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HOW TO MONITOR ELECTRICITY MARKET FINANCIAL SETTLEMENTS

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31 October 2020

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DATA

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ACRONYMS

ACER	Agency for Cooperation of Energy Regulators
BRP	Balancing Responsible Party
CEER	Council of European Energy Regulators
DAM	Day Ahead Market
ENTSO-E	European Network of Transmission System Operators for Electricity
ERCOT	Electric Reliability Council of Texas
ERGEG	European Regulators Group for Electricity and Gas
EU	European Union
FERC	Federal Energy Regulatory Commission
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GoG	Government of Georgia
GSF	Generation Shift Factor
ISO	Independent System Operator
ISO-NE	Independent System Operator - New England
MISO	Midcontinent Independent System Operator
MMU	Market Monitoring Unit
MO	Market Operator
MW	Megawatt
NRA	National Regulatory Agency
NYISO	New York Independent System Operator
PJM	US Regional Transmission Organization
PPA	Power Purchase Agreement
PSO	Public Service Obligation
REMIT	Regulation on Wholesale Energy Market Integrity and Transparency
RTO	Regional Transmission Organization
SPP	Southwest Power Pool
SRMC	Short-Run Marginal Costs
TSO	Transmission System Operator
US	United States
USAID	United States Agency for International Development

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1. BACKGROUND

As Georgia shifts into competitive organized markets across its energy sector, it will be necessary that the Government of Georgia (GoG) creates a transparent rules structure to monitor and enable a successful introduction, and subsequent operation of the market. To accomplish this effort, the newly competitive electricity market will require effective market monitoring. Good market monitoring practices are marked by clearly understood processes, systemic reporting functionality, and analyses of its market design and surveillance. Georgia has a clear window within which it must affect these changes, upon which the success of its greater energy sector liberalization rests. The purpose of these guidelines are to inform and advise the GoG, specific to leading market monitoring practices of financial settlement and data management within organized markets, as it undertakes this ambitious effort.

Effective and efficient competition is critical for successful market liberalization and, as such, market monitoring is a prominent feature of modern wholesale electricity markets around the world. Market monitoring is a regulatory function that seeks to oversee restructured/liberalized electricity markets to ensure the markets are performing effectively by identifying potential anticompetitive behavior by market participants, evaluating and identifying ineffective market rules and tariff provisions, and providing comprehensive analysis and reporting. It can involve *ex ante* intervention in the markets directly (as in the US with offer caps and price caps or EU with price caps) or by way of identifying and recommending *ex post* investigations and market rule changes (as in both US and EU). In both the US and EU, as well as in other markets around the world, policy makers and other stakeholders have concluded that independent market monitoring is essential for successful liberalization. As a result, all the major centralized wholesale electricity markets in North America have established independent Market Monitoring Units (MMUs). In Europe, market monitoring is conducted both on a pan-European basis (through the Agency for Cooperation of Energy Regulators, or ACER) and at the individual national level (through each National Regulatory Agency, or NRA).

The success of the Georgia market reforms will depend on effectively identifying and mitigating market power through well-designed market monitoring and mitigation. In this report, we identify the market monitoring principles that will be best applied to the specific Georgia reforms using international leading practices.

2. GEORGIAN ELECTRICITY MARKET REFORM

As part of Georgia's greater ongoing energy sector liberalization, embodied within its European Energy Community Acquis, Georgia has in recent years made significant steps to reform its electricity market. It is doing so to earn and engender many of the benefits associated with more liberal and openly competitive markets—efficient deployment of existing capital by way of competitive energy and ancillary service markets, incentives for efficient investment through transparent pricing and market design, and greater price responsiveness by electricity consumers.

The Georgian electricity market reforms reflect the key elements of the EU internal energy market design. The central features are the creation of day-ahead and intraday markets for energy and ancillary services products, an imbalance market, and markets for bilateral contracts. Initially, the markets will operate alongside existing long-term contracts that were entered into prior to reform using the creation of public service organizations. The public service organizations will also facilitate the trading and development of renewable energy and interim support for the Universal Service Provider.

On the supply side, all resources in the Georgia electricity sector generally are eligible to some degree for participation in the wholesale markets (Day Ahead Market (DAM), ancillary services, and balancing). Part of the generation fleet is mainly Public Service Obligation (PSO) power plants and power plants with guaranteed Power Purchase Agreement (PPAs) that are obliged to sell into the DAM. Power will be procured from existing supply contracts, resources selling physical capacity into the organized day-ahead and intra-day markets, and imports from neighboring systems. Ancillary services and balancing energy will be supplied from eligible physical suppliers. The public service obligations are important constructs that will integrate existing obligations into the newly formed markets.

On the demand side, buyers in the wholesale market include the Universal Service Provider, Supplier of Last resort, competitive suppliers, and individual Large Customers.

All participants using the electric system will belong to a balancing group to manage injections and withdrawals from the grid. These Balancing Responsible Parties (BRPs) can schedule resources and contracts into the DAM and make spot purchases in the DAM and intraday day markets to meet its anticipated obligations in real-time. In the operating time frame, following the clearing of the intra-day markets, the Balancing Market will settle any schedule deviations arising from the bilateral, over-the-counter market, DAM, intra-day markets. Like the DAM, the Balancing Market as well as the ancillary services market will be cleared using market bids and offers.

Markets will clear based on bids and offers by stacking offers in merit order (lowest offer to highest offer) and clearing the lowest offers against the demand. Except for balancing capacity, which clears pay-as-bid, the markets will clear at a uniform price – highest-cost offer cleared is the single price paid by bidders and received by all offers. Hence, lower-cost offers can receive payment above their offers. This is the well-known uniform single-price auction that creates incentives for efficient bids and offers.

Traders can participate in scheduling imports and exports and can take positions in all other segments.

Universal service supplier will procure power on day ahead and intraday markets (and is responsible for balancing costs) and resells at regulated rates to household and small enterprises who did not choose a supplier. The market purchases by the universal service supplier may be protected against deviations in accordance with Georgia Energy Laws.

There are a number of other elements of the Georgia market that will affect the final details of a market monitoring approach, for example, public service obligations will remain for certain participants in order to support previously approved contracts and to support obligations to the universal service supplier and renewable development. However, introducing competition in forward bilateral contracts, the DAM, intraday and balancing markets are key reforms aimed at efficient and effective procurement of power supply in the wholesale market. As a result, the main elements of a market monitoring approach will address these key features of the market reform. These features are where competition will be most focused and where guards against market power abuse and manipulation is most essential.

3. THE NEED FOR MARKET MONITORING

As the EU and US have sought to liberalize their electricity markets by placing greater reliance on market mechanisms to price electricity and allocate resources, market monitoring became a critical aspect of successful liberalization. Though, relying solely upon competition within the organized market itself is not sufficient to realize its full performance potential or to prevent market abuses, as evidenced through such case studies as California's 2001 energy crisis when market power abuses and market design flaws resulted in inefficiently high prices and severe shortages. Therefore, in both the US and EU, the regulator is charged with monitoring these organized markets – e.g., energy (physical and financial), ancillary services and balancing, capacity and transmission rights. Both US and EU market monitoring schemes consist of an oversight function, which seeks to identify market design defects and solutions, as well as a *market surveillance* function (to detect and respond to market manipulation, abuse, and insider trading).

Market monitoring is an important means to address structural impediments that may remain and prevent the full benefits of competition.

Market power is the primary impediment to effective competition, if not addressed. It can materialize in two distinct forms and provides the ability to raise the price above what would otherwise prevail under competitive conditions (i.e., marginal cost to generate energy). The forms of market power are:

- Vertical market power: Occurs when the owner of the monopoly transmission network also owns or has interest in generation assets. Nascent organized market with limited competition are particularly sensitive due to the pre-existing integration of generation supply with the ownership and operation of the high-voltage transmission grid. Vertical market power is initially and primarily mitigated through open access transmission requirements and independent system operators (as is used in the US), and EU member state regulations unbundling Transmission System Operators (TSOs) from market operation and participants, as is the case in Georgia.
- Horizontal market power: Occurs when a firm or a group of firms on the same level of production can control supply and price by withholding supply from the market or raising offer prices in the auction. Collusion can occur as a single firm or a group of firms across markets, or within select hours such as the DAM over hourly increments. Dominant firms can also engage in predatory pricing whereby prices are offered below costs in order to drive out rivals.

For Georgia, at the outset of its market opening, monitoring of horizontal market power (e.g., the price-setting process as related to data availability and accessibility) will be most critical. Transferring operational control of the network to an independent TSO will substantially ease vertical power issues, but the actions of the Market Operator and the TSO can still have a larger effect on the market outcomes than most individual participants. Therefore, a central role of the market monitor should include monitoring the operators.

4. STRUCTURING AND APPROACHES TO MARKET MONITORING

Prior to the commencement of its market opening, it is important to consider how Georgia may want to apply key leading practices in international market monitoring to ensure effective market competition and help drive efficient outcomes. Special consideration should be afforded to how these recognized global leading practices will fit into the Georgian context, especially its current market liberalization status.

MARKET MONITORING INDEPENDENCE AND RESPONSIBILITIES

Under both the US and EU energy policies, market monitoring is a regulatory function and aims to promote transparency in the wholesale energy markets as well as address market power and market manipulation. Additionally, market monitoring units also assess the comprehensive market design and normal functioning. In the EU, monitoring is conducted both at the EU / regional level, through activities of ACER under REMIT¹, and at the national level through the NRAs. The EU regulations require that each member state designate a single NRA that is independent from the government and any private entities. In the US, wholesale markets are regulated by Federal Energy Regulatory Commission (FERC), which is an agency of the national government which oversees the interstate transmission of electricity, including establishing the monitoring provisions of regional power markets.

Provided the necessary independence of the NRA is established in accordance with EU rules, a monitoring function within the NRA would be sufficiently independent. Accordingly, to ensure independence, the monitoring function should be granted complete independence to perform those activities necessary to provide impartial and effective market monitoring. FERC has established strong independence requirements in its Order 719 that prevent interference in investigations, reports, and recommendations developed by the monitoring function provided they fall within the scope of market monitoring responsibilities.

The Market Monitor should undertake the following responsibilities.

1. Evaluate existing and proposed market rules, market design elements, and recommend proposed changes.
2. Review and report on the performance of the markets to the Commission on at least an annual basis.
3. Identify, and notify the Commission of instances in which a market participant's behavior, or that of the network operators, may require investigation, including suspected violations of commission-approved orders, rules and regulations, and suspected market manipulations. In instances where mitigation action is authorized in advance, the monitors may take such actions.

Based upon a review of the Georgian market rules, Georgian National Energy and Water Supply Regulatory Commission (GNERC) has the authority to undergo the critical duties outlined above of the market monitor.

Independence from the Market Operator (MO) and TSO is essential. Industry experts consider the separation of the operation of the electricity market from the market monitoring function to be a leading practice in North American electricity markets. Independent market monitoring relieves the market and transmission operators from an inherent conflict of interest associated with overseeing the conduct of market participants and, more importantly, with overseeing its own planning and operations. After instances of interference in US markets, the market monitoring function became predominantly organized into external units. In 2007, FERC issued rules that prevented these service contracts from being terminated without its approval and that these external MMUs would receive adequate data and information. The Midcontinent Independent System Operator (MISO), the PJM Interconnection (US Regional Transmission Organization), and Electric Reliability Council of Texas (ERCOT) all have external independent MMU. The New York ISO (NYISO) and ISO New England

¹ The Regulation on Wholesale Energy Market Integrity and Transparency (REMIT) is an EU regulation adopted in 2011 and is a key component of EU market monitoring.

(ISO-NE) also have external MMUs together with internal units. The Southwest Power Pool (SPP) is alone in having a purely internal MMU.

In the US, FERC retains the ultimate authority to enforce transmission tariffs and market rules, including required changes in participant behavior and market design, similarly to the role of the NRA in the EU market. Market monitors are established by TSOs in the US, but their scope of activities is regulated closely by FERC. The role of market monitors, which in many instances are separate entities from the TSO in the US, is to advise and inform FERC. Under the EU's structure, market monitors are generally housed under the NRAs. ACER, at the pan-European level, assists in the monitoring of cross-border trade and refers anomalous cases to individual NRAs concerning market manipulation, market power, and insider trading. ACER supports the investigations of the NRAs through data sharing, but the NRAs retain enforcement powers. NRAs are required to cooperate with ACER at regional level and can choose to conduct additional or complementary monitoring. As the designated NRA, GNERC would serve to enforce or amend market rules, such as formal investigations, dispute resolution, market participant sanctions for misconduct or non-compliance, opining on market design to rectify market flaws or enhance market performance. However, its domestic organized markets are not surveilled by ACER, and the mode and methods of monitoring market activities would be under the authority of GNERC.

It is understood that GNERC intends to develop a market monitoring unit internally, and therefore follow the EU model. This is a reasonable approach so long as the unit is independent of all market participants, as required by EU regulations.

Minimum criteria for market monitoring plans. Per its 2008 Order 719, FERC requires MMUs to have filed and approved market monitoring plans that meet minimum requirements. Specific core tasks include: (1) responsibility for evaluating market and tariff rules to determine effective market design and effectiveness and proposing recommended changes; (2) monitoring participant conduct and referring suspected wrongdoing to the Commission; and (3) analyzing and reporting on the performance of the wholesale markets.

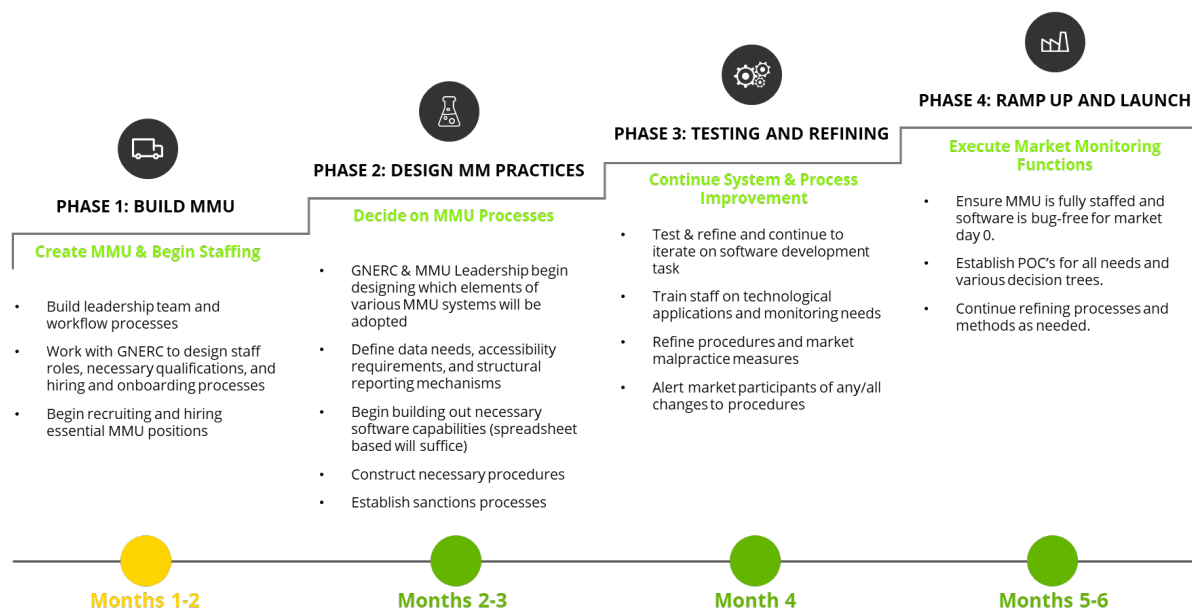
As part of these specific requirements, MMUs must have access to market data, resources, and personnel sufficient to enable the MMU to carry out its functions. All market data collected and produced by the Regional Transmission Organization (RTO) as well as its databases must be available to the MMUs, especially operating data which is particularly vital to monitoring the TSO and MO market impacts. MMUs detail their authorities and discretion of their activities with market monitoring plans, which are then approved by FERC.

For an example, see the ***MISO Independent Market Monitoring Plan***:
<https://cdn.misoenergy.org/Module%20D108025.pdf>

Although the required data collection and reporting is outlined within the Georgian market rules, this is still an important exercise. ***We recommend GNERC develop a market monitoring plan to detail its effective monitoring, analyses and reporting on the electricity market performance and conduct of its participants, in a transparent and impartial manner.*** Not only does this signal fair and prudent regulatory review, but it also clarifies and standardizes expectations for market participants as to roles, responsibilities and obligations. Further, assumed to be a new functioning unit within GNERC, the market monitoring plan also provides for capacity building and continuity of operations with new human resource recruit and staff attrition. The plan would also serve as an outline of the monitoring procedures, which we recommend be developed prior to market opening.

Aiming to be fully operational by the opening of the day-ahead market in the summer of 2021, the market monitoring unit will need to undergo the following activities, include the recruiting, hiring, onboarding & training of staff, procurement of key enabling technologies and software, establishment of market monitoring procedures and reporting, data access decisions, and ideally in-depth simulation-based “dry-runs” to allow for a smooth transitional process.

Figure 1: MMU Setup Roadmap



MARKET MONITORING APPROACH – US VERSUS EU

Conforming to the EU market rules, Georgia will need to consider how it implements its market monitoring approach. The European and American market monitoring approaches are largely comparable to the extent they seek to identify adverse conduct and address such conduct through mitigation (i.e., reduce the impact of such adverse conduct). US industry peers have adopted an *ex ante* approach to market monitoring that has proved successful in control market power. This approach has been used to a small degree in the EU through price caps, and there is not necessarily a constraint in applying it more broadly. *Ex-ante* simply means the monitoring and mitigation approach actively surveils actors to identify and mitigate improper market conduct or activity *before* it occurs. Penalties, sanctions, or remediations are then decided and disbursed based on that activity.

EU directives for NRA monitoring contemplate *ex ante* measures to prevent market power and manipulation and so such approaches would be consistent with the EU policies. Regulation (EC) 1227 provides explicitly for market monitoring for market manipulation in wholesale electricity markets. In article 7 of Regulation 1227, market monitoring is addressed, specifically:

- [ACER] shall monitor trading activity in wholesale energy products to detect and *prevent* trading based on inside information and market manipulation. It shall collect the data for assessing and monitoring wholesale energy markets as provided for in Article 8 (*emphasis added*).
- National regulatory authorities shall cooperate at regional level and with the Agency in carrying out the monitoring of wholesale energy markets referred to [in above bullet].

We recommend Georgia implement a form of ex ante mitigation through offer caps in the interest of stable outcome in the newly formed market, which will aid in identifying market design flaws or abuses early on and provide the ability to mitigate for them.

Below we outline, broadly, common methods used in market monitoring to provide insight concerning alternatives that may be available to Georgia monitoring systems:

US RTO Markets. Market monitoring in the US RTO markets is conducted across a wide time frame and uses many measures. Market trading data is collected on a continuous basis and the RTO makes this data available to the MMU. The MMU processes this data for a variety of screens and indices to detect instances of market abuse, market failure, or anomalous outcomes. Several of these pertinent to Georgia’s market opening are discussed in these guidelines, such as offer caps and floors. As part of the *ex-ante* method, these continuous data feeds are also used in automatic mitigation systems that check bids and offers in real-time and day-ahead to determine an adverse impact from participant conduct. Given the nascency of the Georgian organized market, it is recommended to prioritize

mitigation techniques that would both *prevent* and catch abuses, manipulation, or gaming before the gains can be made.

On a longer timeframe, daily reports are assembled that summarize market activity. If certain screens are violated, the MMU will manually investigate circumstances. These may or may not result in more formal investigations depending on the informed judgment of the MMU. In some RTOs, monthly reports are produced that present market outcomes and other competitive issues affecting the markets. On an annual basis, the MMU releases a State of the Market Report, which provides a comprehensive analysis of market outcomes, market developments, and other major developments.

An example of the NY-ISO's report is provided here:

<https://www.nyiso.com/documents/20142/2223763/NYISO-2019-SOM-Report-Full-Report-5-19-2020-final.pdf/bbe0a779-a2a8-4bf6-37bc-6a748b2d148e?t=1589915508638>

The MMU also has the authority to launch formal investigations or may be asked to investigate matters by FERC. Oftentimes, the RTO works closely with the MMU to resolve market design and operating issues.

With the market monitor as an internal unit, GNERC would also have the ability to compare and analyze other various required filings from licensees and market participants.

MMUs may present to RTO Boards, regulatory forums or stakeholder committees but they *do not* report to the RTO Board (i.e., the RTO has no purview over its analyses). These market monitors will also regularly meet with FERC and individual state regulators.

EU Market. Market monitoring in the EU is largely practiced on an *ex post* basis in which ACER or the NRAs address market abuse through after-the-fact investigations. Market abuse under REMIT includes insider dealing and market manipulation.

Insider Dealing. Article 2(1) of REMIT defines “inside information” as information which has not been made public, relates, directly or indirectly, to one or more wholesale energy products and, if it were made public, would be likely to significantly affect the prices of those wholesale energy products. The types of information this would encompass include the availability and operations of key facilities, production, transmission, and storage facilities; information required to be released under EU or national transparency policies and regulations; and other information that a market participant would use as a basis of its decision to buy or sell wholesale products. This excludes internal strategic information such as risk assessments and proprietary forecasts.²

Under REMIT, these activities would be monitored by identifying trades that have a significant price effect and that:

- were made by major market participants before the announcement of the information, having a significant price effect; or
- were part of anomalous changes in the volume and prices just prior to release of the information.

Market Manipulation. Article 2(2) of REMIT specifies four categories of market manipulation.

- Entering into or attempting to enter into a transaction that gives false or misleading signals as to the supply, demand, or market price;
- Entering into or attempting to enter into a transaction that attempts to secure the price a wholesale energy product at an artificial level;
- Entering into or attempting to enter into a transaction that attempts to employ deception which gives false or misleading signals regarding the price, supply, or demand;
- Disseminating information that gives false or misleading signals as to the supply of, demand for, or price of wholesale energy products.

The main indicators used to monitor for manipulation are discussed below.

It is important to note that, unlike in the US RTO markets where market power mitigation can be applied during the day-ahead and real-time horizons, actions under EU surveillance function for manipulation and market power has been confined to detecting adverse conduct through the REMIT process, which answer such occurrence with an *ex post* investigation. With Georgia currently

² ACER Guidance on the application of REMIT. Updated 4th Edition (2016), ACER

operating under the REMIT “Light” regime, it would be limited in the cooperation of market monitoring between Georgia and ACER. Further, Georgia’s bilateral trading is also outside of the European Network of Transmission System Operators for Electricity (ENTSO-E) grid; and, therefore, the purview of ACER’s cross-border market monitoring.

As highlighted above, the EU directives provide for such *ex ante* approaches, and implementing these within Georgia would be extremely important for a nascent market where market power is likely to be a significant or a not fully-understood factor. As we explain below such as:

- Physical Withholding Capacity (either unilaterally or in coordination)
- Market Manipulation
 - Examples include: Economic withholding, offering below costs to create congestion, raising offer costs in anticipation of operator necessity, and causing congestion using financial positions to benefit congestion rights
- Gaming
 - Congestion or losses are mis-matched between day ahead and real-time models;
 - Rules that allows a resource to deviate from a schedule but over time is effectively a “derate”;
 - Under scheduled load due to modeling and operations;
 - Rules that allocate uplift costs may provide adverse incentives;

5. MARKET MONITORING LEADING PRACTICES

Using international leading practice, below identifies a general framework for market monitoring, explaining key data requirements, analyses and metrics as well as tactics for market power mitigation in the context of Georgia. This proposed framework for a market monitoring plan includes:

- Participants to be monitored;
- Market Power Mitigation (Offer caps for firms with market power, referral to the commission);
- Metrics and Analysis;
- Access to data by monitoring unit;
- Retail Monitoring (eventually, in Georgia’s case); and
- Penalties.

PARTICIPANTS TO BE MONITORED

Market monitoring involves overseeing participants, processes, and entities that can influence market outcomes. This means all participants buying and selling in the competitive sector, including sellers and buyers in the DAM, buyers and sellers in the balancing markets, and competitive buyers and sellers in the bilateral contracts market. In addition, activities of the retail supplier should be monitored. The transmission operator and the market operator will also be monitored. The transmission operator will be monitored to ensure its operating procedures are well-documented and do not interfere with market efficiency. The market operator should abide closely to market rules and provide market data to assist the monitoring function. Below outlines issues commonly monitored for each market participant and key data indicators. Some of these screens are discussed in more detail in the Recommendations section.

Table 1: Common Monitoring Issues & Key Data Indicators by Market Participant

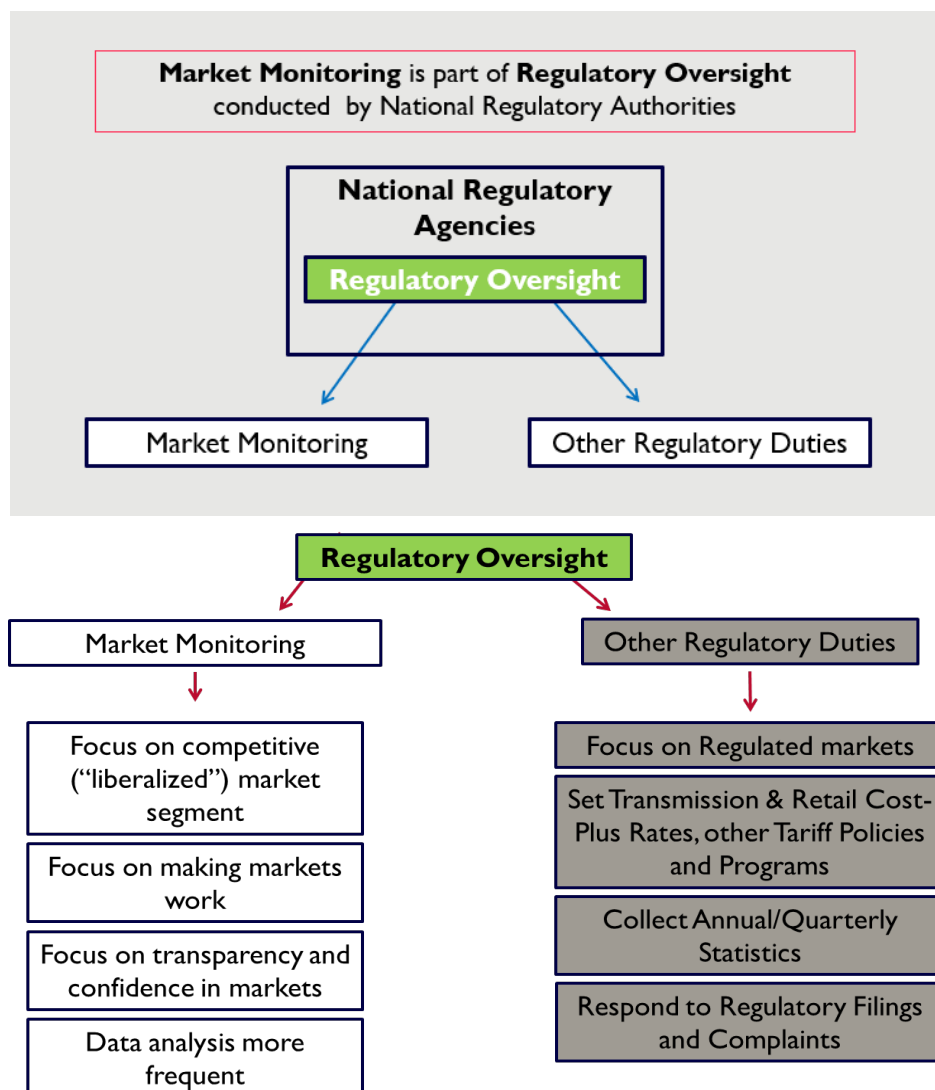
	Market Monitoring Issues	Key Data / Indices	Monitoring Frequency
TSO/ Transmission Owner	Reliability commitments, or out-of-merit dispatch Transmission Line outages Cross-border capacity estimates	Reserve level reports; Transmission outage reporting; Transparency obligations (EU Regulations)	Daily, weekly, monthly, annually
Market Operator	Load forecasting accuracy Congestion management	Uplift reports; Settlement revisions; Price corrections;	Daily, Monthly, as requested.
Market Participants	Market Power and Market Abuse De-ratings, Outages and Curtailments Dispatch Performance Efficiency Price Signals for New Generation	Reference level data for costs and physical parameters Market Price spike indicator in DAM and balancing markets Economic withholding tests Physical withholding tests Over / under production Net Revenue Analysis to assess entry incentives	Daily, Monthly, Annual and updated as needed in accordance with recommended procedures.

ORGANIZATION OF MONITORING UNIT

As an internal unit to GNERC, the market monitor should be closely involved in regulatory activities that affect the market and provide insight and comments through its reporting to regulator authorities relative to the market outcomes and its outlook. These reports and analyses will feed into other regulatory oversight activities that may ultimately be impediments to competition. For example, as a regulated entity, the transmission owner will be regulated to ensure proper cost accounting for transmission upgrades and expansion. Market monitoring may uncover issues relevant to transmission investment planning that are underlying barriers to improved market performance. It may also be beneficial for GNERC to establish standing market development task forces, committees, etc., who are responsible for revising market rules to review the market monitor reports. The market

monitors should be a participating member of these discussions, and the commission should also request comments of the monitor in proceedings involving market rules.

Figure 2: Electricity Market Monitoring and Regulatory Oversight



MARKET POWER MITIGATION

OFFER CAPS

Most US wholesale electricity markets have some form of price or offer caps to mitigate market price spikes or stave off potential market failures that may result from excessive concentration of generation ownership and inelastic demand for electricity. In the US, asset-specific offer caps are developed for all resources. These asset-specific offer caps, (i.e., a cap for each individual resource) are applied only when the resource is determined to have market power. For example, in MISO, the offer caps are applied using a two-part test. First, a participant's offer is tested against the asset-specific cap to determine if the offer is higher than the cap. If so, a second test is used to determine if the "high" offer will materially impact the market. If so, the offer is capped in the market clearing engine. This is the *conduct-impact test*.

The essential feature of this approach is that participant conduct is measured against what competitive conduct is expected. If the conduct is not competitive, the participant may be mitigated by being required to offer at a cap or, as explained below, required to offer other alternative, competitive physical parameters (e.g., ramp rate, minimum and maximum output). Effective mitigation would impose offer caps on such participants to prevent offers from exceeding the marginal cost of their generating units. As such, asset-specific offer caps are central to effective market monitoring as well as to effective development of competitive markets.

In newly developed markets, like Georgia, due to software constraints and data availability, it may not be feasible to test whether a participant's conduct may affect market outcomes, and decidedly impose an offer cap. US power pools generally run these conduct-impact tests as separate simulations prior to the final market run (e.g., DAM, ancillary service and balancing market clearings), which would require a continuous feed of market data between the market operator and the market monitor. Instead, ***Georgia might consider imposing offer caps at all times or at generally defined times when a participant is most likely to have market power, such as during peak hours for some units and non-peak hours for others, depending on the resource.***

Opening competitive markets in 2016, Mexico requires that all generators offer into a multi-lateral power market, dispatching to serve load in each hourly market based upon the merit order of lowest-offered resources. All generators are paid the price equal to the highest offer among selected generators, also called "pay-as-cleared" or "single-price". When there are many small suppliers, this structure creates strong incentives for an individual supplier to offer its power at the short-term marginal cost to ensure it is dispatched at a price equal to or higher than its marginal costs. When the market is less competitive and one or more suppliers dominate the market, there may be incentives at times to offer into the market above the suppliers' true costs. To prevent such behavior, Mexico restricts supplier's offers to 110 percent of their short-run marginal costs as a market power mitigation measure. These short run marginal costs are submitted by generators, regardless of size, and subject to review by the regulator and the offer caps. Unlike in some US RTO markets, the offer cap is applied regardless of whether a generator may be determined to have market power. This approach can be reasonably applied with the data on hand, adjusted annually during the review of market performance, providing a preventative stop-gap measure with regards to concerns such as price spikes or other market distortions. ***If an offer cap is imposed, Georgia should take caution to not suppress the true cost of power that would otherwise send an appropriate price signal to new supply.***

As we discussed above, the EU directives for energy regulators to monitoring electricity markets allow proactive measures to prevent market power and manipulation. Hence, a plan that caps offers to prevent market power is consistent with Regulation (EC) 1227:

trading activity in wholesale energy products to detect and *prevent* trading based on inside information and market manipulation. It shall collect the data for assessing and monitoring wholesale energy markets as provided for in Article 8 [of Regulation EC 1227] (emphasis added).

OFFER CAP LEVELS

Offer caps are intended to restrict participants to offers that reflect competitive conduct. As such, a cap on price offers would be a cost-based value that corresponds to the marginal cost of providing service. In US RTOs, these are called "Reference Values" or "default values". In the case of an offer price for energy, the offer cap would correspond to the cost of producing a Megawatt (MW) of output in the operating horizon, i.e., the period starting day-ahead when units begin to start-up and operate). These values are not public data because publishing them may undermine individual firms' business positions and allow for increased risk of market collusion. In the day-ahead and balancing markets, competitive offer caps would be the cost of producing a MW of output. For fossil fuel plants, this is the fuel cost of production. For wind and solar, it is close to \$0. For hydro resources, it is the opportunity cost of reservoir water, which under fairly general conditions, corresponds to the cost of marginal fossil-fuel units during peak periods.³

Effective mitigation would apply these offer caps when the resources are expected to have market power. A second-best solution would be to apply asset-specific caps at all times.

OFFER FLOORS

While an offer cap is somewhat logical, an offer floor may also be important. In some cases, a resource may want to produce even when its costs are higher than the market clearing price. It may wish to do so to create congestion to benefit its affiliate operations. A resource that over produces could cause congestion on the transmission network. An affiliated resource could then offer at higher prices in the constrained area. A resource could also use this tactic to undercut its competition, such as a dominant supplier that can sustain price cuts to drive out smaller, marginally competitive suppliers. In such cases, offer floor parameters should be established to detect when a unit is offering in a way that may create market abuse.

³ Some renewable energy resources receive subsidies for each MWh of output, so such a unit can have a negative offer cap.

CAPS AND FLOORS FOR OTHER PARAMETERS

Offer caps and floors apply not only to the prices at which power is offered, they can also apply to “physical parameters”. This will primarily involve minimum and maximum capacity for resources offering into the day-ahead and balancing market. It may also involve minimum down times and minimum up times, depending on the parameters used in competitive market. For these physical parameters, a participant use inaccurate values in order to understate the capability of its unit in and therefore to keep it out of the market and cause a price increase. For example a unit that offers an overstated minimum down time may cause the market operator to be short of resources due to the unit’s artificial down time requirement. A unit may also find it advantageous to offer a maximum quantity of output that is below its technological maximum output. This is withholding from the market that can cause artificially high prices. This can cause a unit to be withheld from either the DAM or the balancing market.

Like the mitigation measures introduced above, the mitigation of offer parameters is another (and perhaps the primary) tool that Georgia can use to protect wholesale competition.

All resources offering into DAM and imbalance markets should be assigned offer caps and offer floors to be in place either 1) during time when the resource is expected to have market power, or 2) at all times, if the first condition cannot be determined.

The following caps and floors should be established based on the technical specifications of the resource:

- Price Offer Cap / Floor (\$/MW).
- Start-up cost offer cap (\$);
- Resource output minimum (MW) – the minimum output at which a unit can operate;
- Resource output maximum (MW) – the maximum output at which a unit can operate;
- Resource minimum downtime (hours) – the minimum amount of time a unit must be turned off before starting again;
- Resource minimum run time off cap – the minimum amount of time a unit must operate once it is started.

METRICS AND ANALYSES

Market monitoring and surveillance is a continuous and vigilant process of detecting anomalies within the market operation itself as well as of individual behavior to discover market performance issues or market abuses. GNERC should avail itself of the key reporting data it receives from its licensees, or other publicly available data, such as Council of European Energy Regulators (CEER) thematic analyses and ACER Market Monitoring reports to help establish relevant key benchmarks, and identify market distortions or trends that may reflect issues with market performance or behavioral habits of the market participants both within its market as well as cross-border. It should be emphasized that the market monitor will need to surveil across markets (e.g., DAM, balancing, etc.) as well as specifically within each. For behavioral assessment, Georgia should establish a logging of events and findings to develop trends analyses with individual and market behavior as a whole. The table below represent the key areas that Georgia should consider monitoring within and across each market:

Table 2: Leading Practices for Market Monitoring & Surveillance

Metrics and Analysis – Application to Georgia		
Day Ahead Energy and Balancing Capacity markets	Real-time Balancing Energy	Retail Monitoring
Price trends Price spikes (actual compared to simulated) Economics withholding Physical withholding Traded volumes Pivotal supplier	Price trends Traded volumes Pivotal supplier Balancing Settlement Reports	ACER/EREG-style ⁴ market development statistics (later phase of reform)

The market monitoring system should not only interface with the market operator system but also have the capability of performing the market monitoring analyses below and above-described mitigation functions. ***If GNERC’s software does not have the capability to mitigate in real-time, then GNERC should collaborate with the market operator to integrate these mitigations into its system and generate relevant reporting to be directed to GNERC’s market monitoring unit.*** Ideally, the market monitoring system should include:

- Data interfaces to automatically receive, read and manage data from multiple sources such as general market information and conditions,
- Calculate and report out indices and screens as pertinent to the market monitor,
- Produce real-time alerts,
- Run scenario analyses.

ANTI-MANIPULATION UNDER REMIT

A key function of market monitoring is to ensure that market participants are unable to exercise market power to affect price outcomes. In the EU, REMIT is the basis for the monitoring of market manipulation. The following metrics have been proposed in the EU to meet the objectives of REMIT and will likely be applicable to Georgia at a later point when market liquidity increases, and it becomes more fully integrated with ENTSO-E.

- Trade orders representing a significant portion of the daily volume of transactions coincident with a significant change in price;
- Trade orders undertaken by participant a significant buying or selling position coincident with a significant change in price;
- Trade orders that lead to no change in beneficial ownership of a wholesale energy product;
- “Wash” trades” –transactions with position reversals in a short period that represent a significant proportion of the daily volume
- Trade orders undertaken in a concentrated time span and lead to a price change which is subsequently reversed;
- Trade orders undertaken that change the representation of the best bid or offer prices and are removed before they are executed;
- Trade orders undertaken at or around a specific time when reference prices, settlement prices and valuations are calculated and lead to price changes which influence such prices and valuations; and

Uneconomic trades lowering or increasing the market price and enabling a market participant to subsequently profit to a much greater degree through separate trading activity via a larger connected accrued position.

STRUCTURAL MARKET POWER ANALYSIS

In electricity markets, it is important to evaluate the competitive structure and performance of the markets using various measures to identify the presence of market power. Structural analyses identify market dominance by participants as measured by the portion of the market they serve. These analyses are important to consider when evaluating what market power mitigation rules may be necessary for the market to produce reasonably competitive outcomes.

⁴ European Regulators’ Group for Electricity and Gas, Ref: E10-RMF-27-03 12 October 2010.

A *pivotal supplier* metric is a structural analysis that can be applied to wholesale power markets. This analysis addresses the frequency with which suppliers in the market are “pivotal” – i.e., necessary to serve load reliably or to resolve transmission congestion. A *pivotal supplier* metric considers both the supply, demand, and import capability into a particular area of the market. A supplier is pivotal when some of its resources are needed to satisfy the demand (i.e., it is a monopolist over some portion of the load). Other common structural metrics are concentration ratios that measure the portion of the market that a participant or group of participants controls. This is measured by portion of sales or production capacity. For example, a common one is the two-firm market share ratio, which measures the control of the market by the largest two firms. The following figure shows the calculation of concentration ratios for a hypothetical market. The calculation uses MWh as the measure of sales and alternatively MW of installed capacity.

Figure 3: Calculation of Concentration Ratios

Firm	Production	
	MWh	Capacity
A	54,750	250
B	36,500	125
C	15,330	70
D	10,950	50
E	10,950	50
F	7,300	25
G	5,475	25
Total	141,255	595
One-Firm Ratio	39%	42%
Two Firm Ratio	65%	63%
Four Firm Ratio	83%	83%

Such metrics can be used as another tool to determine in Georgia if *ex ante* market power mitigation measures should be invoked. In instances where pivotal suppliers are present, common US market monitor practice is to require the pivotal resource to accept its ‘reference value’ offer or the marginal cost estimate. These values are calculated regularly, often daily, in US power markets and may include a small adder.⁵

BEHAVIORAL MARKET POWER ASSESSMENT

While structural analyses measure indicative market power, behavior analysis seeks to directly observe market power by analyzing participant conduct to determine whether it is consistent with competitive behavior or whether there are indications of attempts to exercise market power. There are three main types of behavioral assessments that seek to identify the exercise of market power: economic withholding, physical withholding, and overproduction.

Economic withholding occurs when a participant offers its resource at a price substantially above a competitive offer (i.e., above its marginal cost) in an effort to raise market clearing prices. An analysis of economic withholding requires a comparison of actual offers to competitive offers. Suppliers lacking market power maximize profits by offering resources at their marginal costs. A generator’s offered marginal cost is its incremental cost of producing additional output.

To identify potential economic withholding, one needs to calculate an “output gap” metric. The output gap is the difference between the economic output level of a unit at the prevailing clearing price, based on the unit’s Short-Run Marginal Costs (SRMC), and the amount actually produced by the unit. In essence, the output gap quantifies the generation that a supplier may be withholding from the market by submitting offers above competitive levels. Therefore, the output gap for any unit would generally equal:

⁵ https://www.ferc.gov/sites/default/files/2020-05/AD14-14-mitigation-rto-iso-markets_0.pdf.

$Q_i^{\text{econ}} - Q_i^{\text{prod}}$ when greater than zero, where:

Q_i^{econ} = Economic level of output for unit i; and

Q_i^{prod} = Actual production of unit i.

Economic withholding can also be counteracted or prevented through previously mentioned *ex ante* mitigation techniques, including offer caps and floors. Tighter and always operating offer control mechanisms may eliminate the need for MMU's to calculate output gaps. Therefore, given GNERC's considerable task in standing up a MMU, mitigation tactics such as these can help lighten the duties of the new MMU *ex post*.

Physical withholding occurs when an economic unit is unavailable to produce some or all of its output. Physical withholding can cause price increases due to the scarcity of available supply. Such withholding is generally achieved by claiming a resource outage or a resource derating (reduction in available capacity). It can also occur when physical parameters are changed, like the minimum down time of a unit.

Uneconomic production occurs when a participant produces energy uneconomically and at a loss, generally offering below its marginal cost or by blocking up the output of the unit to force transmission congestion. This can occur by the unit:

- Lowering incremental energy offer prices below actual costs;
- Increasing the minimum run time;
- Producing more output than its dispatch instructions;
- Running at a fixed output higher than reference the economic minimum.

The evaluation of physical and economic withholding and uneconomic generation requires the following data inputs, with the latter two reserved for special studies if anomalous transmission congestion is detected. TSO and MO should have this data and provide it upon NRA request.

- List of each generator with the Min, Max, plant type, fuel type, ultimate owner or controlling entity, location;
- Generation offers in day-ahead and balancing market;
- Estimation of generating resources' offer price caps, estimated by the market monitoring staff (GNERC);
- Transmission Constraint data, to include constraint name, shadow price, constraint limit, limit control, modeled flow across the constraint, actual flow across the constraint, and the violation degree of the constraint;
- Generation Shift Factor (GSF) data; A GSF measures the portion of a plant's output that flows over a specific facility. It is useful if a unit is suspected of creating congestion to benefit its own affiliate.

MARKET PERFORMANCE

Convergence of projected and actual clearing prices. The DAM is a financially binding forward market that enables firms to make forward purchases and sales of power for delivery in real time the following day. This allows participants to hedge their portfolios and manage balancing market volatility. In a well-functioning market, the day-ahead and balancing prices will not diverge systematically because participants will adjust their purchases and sales to arbitrage such differences. However, participant gaming can occur between markets and this behavior should be monitored by evaluating price spreads between the balancing and day-ahead markets. Further, this can identify market design issues, as intermittent renewable resources play a more dynamic role in the market. Some US – and even global markets – have experienced steeper variances across markets and within certain time frames coincident with ramping curves or broad forecasting deviations.

This can be measured by maintaining a metric comparing the day-ahead to the balancing market price – i.e., price trends. Additionally, forecasting requirements for such resources can also help mitigate this issue.

Review of Individual Pricing Events. The review of individual price events is necessary for a fundamental understanding of the market operations and are the building blocks for long-term review of the market's performance. The review of price events may lead to early detection of possible market power or market design concerns, or inefficient market operator actions. An approach to reviewing pricing events is to establish alerts for instances when prices exceed a designated threshold. These alerts are routinely to run on a weekly basis in the US power market monitoring

practices. Routine alerts in Georgia would be predicated upon the software capabilities and data availability between the market operator and the monitor. An analyst may review the fundamental drivers of the prices by conducting a capacity balance to see on net the forces that are being exerted on prices. A good practice is to examine the change in the energy balance and load, as well as operator actions that may have contributed to the price change.

Monitoring operator actions that are inefficient or not reflected in prices

Manual interventions by the transmission operator or the market operator should justify by regulator-approved procedures and be well documented. Operator interventions, such as redispatch to manage congestion or other system constraints have the potential to distort the market and cause inefficient behavior by market participants. The operators should be obliged to provide all related information when such actions take place. GNERC may want to establish a regular cadence with the transmission or market operator to report any interventions either in advance (if notice can be provided) of these actions and/or within routine reporting requirements describing the nature of the event and its justification per the regulator-approved procedures.

Monitoring Cross-Border Transmission Capacity

National regulators must have authority to monitor the calculation of cross-border capacity and have access to the assumptions and models used by the TSO to calculate cross-border capacity. Cross-border trade can be important for robust market competition. Therefore, regulators should monitor the cross-border capacity market to help ensure effective market development. The job of the regulator is to make sure the TSOs provide adequate capacity to the market and to make sure participants do not over-reserve the capacity to keep it away from competitors. The monitor requires access to transmission reservation and schedules as well as key data the transmission operator uses to establish cross-border transmission capacity.

RETAIL MONITORING INDICATORS (5 YEAR TIMELINE)

The Georgia market will allow suppliers to compete for customers at the retail level eventually, as of now expected to be within 5 years of market debut. Due to expected lag time between the establishment of the DAM and Retail, the following information is offered as a *future reference*. The key metric and indicators for monitoring the competitive conditions in the retail sector have been developed by the EU. In its report, "Final Guidelines on Good Practice on Indicators for Retail Monitoring of Electricity and Gas,"⁶ the European Regulators Group for Electricity and Gas (now ACER) identify a range of indicators to monitor the retail electricity market. We propose the stakeholders consider how these may be implemented in Georgia.

PENALTIES

The regulator should have recourse to financial penalties and other sanctions when it determines a market participant has manipulated the market through the devices described above. In case of the violations of competition, the NRA should have the authority to levy fines or structural remedies, such as divestment or unbundling of companies, to avert market power issues and enforce competition laws.

REMIT

Regulation No 543/2013 relates to the wholesale market information and transparency (REMIT) and focusses on data submission by individual participants. *Insider Dealing*. Article 2(1) of REMIT defines "inside information" as information which has not been made public, relates, directly or indirectly, to one or more wholesale energy products and, if it were made public, would be likely to significantly affect the prices of those wholesale energy products. The types of information this would encompass include the availability and operations of key facilities, production, transmission, and storage facilities; information required to be released under EU or national transparency policies and regulations; and other information that a market participant would use as a basis of its decision to buy or sell wholesale

⁶ European Regulators' Group for Electricity and Gas, Ref: E10-RMF-27-03 12 October 2010

products. This excludes internal strategic information such as risk assessments and proprietary forecasts.⁷

Under REMIT, these activities would be monitored by identifying trades that have a significant price effect and that:

- (1) were made by major market participants before the announcement of the information, having a significant price effect; or
- (2) were part of anomalous changes in the volume and prices just prior to release of the information.

Market Manipulation. Article 2(2) of REMIT specifies four categories of market manipulation.

- (1) Entering into or attempting to enter into a transaction that gives false or misleading signals as to the supply, demand, or market price;
- (2) Entering into or attempting to enter into a transaction that attempts to secure the price a wholesale energy product at an artificial level;
- (3) Entering into or attempting to enter into a transaction that attempts to employ deception which gives false or misleading signals regarding the price, supply, or demand;
- (4) Disseminating information that gives false or misleading signals as to the supply of, demand for, or price of wholesale energy products.

The following metrics have been proposed in the EU to meet the objectives of REMIT and are likely applicable to Georgia:

- a) Trade orders representing a significant portion of the daily volume of transactions coincident with a significant change in price;
- b) Trade orders undertaken by participant a significant buying or selling position coincident with a significant change in price;
- c) Trade orders that lead to no change in beneficial ownership of a wholesale energy product;
- d) “Wash” trades – transactions with position reversals in a short period that represent a significant proportion of the daily volume;
- e) Trade orders undertaken in a concentrated time span and lead to a price change which is subsequently reversed;
- f) Trade orders undertaken that change the representation of the best bid or offer prices and are removed before they are executed;
- g) Trade orders undertaken at or around a specific time when reference prices, settlement prices and valuations are calculated and lead to price changes which have an effect on such prices and valuations; and,
- h) Uneconomic trades lowering or increasing the market price and enabling a market participant to subsequently profit to a much greater degree through separate trading activity via a larger connected accrued position.

⁷ ACER Guidance on the application of REMIT. Updated 4th Edition, 2016, ACER.

6. RECOMMENDED PROCEDURES FOR MONITORING THE GEORGIA WHOLESALE ENERGY AND ANCILLARY SERVICES MARKETS

There are four areas where market power is likely to adversely impact implementation of the liberalized Georgia market if not addressed through market monitoring.

1. Market Power in Day Ahead Energy Markets;
2. Market Power in Day Head Balancing Capacity market;
3. Market Power in Balancing Energy Market;
4. Retail Market Monitoring;
5. TSO Transparency Requirements;
6. General Market Monitoring Requirement.

The following recommendations address how these market power issues can be detected and mitigated.

1. Recommendation on Monitoring and Mitigating Market Power in Day Ahead Energy Markets.

The primary day-ahead market is the energy market. But ancillary services are also cleared day-ahead. As with electricity markets around the world, the day-ahead energy market is at the centerpiece of electricity market reforms because of its critical role in facilitating trade among existing resources.

The day-ahead energy market clears using a supply curve of in-merit generation offers, the lowest-offered units clearing ahead high-offered ones. The market clears at a uniform price at the point where supply meets demand. This type of market is susceptible to the exercise of market power by both economic and physical withholding. We recommend the following monitoring and mitigation procedures.

For Economic Withholding, it can be monitored and mitigated in two ways:

- a) *Ex Ante* Mitigation (determine if a participant has market power, then apply offer caps), or
- b) *Ex Post* Mitigation (determine who exercised market power, then apply financial penalties and other sanctions)

Procedure: Estimate Reference Values (marginal-cost-based estimates of energy costs (and Ancillary Services Costs). The following table established the data and calculation for simple energy reference values. Reference values are used in both the *ex ante* and *ex post* mitigation approach for economic withholding.

Table 3: Reference Value Data and Calculations

Data Element	Frequency	Note
Fossil Fuel Plants		
Unit Name		
Primary Fuel		
Heat Rate (Fossil Plant)		
Max Capacity Summer	Season	
Max Capacity Winter	Season	
Max Capacity Shoulder	Season	
Primary Fuel costs	Weekly	
Variable O&M (/mWh)	Season	Cost incurred at plant while operating that do not incurred when idle, , e.g., labor, cooling, variable supplies (excl. fuel), major maintenance costs allocated over start times or kWh
Cap	Daily	Heat Rate * Fuel Cost + VOM
Hydro (Reservoir)	Season	Cap at CCGT
Renewable Storage		Cap at CCGT
Renewable non Storage		Zero

MONITORING AND MITIGATION OF ECONOMIC WITHHOLDING IN THE DAY AHEAD ENERGY MARKET

Ex Ante Mitigation. The *ex ante* approach establishes offer caps based on the reference values. We recommend an offer cap based on 110% of the resource reference value. The offer cap can be placed on all units or just on units that are determined in advance to have market power. The advance analysis can use the pivotal supplier test or any firm previously found to have exercised market power.

Ex Post Mitigation. The *ex post* approach relies on detecting departure from efficient dispatch. A dispatch is simulated using the reference values and the simulated clearing price is compared to the actual price. The simulated price is a simple supply stack based on reference values and cleared at hourly load, adjusting for scheduled and approved outages. The market software vendor may be able to provide simulated outcomes using reference values and provide a parallel clearing report. The market software can also identify the marginal unit setting price. See Day-Ahead Energy Market report in Table 4. In the Table, we see an example of a 10% threshold to investigate.

Table 4: Day Ahead Energy Market Report

Hour	Energy		Price Ratio Indicator	Fail at 110%	Marginal Unit
	Clearing Price	Simulated price			
1	60	55	109%	0	Hydro A
2	60	60	100%	0	Hydro A
3	60	65	92%	0	Hydro A
4	60	65	92%	0	Hydro A
5	60	65	92%	0	Hydro B
6	60	60	100%	0	Import
7	70	65	108%	0	Hydro B
8	75	67	112%	1	Hydro B
9	74	68	109%	0	Hydro B
10	74	70	106%	0	CCGT A
11	78	80	98%	0	Hydro A
12	78	83	94%	0	Hydro A
13	89	82	109%	0	Hydro A
14	95	90	106%	0	Hydro B
15	100	102	98%	0	CCGT B
16	100	105	95%	0	Hydro A
17	110	105	105%	0	Hydro A
18	90	100	90%	0	Hydro B
19	89	90	99%	0	CCGT B
20	92	90	102%	0	Hydro A
21	75	85	88%	0	Hydro A
22	60	80	75%	0	Hydro B
23	55	70	79%	0	CCGT B
24	65	60	108%	0	Hydro C

Investigation of the high price will identify potential economic withholding by determining if either (a) the price-setting unit (marginal unit) or (b) uncleared units with reference values below the simulated price are offered substantially above their reference level (10% above). As such, each participant must justify its offer price. An unjustified price subjects the participant to:

- Resettlement of energy trades for the resource and its affiliated resources at reference value⁸ or,
- Resettlement plus penalty.

⁸ In practice, all market participants could be resettled, even if most participants did not contribute to the price increase. This would be consistent with a competitive outcome. However, it could introduce complications. For example, higher prices caused by withholding have cleared resources who offered competitively but still had offers above the competitive price. If these participants are resettled at a competitive price, they would not cover their costs, even though did not exercise market power. These participants should be paid their offered costs, even if the entire market is resettled.

MONITORING AND MITIGATION OF PHYSICAL WITHHOLDING -- DAY AHEAD ENERGY MARKET

Physical Withholding must use *ex post* mitigation because it is not possible to require a unit to produce at its full capacity if it declares an outage or a derating. *Ex post* monitoring and mitigation for physical withholding is similar to *ex post* monitoring and mitigation for economic withholding.

Step 1: Determine if market power was exercised. A dispatch is simulated using the reference capacity values and reference energy prices to simulate a clearing price that would prevail if all non-planned outage capacity was offered. The market software vendor may be able to provide simulated outcomes using reference capacity and cost values and provide a parallel clearing report.

Step 2: Compare actual hourly clearing prices to simulated prices and identify hours when price was some threshold higher than the reference price. Use Day Ahead Energy Market Report to identify physical withholding, comparable to Day Ahead Energy Market Report shown in Table 4 except the marginal unit is not the target of investigation and is not reported. Instead, the report identifies hours when the actual price exceed the simulate price by 10%. This indicates which hour is investigated for physical withholding.

For any such hour, identify any physically withheld resource using Physical Withholding Report. The Physical withholding report identifies any participant that has not met obligations to be available for the market. See Table 5.

Table 5: Physical Withholding Report (For Sample Participant A)

Participant A Hour	Licensed Capacity	Offered in DAM	Scheduled	Scheduled	Withholding
			under Bilateral Contract	under Other obligations	
		(1)	(2)	(3)	(1)-(2)-(3)-(4)
1	65	25	15	0	25
2	65	25	15	0	25
3	65	25	15	0	25
4	65	25	15	0	25
5	65	25	15	0	25
6	65	25	15	0	25
7	65	25	15	0	25
8	65	25	15	0	25
9	65	25	15	25	0
10	65	25	15	25	0
11	65	25	15	25	0
12	65	25	15	25	0
13	65	25	15	15	10
14	65	25	15	15	10
15	65	25	15	15	10
16	65	25	15	15	10
17	65	25	0	15	25
18	65	25	0	15	25
19	65	25	0	15	25
20	65	25	0	0	40
21	65	25	0	0	40
22	65	25	0	0	40
23	65	25	0	0	40
24	65	25	0	0	40

If withholding corresponds to the hours when prices were high, then for all participant withholding quantities:

- Determine if withholding affected price by 10%;
- Determine if any affiliated unit profited from withholding;
- Request justification for withholding; If not satisfactory;
- Move to mitigation:
 - Resettle energy revenues on affiliated units; and/o
 - Impose fine.

2. Recommendation on Monitoring and Mitigating Day Ahead Ancillary Service Markets

The main ancillary services products to monitor are reserve products (Primary, secondary, tertiary). In day ahead, TSO must identify capacity to be online for the operating horizon. This is the balancing capacity product that is cleared day ahead on a pay-as-offered basis – not a uniform price like in the energy market. Balancing capacity must qualify in advance due to the need to respond to the real-time ancillary services products. In the operating horizon, both cleared and uncleared qualified balancing capacity is activated, if necessary, to provide Balancing Energy.

MONITORING AND MITIGATION OF THE BALANCING CAPACITY MARKET

The day-ahead market will clear offers to supply Balancing Capacity against the TSO reserve requirement. This is cleared similar to the energy market by clearing the lowest-offered capacity first to meet the requirement, adjusting supply for the longer-term schedules. Cleared offers are paid on a “pay-as-offered” basis.

The Balancing Capacity market will be monitored using Reference Values for reserve capacity. Reference Values are the estimated cost of supply balancing capacity in the day-ahead market. These reference costs are:

- a) Cost of staffing idle capacity;
- b) Cost of outage during deployment (if penalties apply); and
- c) Lost opportunity cost of energy sales;

MONITORING AND MITIGATION OF ECONOMIC WITHHOLDING -- DAY AHEAD BALANCING CAPACITY MARKET

Because of the pay-as-offered clearing, only *ex post* mitigation will work for balancing capacity. This is because the underlying marginal cost is not necessarily the efficient offer of a supplier. Pay-as-offer markets are efficient when participants offer their supply at the estimated efficient clearing price. An efficient clearing price under pay-as-offered is the highest-cost offer to satisfy balancing capacity demand, this is the same price is the same as uniform clearing price.

While the prices under uniform clearing and pay-as-offered clearing are the same, there is uncertainty for offers under the pay-as-offered due to the need to forecast. Hence, in measuring whether market power has been exercised, a price spike should have a higher threshold than under the uniform price auction (e.g., 20% instead of 10%).

To monitor for market power, we once again recommend a parallel clearing using reference values cleared against requirement (adjusted for longer-term procurement). Create a Day Ahead Balancing Market Report (similar to Day Ahead Energy Market report) that compares clearing price to simulated price.

If Daily Balancing Capacity Price report shows “high price”, then

- (1) all cleared offers within 20% of the clearing price are evaluated. These are the offers that may have attempted to cause a high clearing price;
- (2) All offers from (1) that are above 20% of their reference value are mitigated.

Mitigation:

- Resettle mitigated offer at offer of highest *reference value* cleared (not highest *offer* cleared);
- Penalty.

MONITORING AND MITIGATION OF PHYSICAL WITHHOLDING - DAY AHEAD BALANCING CAPACITY MARKET

Physical Withholding is an *ex post* monitoring and mitigation. When the Day-Ahead Balancing Market Report flags a price spike, (e.g., 20%) compared to a parallel clearing using Reference Values cleared against requirement (adjusted for longer-term procurement), the market monitor should investigate if a physical withholding has occurred.

Determine any physical withholding of balancing capacity among units with balancing capacity obligations and determine if they have offered in according with their obligations. The monitoring approach will depend on specific market rules of the balancing capacity market. For any resource failing the offer obligations:

- Determine if resource owner has affiliates cleared in Balancing Capacity market;
- Determine of withholding caused the prices to exceed simulated price by 20%.

Mitigation:

- Investigate cause of withholding; if unsatisfactory;
- Resettle all affiliated units at reference value;
- Financial Penalty (for repeated violations).

3. Recommendation on Monitoring and Mitigating Real-Time Balancing Energy Market

Monitoring and Mitigation of Economic Withholding - Balancing Energy market

In the operating horizon (real-time), balancing energy is provided by:

- Balancing Service Provider cleared the day ahead in the balancing capacity market;
- Balancing Service Provider **NOT** cleared the day ahead in the balancing capacity market;
- BRP that are long on energy.

The balancing price is established by stacking balancing energy offer prices among participating BSP and clearing the stack against the balancing needs. The monitoring approach is very similar to day-ahead energy market monitoring and mitigation.

Ex Ante. The *ex ante* approach is to establish offer caps based on the energy reference values (110%) of the resource reference value. The offer cap can be placed on all units or just on units that are determined in advance to have market power. The advance analysis can use the pivotal supplier test or any firm previously found to have exercised market power.

Ex Post Mitigation. The *ex post* approach relies on detecting departure from efficient dispatch. A dispatch is simulated using the energy reference values and the simulated balancing clearing price compared to the actual price. Simulated price is a simple supply stack based on reference values and cleared at hourly balancing energy demand. Investigate hours when actual price exceeds simulated by 20%.

In such hours, investigation of the high price will identify the price-setting unit to determine if the price-setting unit (marginal unit) offered substantially above its reference level (10% above). The participant must justify its offer price. An unjustified price subjects the participant to:

- Resettlement of energy trades for the resource and its affiliated resources at reference value;
- Resettlement plus penalty.

4. Recommendation on Monitoring Retail Competition

Competition in the retail sector is important because it both indicates the degree to which consumer choice has taken root and it also can advance competition itself but forcing more efficient decision by retail suppliers and resources. As a result, monitoring retail choice is largely measuring how it has pervaded the sector. Key metrics and indicators for monitoring the competitive conditions in the retail sector have been developed by the EU. In its report, "Final Guidelines on Good Practice on Indicators for Retail Monitoring of Electricity and Gas",⁹ the European Regulators Group for Electricity and Gas (formerly ERGEG, now ACER) identify a range of indicators to monitor the retail electricity market.

⁹ European Regulators' Group for Electricity and Gas, Ref: E10-RMF-27-03 12 October 2010.

When retail supply options begin to increase for Georgia consumers, we recommend the ERGEG Guidelines as the starting point for monitoring.

5. TSO Transparency Requirements

See Appendix A.

6. General Market Monitoring Reporting

The following in Appendix B are examples of tables that will assist in the day to day general market monitoring and flag potential areas of concern or further evaluation.

Table 6: TSO Transparency Requirements

TSO Transparency Data	
<u>Load</u>	<ul style="list-style-type: none"> Actual Total Load Day-ahead Total Load Forecast Week-ahead Total Load Forecast Month-ahead Total Load Forecast Year-ahead Total Load Forecast Year-ahead Forecast Margin
<u>Generation</u>	<ul style="list-style-type: none"> Installed Generation Capacity Aggregated Installed Generation Capacity per Day-ahead Aggregated Generation Day-ahead Aggregated Generation Wind and Solar Day-ahead Generation Forecasts for Wind and Solar Actual Generation per Generation Unit Aggregated Generation per Type Aggregate Filling Rate of Water Reservoirs and Hydro Storage Plants
<u>Transmission</u>	<ul style="list-style-type: none"> Expansion And Dismantling Projects Forecasted Day-ahead Transfer Capacities Day Ahead Flow Based Allocations Cross-border Capacity for DC Links Yearly Report About Critical Network Elements Limiting Offered Capacities Explicit Allocations - Use of the Transfer Capacity Total Nominated Capacity Total Capacity Already Allocated Day-ahead Prices Implicit Allocations - Net Positions Scheduled Commercial Exchanges Physical Flows Transfer Capacities Allocated with Third Countries
<u>Balancing</u>	<ul style="list-style-type: none"> Amount of Balancing Reserves Under Contract Price of Reserved Balancing Reserves Accepted Aggregated Offers Activated Balancing Energy Prices of Activated Balancing Energy Imbalance Prices Total Imbalance Volumes Financial Expenses and Income for Balancing Volumes of Exchanged Bids and Offers
<u>Outages</u>	<ul style="list-style-type: none"> Planned Unavailability of Consumption Units Changes in Actual Availability of Consumption Units Planned Unavailability in the Transmission Grid Changes in Actual Availability in the Transmission Grid Changes in Actual Availability of Off-shore Grid Infrastructure Planned Unavailability of Generation Units Changes in Actual Availability of Generation Units Planned Unavailability of Production Units Changes in Actual Availability of Production Units
<u>Congestion management</u>	<ul style="list-style-type: none"> Redispatching Countertrading Costs of Congestion Management

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