view of producers, it is the impact of the ETM on their profits that matters, whereas from the point of view of consumers it is the impact on the electricity prices they pay.

Improved environmental outcomes go hand-in-hand with improved competition in the sector. If ETM is not implemented, then the GoG needs to consider local electricity supply only from the TTP’s generation. This in addition will create environmental issues for the GoG and Georgian citizens. In the European Union scenario, environmental policies are to a large extent internationally implemented with a global emissions trading scheme.

## 5.2 QUANTITATIVE MODELLING: NON-MARKET AND MARKET IMPACTS

A cost-benefit analysis between the existing electricity power system and the developments suggested by the ETM approach is only possible if broad financial and economic system performance information is available. The analytical difficulty faced by this study is to adequately characterize the existing electricity marketing Georgia based on the available collected information and on the current market performance. That includes describing quantitatively how generators are dispatched, how congestion and its costs are handled, how power flows across organizational boundaries are managed, and a host of other details describing the existing institutions. Our estimates and findings are based on a range of benchmark estimates and assumptions on items for which information was only available through ESCO, GSE, GNEWRC, and Telasi web sites. At this stage, we make our estimates of the costs and benefits of the ETM using only required revenues information and tariffs information. In order to make a fully robust assessment, more data is required. Nevertheless, this analysis proves the important positive impact of the proposed ETM to the electricity power system in Georgia and quantitatively as well as qualitatively justifies its further implementation.

To appraise the costs and benefits of any market improvements it is necessary to compare the costs and benefits that will accrue to society as a result of the implementation, with the costs and benefits that would have accrued under CMS. Therefore, we have estimated the costs and benefits in the first category (which we labeled “non-market impacts”) by making assumptions based on the data from ESCO, GSE and GNEWRC web sites as well as international benchmarks where necessary. We have estimated costs and benefits in the second category (which we labeled “market impacts”) using modeling evidence, which compares projected outcomes in the CMS with the ETM scenario. Further, we describe the details of these estimates for each of the market impacts.

As noted above, we evaluate costs and benefits over a 13 year time horizon from 2013 to 2025, reflecting a reasonable lifetime for the long-term impacts proposed by the ETM. According to GEMM 2015 and the ETM, an independent TSO is created and will start operations under new management. By the end of 2013 there will be a legal separation of ESCO into MO and Consolidator.

#### 5.2.1 Non-market impacts

The non-market impacts include all the costs of implemented changes (i.e. establishment of TSO and MO) needed to operate under the ETM, so the comparison to the CMS scenario is likely to show a net cost for non-market impacts. Conceptually, calculating the non-market impacts, or net costs of the ETM, is a simple matter of comparing the costs of implementing the ETM against the costs of maintaining the existing systems under CMS. The majority of the costs are incurred in the run up to the implementation of the ETM and in the early stages of its implementation. Hence, overall the cost benefit analysis needs to determine whether the net benefits of the market impacts of the ETM will be sufficient to outweigh the net cost of the non-market impacts.

At the time of preparing this analysis, we continue to investigate the capital cost of introducing the ETM. For this assessment, we make a preliminary assumption that the total capital cost will be 45 million USD, grouped under the major categories shown below.

- *Market operator (MO) implementation cost: the costs of creating the MO;*
- *Market participant costs*: the costs of installing the new systems needed by generators to interface with the system;
- *TSO implementation cost*: the costs of creating the TSO;
- *Other costs related to system development.*

Many of the costs associated included in the preliminary 20 million USD estimate are related to the acquisition and installation of new IT information systems. For example, as well as paying for its own set up and operations to run the ETM, which we estimate at approximately 3 mln USD as revenue requirement estimation the MO will need to invest several million dollars in a new IT platform. Furthermore, we assume that all incremental MO operating costs are recovered from suppliers on a per kWh basis, which will get passed-on in full to consumers. In the longer term, the costs of the ETM fall significantly based on the recovery from the consumers.

At the same time, the initial cost of creating the TSO is assumed to be 20 mln USD in terms of operational cost. We estimate one-off TSO implementation cost to be capitalized over 10 years and recovered through transmission charges. We assume the TSO budget based on the GSE budget information and mainly international practices. We also assume that 20% of the operational expenses will be transferred to TSO for the dispatch license. We also assume that as of 2017 approximately 3 mln USD will start to be collected from the generators by TSO for the performed activities.

The major effect on the cost side of unbundling comes with the investment costs of generation assets. Above we assumed that an effect of unbundling could be that it accelerates the investment in generation and interconnector capacity (the capacity acceleration effect). The argument here is straightforward: apart from the competitive advantages this would bring it does have higher capital costs as the downside. Market participant costs total a few million USD, the majority of which are the design costs and capital costs of new systems needed under the ETM.

While further investigation is required to confirm our 45 million USD total ETM capital cost estimate, we are confident that the initial setup of the ETM will not have a significant, negative fiscal impact on the GoG.

#### 5.2.2 Market Impacts

In the case of market impacts, the distribution of costs and benefits results from the operation of market developments, combined with regulatory and contractual factors. They are a key determinant of the distribution of costs and benefits on the system overall and between market participants and consumers. Market level impacts associated with each of the ETM implementations are assessed using the following impact measures: (1) capacity changes, (2) generation changes, (3) required revenue changes, (4) variable production cost changes, and (5) electricity price changes for consumers.

Investments in new power generation are naturally determined by the profitability of the above-defined measures and are at the same time heavily influenced by policies and regulations. Power generation investments are often heavily impacted by clear regulatory policies for local market and cross-border initiatives. The most important investment drivers include, for example, fuel prices (and expectations thereof), availability of resources, demand growth, and the current structure of the generation portfolio (including age).Many of these factors can be positively impacted by implementation of ETM towards a competitive market and transparent management of investment risks in Georgia. The major effect on the cost side of unbundling comes with the investment costs of generation assets. Furthermore, the effect of unbundling is that it accelerates investment in generation and interconnector capacity. Apart from the competitive advantages that are led by the ETM the unbundling will cause coordination of investment of the network.

In 2011, total electricity demand in Georgia, including losses was 9.3 TW and 930 GW for export. Enguri is expected to be renovated and fully operating in the year 2015. If this occurs, local supply will increase by 15% in 2015 (assuming 4% increase in demand based on GDP/capita growth). As can be seen, since 2010, exports are declining. In 2015, exports will increase significantly due to Enguri but after that due to the projected increase in local demand the current generation portfolio will not be enough to cover local demand and enable further export. Export will start declining again and by 2018, Georgia will have an export deficit. If this scenario happens, the GoG will have no choice but to increase the import of natural gas for local electricity generation. As discussed above, currently, in order to satisfy local demand from September through April, 20% of Georgia's electricity generation comes from natural gas imports.

In order to minimize import dependence and to take advantage of the natural resources of the country, the GoG plans on executing a total of approximately 2 GW installed capacity of new HPPs between 2012 and 2020 (Appendix B). If all plants currently under MOU start operations planned, by 2015 local generation from HPPs will be enough to satisfy potential growth in local demand and even to fully substitute the need of gas import to Georgia. The predicted new annual generation will be in the range of 7 TWh by 2020.

In addition, this will give a chance to Georgia, by year 2016, to increase its electricity export by almost 3 times compared to now. Figure 5.1 shows the projected export potential based on the current production of the generation and the potential production if the new HPPs are added to the system. The capacity of the system in total will increase by almost by 2 GW by the end of 2020. Figure 5.2 presents the projected total supply in both cases: with and without the new HPPs to the system. As shown, the new HPPs will double the supply in the long term.

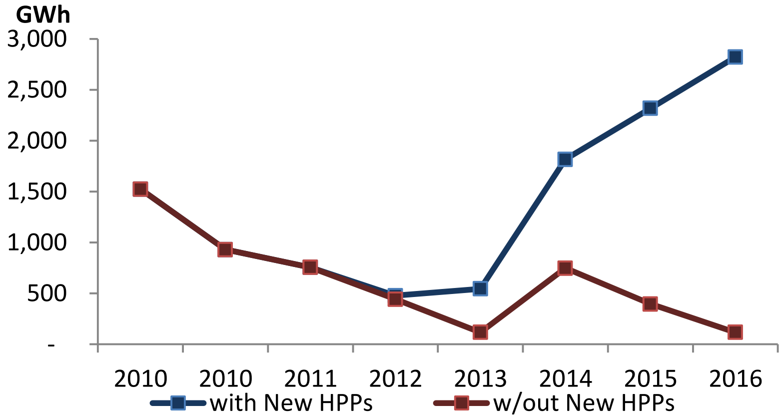



**Figure 5.1: Export potential from generation with existing and new HPPs**

In order to execute the new generation plants, according to the Ministry of Energy and Natural Resources, an estimated investment of almost 3 bln USD by 2020 will be required. By assuming an escalation rate of 3% for operational costs per GWh, the annual new HPPs cost will be in the range of 5 USc/KWh. If we assume the export price/Kwh to be equal to the imported electricity price (around 7USc/KWh) as of today, then the total cost benefit, including the export by year 2020, will be over 50 Mln USD per year as of 2015. This is the most pessimistic scenario where no escalation rate of the export price is considered and the assumption underestimates the potential export benefit. If we assume an escalation rate of 4%, the total benefit including the potential export increases almost double in comparison with the first scenario (Figure 5.3).

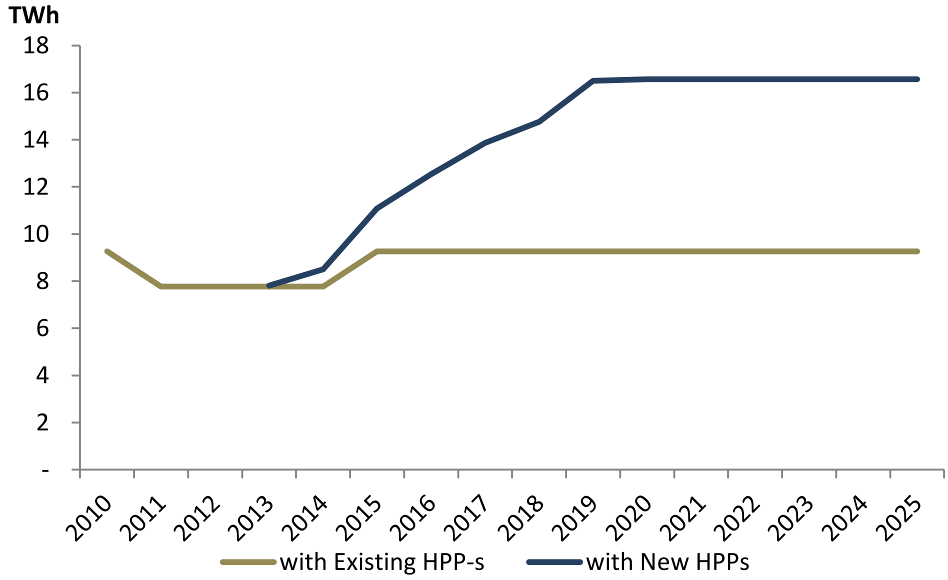



**Figure 5.2. Total system supply projection with existing and with new HPPs**

Under the above assumptions, we estimate ETM implementation will reduce total system cost by 10% per year in comparison to the current system (Figure 5.3). The cost benefit associated with the ETM implementation is in the order of 200 Mln USD/year as cost benefit performance for the system. This value assumes a 4% escalation rate for potential export prices (Figure 5.4).The NPV value associated with the cost performance of the system is in the order of 1.2 bln USD with an assumed 10% discount rate from 2015 until 2025.

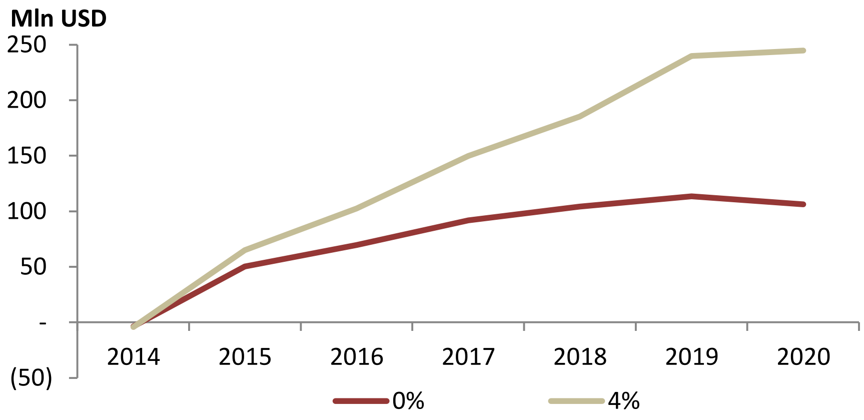



**Figure 5.3: Total cost benefit from increasing export potential**

However, all best international practices confirm the fact that new generation units will enter the considered market only if the following prerequisites for the private investors are satisfied: (1). Effective local market functioning; (2). Access to cross-border transmission links; and (3). Transparent regulations that are synchronized with regional markets trading mechanisms.

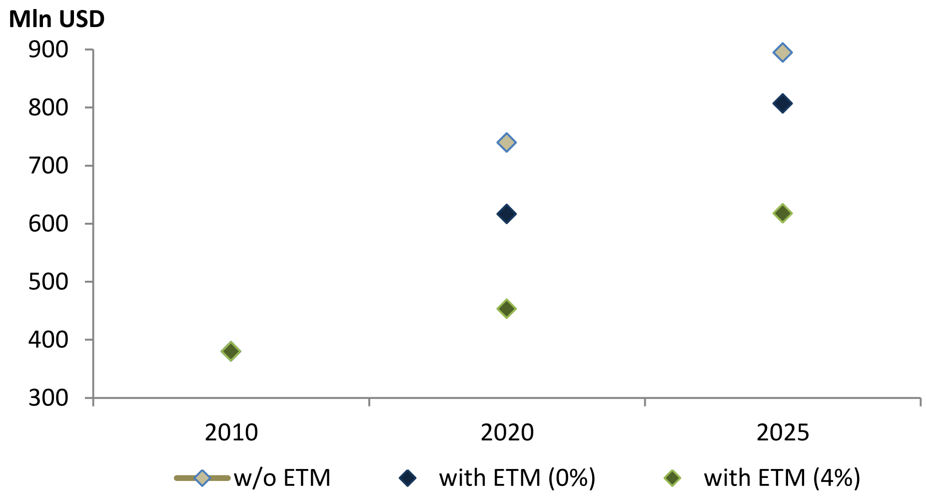



**Figure 5.4: Power system cost performance with/without ETM implementation**

Another important market impact related to the cost-effectiveness objective based on the ETM implementation is the tariffs performance. In principle, the electricity price for each customer group must reflect the actual cost of supplying that group. Currently, the end user price is not defined on cost-performance basis. Best international practices confirm the requirements that tariffs must provide a reasonable return on invested equity sufficient to attract financing for the construction/reconstruction of assets and the further development of the sector. Figure 5.5 shows the tariff performance effect if the ETM is implemented. As in the analysis presented by Figure 5.3, we consider two scenarios for the potential export price that contributes to the tariff's performance: with no escalation rate and with 4% rate of increase. As it can be seen from the projection, the average tariffs will lower in benefit to the customers by over 10% in cost which is a significant reduction in price.

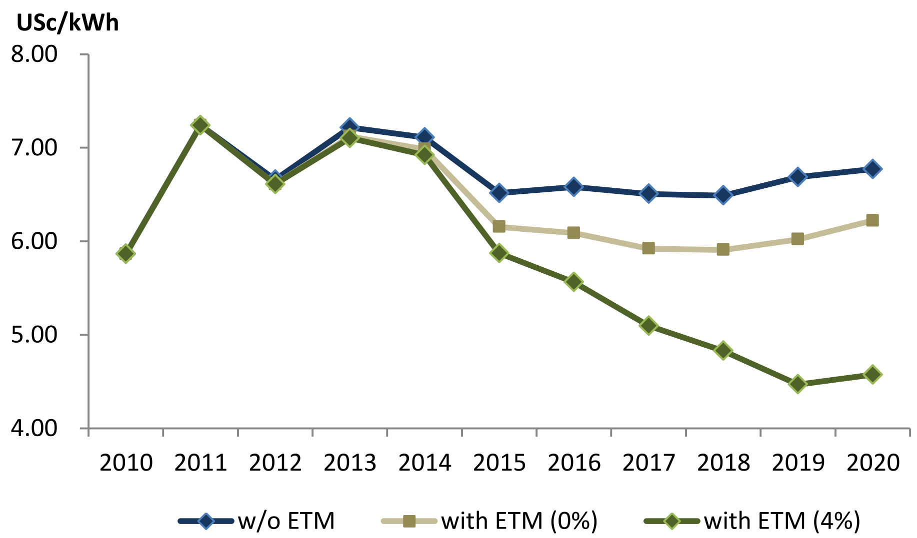



**Figure 5.5: Projected domestic tariffs with/without ETM implementation with 0% and 4% escalation rate for the potential export price**

The idea of ETM is to create a suitable environment for a competitive market and its participants. In principle, a competitive market at any particular time is summarized by the market's demand and supply curve. Figure 5.6 shows a general picture of a competitive market in equilibrium at any time (i.e., a particular hour, day, or year). In such market, consumers continue to buy as long as the benefit to them of each additional unit purchased exceeds the unit's price. Likewise, suppliers increase deliveries as long as the revenue gained from selling one more unit (i.e., the unit's price) is at least as much as the unit's additional (marginal) cost. These forces are resolved in market equilibrium: supply equals demand at the market quantity, price equals marginal cost, and price also equals marginal benefit. In this setting, "price" refers to the delivered price of the commodity. "Cost" refers to all the costs associated with producing, distributing, marketing, and delivering the commodity. Increase in consumption result in extra benefits for both consumers and producers.

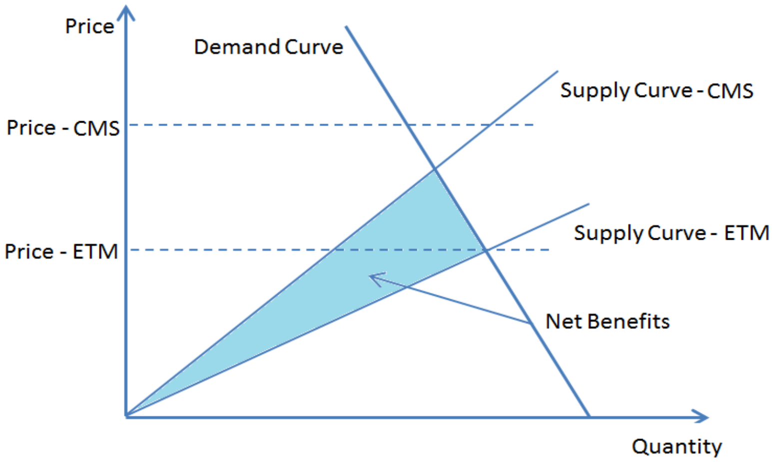



**Figure 5.6: Competitive market equilibrium and market surplus**

When we have inelastic demand, this price inelasticity means that price changes do not cause detectable increases or falls in the demand for electricity, only changes in the price paid by consumers and received by producers. Since the sole effect of a price change is to change the amount consumers are paying and producers are receiving for the same volume, the only effect of a price change is to transfer wealth between one group and the other. But the market impact effect is the result of more efficient dispatch and investment, as well as price change.

Consequently, to calculate market surplus it is necessary to characterize the impact of regulation on future supply and demand. Given demand, dynamic efficiency is obtained when the level and mix of investment maximizes the present value of surplus. Competitive markets operating in an idealized world of perfect future markets are dynamically efficient. When there are investments in the power system then we can talk about market efficiency. Two things are important regarding power market efficiency. These are the seller and the buyer surplus, respectively. If there is a sufficient surplus on both sides, then we can talk about their positive profits and benefits and an efficient power market.

By definition, social net benefit equals the increase in total welfare between the proposed scenario and CMS. Total welfare equals the sum of the consumer surplus and the producer surplus. With inelastic demand, the change in the consumer surplus is given by the difference between the consumer prices under the ETM and CMS, multiplied by demand. The producer surplus corresponds to the profits generators earn at market prices, and hence the change in the producer surplus is simply the change in profits (including changes in fixed costs).

In this analysis, our estimations are based on tariff information and required revenues.

Hence, we have undertaken modeling of the tariffs formation process under both CMS and the ETM as a basis for determining the distributional effects of the market impacts of the ETM**.** In order to generate a consistent long-term picture, the price projections presented here have been generated using our model of the electricity system that assumes competitive behavior under the implementation of the ETM and free entry to the market**.** Based on this, we assume the market entry of all new HPPs as planned by the GoG. In reality, prices in the ETM will be determined by the marginal cost of the marginal plant on the system (system marginal price, or SMP). Hence, if new entry is delayed compared to the least cost pattern we have assumed in our modeling, then prices in the ETM may be significantly higher than those we have assumed. Particularly, in the short-term if inefficient old plant are kept on the system even though they may not be the least cost option.

Furthermore, the ETM focuses on competitively priced wholesale trading activities. In competitive markets prices rise and fall naturally with the marginal cost. Demand responses to price changes which means as demand rises, additional generating units with higher operating costs must be turned on; as demand declines, the units with higher operating costs are shut off. Thus, spot markets do not cause volatility in marginal costs; they merely record it. Visible prices can also have other benefits. Once consumers can see prices, they can choose to respond by consuming only when it is worthwhile to them, i.e., when the marginal benefit from additional consumption exceeds its price.

**The impact of creating TSO**

The TSO holds the key to competitive electricity markets. The TSO is obligated to manage the security of the power system in real time and to coordinate the supply and demand for electricity in a manner that avoids frequency fluctuations and supply interruptions. Under GEMM2015, this obligation (or function) is separated from its role as owner of the Transmission System.

Reliability refers to adequacy and security of supply. Reliability need not decline in the competitive electricity industry. Reliance on competence to acquire reliability resources should permit the market to be more flexible to the consumer's perspective. New systems and regulations will enable traditional (or higher) levels of reliability to be maintained for those that require it and for other benefits to be realized by those who do not.

Eligible customers for the energy purchased to cover losses will pay the TSO for transmission charges (to the extent applicable) calculated in accordance with the tariff included in the Transmission Services Agreement approved by the GNEWRC. The TSO shall also:

- forecast and purchase ancillary services from RGs and other generators, on an annual, weekly, day ahead and real time basis;
- purchase electricity from RG and other generators required to cover losses in the Transmission System;
- have the right to receive compensation for its services from the Market Participants pursuant to tariffs approved by the GNEWRC.

Physical coordination of demand and supply ensure the safe operation of the electricity system and can only be realized, if the TSO possesses capacity reserves allowing immediate intervention. If real time surplus or shortage occurred in the national energy balance, the TSO would create the balance of production and consumption by activating previously purchased capacity. Without real separation of the transmission and distribution network operators from generators, incentives to invest in cross-border interconnection infrastructure are very difficult to assess. Therefore, the TSO must be effectively separated from generation and retail supply.

As discussed above, in the case of establishing TSO, the investment is the one-time cost to set up, train, and equip the new organization. Once up and running, the TSO generates a stream of net benefits (and costs). Because the costs and benefits of TSO are spread over many years, the dollar values of net benefits are calculated at each year in time up to year of 2025. The present value of future net benefits is then compared to the investment in the TSO itself. If the present value of future net benefits generated by the TSO exceeds the investment in the TSO, the investment is economically justified; that is, its benefits, expressed in dollars, exceed its costs.

Addressing reliability impacts requires development of reliability metrics and collection of relevant data over time. A key challenge is that significant outages are comparatively rare events. Reliability is often measured by the frequency, duration and extent of power system disturbances and outages. Efforts to enhance reliability reduce the chances of power outages. Furthermore, *reliability benefits* are the reductions in the likelihood and consequences of forced outages that impose financial costs and inconvenience on customers.

SAIFI (System Average Interruption Frequency Index) is the average number of interruptions per customer during the year and is designed to give information about the average frequency of sustained interruptions (those lasting more than five minutes) per customer in a predefined area. It is calculated by dividing the total annual number of customer interruptions by the total number of customers served during the year. SAIDI (System Average Interruption Duration Index) is the average duration of interruptions for customers who experience an interruption during the year. It is determined by dividing the sum of all durations of service interruptions to customers by the total number of customers. This index is commonly referred to as Customer Minutes of Interruption or Customer Hours and is designed to give information about the average time during which customers' power supply is interrupted. These indices capture the effects of the number of outages, both momentary and sustained, as well as the duration of each outage, and are usually computed from the past year's or several years' utility data. In addition, they ultimately relate to customer satisfaction, which is based not only on the total length of interruptions but also on the frequency of interruptions. It has been recognized that reliability has a value for a customer. Table 5.1 captures the reliability performance in terms of SAIDI, SAIFI and ENS (energy not-supplied) indexes for the distribution companies.

| SAIDI (min/cons) | | 2009 | 2010 |
|---|---|---|---|
| **Telasi** | city | 259.241 | 645 |
| | suburbs | 71.777 | 259.8 |
| **Energo-Pro** | | 1,981.2 | 10609 |
| **Kakheti** | city | 12.1 | 1292 |
| | suburbs | 40.7 | 4,610 |

| SAIFI (freq/cons) | | 2009 | 2010 |
|---|---|---|---|
| **Telasi** | city | 2.782 | 5.3 |
| | suburbs | 0.284 | 0.8 |
| **Energo-Pro** | | 10.360 | 61.7 |
| **Kakheti** | city | 2.118 | 9.72 |
| | suburbs | 5.736 | 24.9 |

| ENS [kWh] | 2009 | 2010 |
|---|---|---|
| **Telasi** | | 11,695.8 |
| **Energo-Pro** | | 31,000,000 |
| **Kakheti** | | 4,471,388 |

**Table 5.1. SAIDI, SAIFI and ENS indexes**

Unfortunately, the data for the year 2009 represents only the last quarter of the year and therefore it is not possible to make any justification for the reliability. The missing data on the reliability of the system affects the cost performance of the distribution companies as well as potential investments in the sector.

Another important measure for investments is the value of lost load (VOLL). VOLL is usually expressed in terms of the estimated total damage caused by not delivered electricity divided by the amount of electricity not delivered in kWh**.** Calculating VOLL as variable for quantifying supply interruption costs constitutes one of the important approaches towards evaluating security of electricity supply and provides insight in the value of security of energy supply at large. As many investment decisions in the energy sector are dominated by arguments regarding demand for security of supply, estimating the level of VOLL may be informative and even essential for justifying these decisions. The higher is the product of VOLL and the probability of supply disturbances, the more valuable are investments in generation and/or network capacity extension or improvement. TSO will collect and record all these important indexes that will impact investment decision about the security and reliability of the system.

While analyzing the energy security and external dependence issues one needs to take into consideration the seasonality effect. The dependence seasonal index is the ratio of the amount of imported energy in each month divided by the total imported in the considered current year. Figure 5.7 shows the electricity dependence seasonal index for years 2010 and 2011. As can be seen, there is a significant overall increase in the electricity import for the year 2011 that also reflects to security of supply.

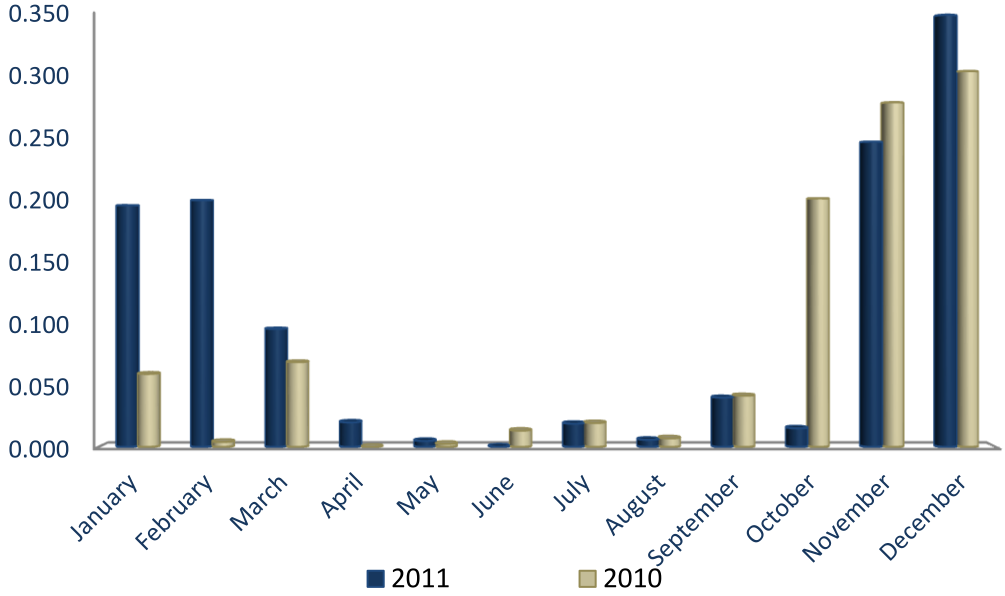



**Figure 5.7: Dependence electricity seasonal index for years 2010 and 2011**

Furthermore, reliability of service is one of the most important dimensions of quality in the electricity industry. It refers to the degree to which buyers can be supplied without interruptions. Electricity networks provide a crucial link in getting electricity to consumers – their good functioning is as important as the good functioning of generation facilities. Unfortunately, similarly to generation facilities, electricity networks may experience failures that may cause interruptions of electricity supply. In general, the above indexes can have even a bigger negative impact related to the export. Production and network failures both imply costs associated with the interruption in power supply. A more reliable system is a definite need to the market. Allowing cross-border trading is a major aim of the ETM implementation. As consequence, this will impact foreign investments cross-border activities.

Transmission cost savings are savings that we assume will result if marginal pricing is introduced as a result of the ETM. They reflect savings from more efficient location of generation and demand in response for use of the transmission network. We assume these costs, similar to TSO implementation costs that are capitalized over 10 years and recovered through transmission charges. We thus assume that these costs are an increase in annual operating costs for generators and suppliers, which get passed-on in full to consumers (in the order of 3 mln USD per year) starting from 2017. This will reflect to the end user prices and as shown by our projections, they will decrease (Figure 5.5).

If markets function well, prices will give producers incentives to invest if supply becomes scarce, while at the same time consumers are encouraged to reduce demand. This enables the market to match supply and demand. Furthermore, well-functioning market may be prone to price spikes. If prices do not reflect real scarcity or producers or consumers are not able to respond to changes in prices, security of supply problems could appear. Establishing and maintaining well-functioning markets appears to be an efficient approach in realizing a secure supply of energy. Therefore, well-functioning market design plays a crucial role and includes the removal of entry barriers, securing equal access to essential facilities, such as networks, and solving information problems. All these conditions are offered by the implementation of the ETM and in particular, the creation of TSO.

In comparison, deregulation of the electricity supply industry has brought attention to reliability issues in many countries. Here we review some international experiences (in particular, of the UK and Norway) with respect to the policies directed at electricity networks. We have chosen these countries with the longest history of deregulation and high-powered incentive schemes, to be able to observe the effect of their policies. However, it should be noted that the reliability level in the Netherlands is higher than the reliability level in both Norway and the UK. Deregulation of the electricity industry in the UK went parallel with privatization that began in 1989. The electricity network comprises the network of the National Grid Company, NGC, and 14 regional networks. Originally, the regional companies provided both transportation and supply services, but they were unbundled in 2000, in accordance with the Utility Act 2000. The responsibility of network operators in the UK is set out in the standards of performance. There are two types of standards: guaranteed standards and overall standards. These standards include not only standards on network reliability itself, but also standards on some aspects of service quality (e.g., time of the investigation of a complaint). Guaranteed standards set service levels to be met for each individual customer and specify fines for underperformance. For example, there is a standard regarding restoration of supply, requiring that supplies should be restored within 18 hours; otherwise a payment must be made. The current payments are 50 pounds for domestic customers and 100 pounds for non-domestic customers, plus 25 pounds for each following 12 hours. Overall standards specify a certain average level of performance for a particular service (e.g., minimum percentage of supplies to be reconnected within 3 hours following faults).

Today, there are no clear regulations with regards to the established policies on the reliability of the system performance. Another important advantage of creating TSO is that the GoG will no more be responsible for reliability of the transmission system if there are outages and transmission network problems with the export. As of today, GSE is the regulatory body responsible for such issues.

**The impact of creating MO and the balancing market**

The MO will administrate the balancing market by carrying out activities related to registration of the participants and the bilateral contracts signed between them, as well as receiving bids and offers for balancing energy, preparation of merit orders, calculation and invoicing of the imbalances.

The MO costs are recoverable from market participants under the SEM, and hence these costs will be allocated to producers and suppliers, who will seek to pass them onto consumers. Whether they can do so or not depends on whether:

- The generators and suppliers have a regulatory guarantee of cost recovery; and
- The extent to which consumers can avoid these costs by switching supplier.

Furthermore, introducing balancing market will most likely change the current tariffs for Energo-Pro, Kakheti and Telasi (Table 5.2). This will be a result of having marginal price (change in total cost that arises when the quantity produced changes by one unit) in a competitive market.

| | Telasi | Energo Pro | Kakheti |
|---|---|---|---|
| 220/380 V | 13.56 | 13.56 | 11.698 |
| 6-10 KV | 12.618 | 9.968 | 8.106 |
| 35-110 KV | 7.28 | 8.274 | 6.412 |

**Table 5.2. Current tariffs for Telasi, Energo Pro and Kakheti**

In addition to the quantitative benefits listed above, international practices suggest that a range of other benefits will accrue from the ETM, although they are not amenable to objective quantification. These other qualitative benefits are defined as: improved competition locally and regionally, improved co-ordination of transmission operation, better management of flows in the future, and increased security of supply

# 6 QUALITATIVE ASSESSMENT OF ETM IMPLEMENTATION

In addition to the quantitative benefits, it is expected that the ETM will lead to the following qualitative improved market benefits, although they are not amenable to objective quantification:

**1. Market power benefits**: The existence of a marginal price should reduce opportunities for the exertion of market power. Notwithstanding this, market power is of considerable concern regardless of the design of the trading arrangements. The practical implication of the ETM is that less intrusive market power mitigation mechanisms are expected to be required in order to reach a functioning competitive market.

**2. Benefits from improved competition**: The ETM is expected to increase the level of competition in the generating sector in Georgia. In turn, the market competition is expected to improve operating efficiency from generators, to improve investment decisions and ultimately lower costs to consumers as estimated above. Improved competition under the ETM is expected as a result of:

• The wider scope of the market and cross-border trading;

• More transparent pricing rules for tariffs;

•Social impact: Improved competition will lead to welfare enhancing.

**3. Operational benefits**: Other expected benefits resulting from greater coordination of TSO and MO functions include:

• Better generator maintenance scheduling (and potentially transmission);

• Reduced failure propagation;

• Fewer black outs and brown outs problems; and

• Potentially reduced requirements for automatic generation control (frequency control).

At such a time however, the ETM will present advantages over CMS because the ETM involves integrated management of the transmission system.

**4. Regulatory benefits:** The ETM is a key step forward in the development of the regional development and cross-border mechanism for Georgia and a stepping stone towards a competitive market.

**5. Social benefits**: Inevitably, the process will bring concerns about the social aspects of this transformation. A competitive market, within the right regulatory framework brings wider social benefits. For instance, poorest customers will benefit from market innovation in new tariffs.

Next, competition and pressure to improve output can affect employment levels. Bringing flexibility to the workforce, together with fair policies and alongside Government support through social programs in specific problem areas are all essential to ensure the transition is carried out successfully. It is important for employment issues to be handled in a sensitive and constructive manner.

**6. Environmental benefits:** Allowing competition in the market and associated new opportunities for expanded inter-regional electricity trading could result in substantial changes in the mix of generation hydro technologies employed to produce electricity, in the efficiency of power plant operations, and in the price and quantity of electricity traded in the marketplace. These changes in turn could have potential implications for emissions, particularly of NOx and $CO_2$, for environmental quality and for economic welfare. At the same time that the industry in the region is moving towards retail competition, it is also facing the prospect of new environmental regulations to restrict emissions of NOx. The ETM supports the hydro production that adds an environmental benefit to the country

# 7 CONCLUSIONS

In the current electricity market in Georgia, electricity is priced at its average (not marginal) cost; customers never see marginal costs and generally cannot adjust their consumption to price (marginal cost) fluctuations; investments must be approved and are often mandated by regulators; and, therefore returns on capital are limited. The GEMM 2015 and ETM are designed to advance the GoG's electricity sector policies towards a competitive market. Our analysis shows that the NPV value from the ETM implementation is in the order of 1.2 bln USD based on 10 % discount rate for 10 years period which is a significant benefit to the power system of Georgia and to the country in general.

The idea of unbundling is twofold. On the one hand, unbundling should improve competition by restoring the level playing field among competitors. On the other hand, unbundling should improve the incentives for more investment in the sector. This in turn serves three goals. It improves competition, it improves supply security and it strengthens the development of the internal regional energy market. Therefore, in this analysis the underlying competitive concept is central**.** Overall, the promotion of competition is a key argument for the implementation of the ETM to protect the interests of consumers of electricity supplied by authorized suppliers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission or supply of electricity.

The full ETM implementation consists of the following four main stages: (a) formation and approval of a power policy by government that provides commitment needed to sustain the process, followed by the enactment of legislation necessary for implementing this policy; (b) development of a transparent regulatory framework for the electricity market; (c) unbundling of the integrated structure of the power supply into generation, transmission, distribution and supply activities and establishing a market in which electricity is traded; and (d) divestiture of the GoG's ownership at least in most of the electricity generation and distribution segments of the market.

In our analysis, the energy system modeling of the electricity market of Georgia provides a view of the cost and benefits based on assumptions and scenarios. Our findings quantify the positive impact of the ETM implementation. In particular, there will be reduction in retail tariffs for consumers, considerable potential electricity export increase by year 2016, decreasing the gas import dependence, and social welfare benefits. At the same time, the total power cost performance of the unbundling will not exceed by much the exciting electricity system. In addition, strong cross-border interconnections will have direct economic benefits and decreases generators possibility to exercise market power, increases the security of supply for all trading partners, and leads to more stable electricity prices and thereby lower risk on investments.

In principle, electricity markets bear a high risk of insufficient competition if governments fail to regulate adequately. This risk is relatively large if a certain government focuses strongly on equity and environmental issues and less on the issue of efficiency. As a result of insufficient competition, suppliers could be capable to raise commodity prices above marginal cost level. At the same time, generation and retail electricity markets yield major market advantages over vertical integration. First, they allow the efficient handling of business risk. There are substantial uncertainties in the short, medium and long term in power markets. Markets are good at handling these types of risk. Indeed, i.e., given the capacity of the oil market to handle much more significant risks, it would be odd if we did not leave these to the market in electricity.

In principle, there are several options to deal with the risk of insufficient competition. Measures aiming at hindering concentration of market players and improving conditions for entrance by new HPPs directly affect the degree of competition in the market. A totally different approach consists of reducing the demand of electricity. This type of policy is not primarily aimed at reducing market power or preventing a crisis, but at lowering the economy's vulnerability to such a crisis. Besides this effect, this policy measure could result in more competition as a reduced demand reduces scarcity, and, hence, market power of producers. In the long run, this effect will be mitigated as suppliers could respond to the reduced demand by adapting the extent of production. In addition, financial stability and the feasibility of investment are important to mitigate risks that relate to prices, foreign investments and government responsibility.

In conclusion, our findings in this report illustrate that a coordinated trading mechanism will lead to increase of market competition, increase of interconnection usage and reduction of GoG risk, as well as generation of revenue in market based methods.

# 8 APPENDIX A - STATEMENT OF INTENT

## 8.1 DEVELOPING AN ELECTRICITY TRADING MECHANISM FOR THE GEORGIAN POWER MARKETTOPROVIDE HYDROPOWER PLANT ACCESS TO REGIONAL POWER MARKETS

**Developing an Electricity Trading Mechanism for the Georgian Power Market to Provide Hydropower Plant Access to Regional Power Markets**

**January 2012**

### Objective

To design and implement the minimum modifications (compliant with EU competitive market principles and harmonized with the Turkish power market rules and procedures) to the Georgian power market design to enable Georgian Hydro Power Plants (HPPs) to sell their electricity output into the Turkish power market (and, eventually, other regional markets), with a trading mechanism that properly allocates risks among market players and provides dependable cross-border transmission capacity rights.

The intent in modifying USAID's current efforts in hydropower investment promotion is to support the widely-known Government of Georgia's (GOG) Strategic "10-Point Plan" in the following areas:

a. Creation, maintenance of a favorable investment and business environment;
b. Formation as a regional and logistical hub;
c. Upgrade of infrastructure – multimodal transport and energy hub for the wider region;
d. Georgia's integration into Euro-Atlantic institutions;
e. Legal and regulatory framework improvements.

The support provided under USAID's Hydropower Investment Promotion Project (HIPP) will also address the Ministry of Energy's priorities for becoming a regional leader in clean energy generation for domestic consumption and export of electricity.

Implementation of the enabling electricity market trading mechanism requires revisions of energy law and regulatory issues (primary and secondary legislation and regulations) and is important to the GOG, the developers of Georgian HPPs and lending institutions because it provides a key element of bankable HPP projects.

### General Assumptions

The following assumptions will direct the power market design and development of the enabling electricity trading mechanism:

1. Retail electricity consumers in Georgia would preferably not be negatively impacted by any change in the power market design;
2. To the extent possible, Georgian HPPs should enjoy the same market privileges, contract, and legal rights as HPPs in eastern Turkey;

3. Availability of financing for the construction of Georgian HPPs will be considerably enhanced.
4. The Turkish power market is still developing and harmonization with the Georgian power market, under European Network Transmission System Operators for Electricity (ENTSO-E) of the European Union's Acquis Communautaire will be a continuous process.
5. Clarity, certainty and transparency in the Georgian power market will improve investor confidence.

## Phased Transition

The process envisaged for implementing an enabling electricity trading mechanism will be a multi-phase process that aims to commence regional spot trading with improvements so that expanded types of trading can be added over time.

Phase 1 – Planning (conceptual future electricity market design including the energy law, revised market design and secondary legislation such as market rules, grid code, etc., a road map, action plans for each key market supporting entities, joint implementation agreement between GoG and donors/IFIs) (by the end of March, 2012).

Deadlines for the following items will be determined at the end of Phase-1:

Phase 2 – Implementation of action plans,

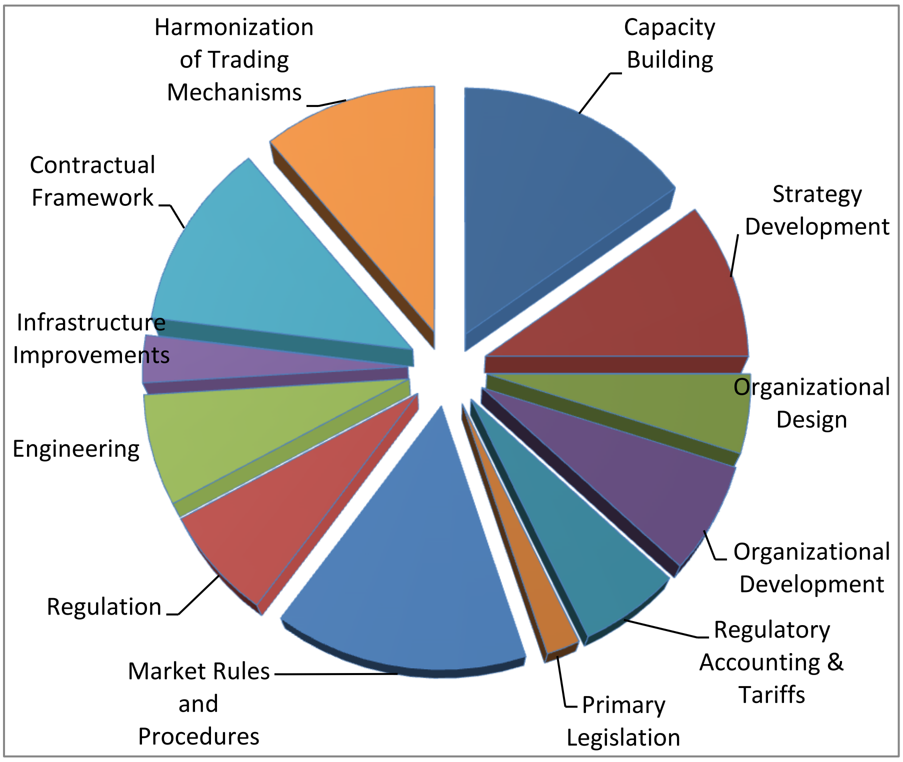
Phase 3 – Harmonization with Turkey's power market framework according to ENTSO-E rules,

Phase 4 and beyond – Implementation of next rounds with updated harmonization.

## Key Areas of Support

Competitive electricity trading in Georgia is mostly limited to direct line sales to end-consumers and export sales utilizing island mode.

Direct line energy sales are dependent on finding large energy end-consumers relatively close to power plant sites; therefore further growth of direct line consumers is quite limited. Island mode sales to Turkey will cease when Turkey joins ENTSO-E. New Georgian HPPs need a new mechanism that allows for open access on the Georgian electrical transmission




**Conceptual Interventions**

networks and an opportunity for competitive trading in regional power markets.

However, to enter the competitive power markets of Turkey and/or Southeast Europe, Georgian HPPs will need transmission paths, trading tools, and risk mitigation options so that they can compete effectively with other power traders in those markets.

Planning and implementing the development of the power market to allow Georgian HPPs to enter regional, competitive power markets will require support (level of effort) in several areas as illustrated in the pie chart above. The chart is illustrative and actual levels of support will be determined after the road map (conceptual plan) and entity action plans have been developed.

## Coordinated Approach

The level of resources and budget to fully support the process of designing and implementing the enabling electricity trading mechanism may require the GoG to look for assistance from various donors/IFIs and others (hereinafter referred to as "key stakeholders") to provide financing and their resources to meet process deadlines. In addition, regular feedback on the process by all key stakeholders will provide guidance to the GoG on the effectiveness of the process for reaching the goal of bankable HPP projects. Facilitation of the process will be through a Working Group composed of MENR representatives and selected key stakeholders. The Working Group will be responsible for providing input in:

- Designing and planning the process to implement the enabling electricity trading mechanism;
- Setting and monitoring deadlines and milestones that ensure the success of the process;
- Identifying areas of support that are covered under existing programs and soliciting support from donors;
- Ensuring effective use of each donor's resources focused on supporting the enabling electricity trading platform and ensuring no overlap of the activities;
- Communicating the results of the Working Group to key stakeholders and receiving feedback from key stakeholders on a regular basis.

If agreed upon by the participating key stakeholders, a joint implementation agreement will be signed by the participating key stakeholders with concurrence from MENR will commit to support of the Working Group and provision of resources for this process. Additional stakeholders may be added to the Working Group upon mutual agreement between MENR and stakeholders.

## Specific Support from Donors

The exact nature of key stakeholder support will be defined after the GoG approves the transitional plan for the power market and the conceptual plan for designing and implementing the power market enabling trading mechanism.

USAID plans to support the GoG to provide technical assistance covering many of the related required tasks including:

- Strategy development, conceptual design and road map development and entity action plans;
- Coordination of the Working Group activities;
- Process planning;
- Organizational design and development;

- Market procedures;
- Analysis of the regional markets and trading mechanisms in those markets;
- Contractual framework;
- Development of primary legislative changes;
- Support on negotiations with Turkish entities;
- Harmonization of market trading mechanisms.

**Support needed from other participating key stakeholders may include:**

- Capacity building in specific topics, including study tours to Turkey and SEE/EU;
- Infrastructure improvements and related training including metering, communications equipment, IT tools, trading models, and database development;
- Support from donors'/IFIs' regional representative offices, especially in Turkey, to develop electricity trading initiatives;
- Review of and feedback on documents developed by Working Group;
- Support for regulator(s) as it develops a framework for the energy trading mechanism;
- SMEs to provide targeted technical assistance in multiple areas;
- IFIs to review operating and market rules, legislative, contractual and other documents and provide feedback on their bankability.

## 9 APPENDIX B – ANNUAL GENERATION AND CAPACITY OF NEW HPP (GWH) AND OPERATION START YEAR

| Name of HPP | Installed Capacity (MW) | Annual Generation (GWh) | Completion of Construction |
|---|---|---|---|
| Abuli | 20 | 129 | 2014 |
| Adjaristskali 1 (Adjaristskali Cascade) | 26 | 128 | 2015 |
| Adjaristskali 2 (Adjaristskali Cascade) | 14 | 66 | 2015 |
| Adjaristskali 3 (Adjaristskali Cascade) | 6 | 32 | 2015 |
| Akhalkalaki | 15 | 85 | 2014 |
| Alpana HPP | 44 | 236 | 2018 |
| Aragvi HPP | 8 | 50 | 2015 |
| Arakali | 11 | 63 | 2014 |
| Bakhvi 1 HPP | 15 | 85 | 2017 |
| Bakhvi 2 HPP | 20 | 110 | 2013 |
| Bakhvi 5 HPP | 2 | 11 | 2013 |
| Bakhvi HPP | 6 | 35 | 2012 |
| Chorokhi (Adjaristskali Cascade) | 36 | 182 | 2015 |
| Dariali HPP | 109 | 521 | 2014 |
| Gubazeuli 6 HPP | 3 | 20 | 2013 |
| Khelvachauri 1 HPP | 36 | 154 | 2016 |
| Khelvachauri 2 HPP | 35 | 168 | 2016 |
| Khobi HPP 1 | 47 | 247 | 2017 |
| Khobi HPP 2 | 40 | 221 | 2015 |
| Khudoni HPP | 702 | 1500 | 2017 |
| Kintrishi HPP | 5 | 30 | 2014 |
| Kirnati HPP | 35 | 173 | 2016 |
| Koromkheti HPP (Adjaristskali Cascade) | 21 | 113 | 2015 |
| Kvirila HPP | 5 | 22 | 2015 |
| Larsi HPP | 20 | 98 | 2013 |
| Lekarde HPP | 20 | 107 | 2016 |
| Lukhuni HPP 1 | 11 | 66 | 2019 |
| Lukhuni HPP 2 | 12 | 74 | 2014 |
| Lukhuni HPP 3 | 8 | 46 | 2024 |
| Magana HPP | 21 | 106 | 2016 |
| Mtkvari HPP | 43 | 200 | 2015 |
| Nabeglavi HPP | 2 | 13 | 2013 |
| Paravani HPP | 78 | 425 | 2013 |
| Paravani Wind Power | 50 | 170 | 2014 |

| | | | |
|---|---|---|---|
| Plant | | | |
| Sadmeli HPP | 125 | 620 | 2016 |
| Shilda HPP | 5 | 28 | 2013 |
| Tsageri HPP | 110 | 570 | 2017 |
| Vaio HPP (Adjaristskali Cascade) | 40 | 196 | 2015 |
| Zomleti HPP (AdjaristskaliCascade) | 31 | 147 | 2015 |
| Zoti HPP | 36 | 144 | 2015 |
| **Total** | 1,872 | 7,391 | |

USAID Hydropower Investment Promotion Project (USAID-HIPP)

Deloitte Consulting Overseas Projects - HIPP

11 Apakidze Street, Tiflis Business Center

Tbilisi, 0171, Georgia