RECOMMENDATIONS FOR CREATION OF BALANCING GROUPS AND BRP

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RECOMMENDATIONS FOR CREATION OF BALANCING GROUPS AND BRP

USAID HYDRO POWER AND ENERGY PLANNING PROJECT (HPEP)
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<th>Term</th>
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<tr>
<td>ACER</td>
<td>Agency for the Cooperation of Energy Regulators</td>
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<td>ANRE</td>
<td>Romanian National Energy Regulatory Authority</td>
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<tr>
<td>BG</td>
<td>Balancing Group</td>
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<td>BM</td>
<td>Balancing Market</td>
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<td>BRP</td>
<td>Balancing Responsible Party</td>
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<td>BSP</td>
<td>Balancing Services Provider</td>
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<td>DSO</td>
<td>Distribution network Operator</td>
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<tr>
<td>ELES</td>
<td>Electricity Transmission System Operator of Slovenia</td>
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<td>ENTSO-E</td>
<td>European Network of Transmission System Operators for Electricity</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>HPP</td>
<td>Hydro Power Plant</td>
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<td>GME</td>
<td>Italian Market Operator (Gestore Mercati Energetici)</td>
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<td>GNERC</td>
<td>Georgian National Energy and Water Supply Regulatory Commission</td>
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<td>GSE</td>
<td>Georgian State Electro System</td>
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<tr>
<td>GSE SpA</td>
<td>Gestore Servizi Energetici Italian Electricity Services Operator</td>
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<td>HPEP</td>
<td>Hydro Power and Energy Planning Project</td>
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<td>HV</td>
<td>High voltage</td>
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<td>Hz</td>
<td>Hertz</td>
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<tr>
<td>kW</td>
<td>Kilowatt</td>
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<tr>
<td>MEPSO</td>
<td>Macedonian Transmission System Operator</td>
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<td>MO</td>
<td>Market Operator</td>
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<tr>
<td>MW</td>
<td>Megawatt</td>
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<tr>
<td>RES</td>
<td>Renewable Energy Sources</td>
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<td>SLP</td>
<td>Standardized Load Profile</td>
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<td>Terna</td>
<td>Italian Transmission System Operator</td>
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<td>TPP</td>
<td>Thermal Power Plant</td>
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<td>TRM</td>
<td>Transmission Reliability Margin</td>
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<td>TSO</td>
<td>Transmission System Operator</td>
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<tr>
<td>UCTE</td>
<td>Union for the Coordination of Transmission of Electricity</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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2.0 PHYSICAL PROCESS OF BALANCING

The loads in electricity system is constantly fluctuating and changes hourly, daily and seasonally. The balance between production and consumption of electric energy at any given moment is indicated by the frequency of the electricity system. Any imbalance between production and consumption causes the system frequency to deviate from the standard nominal value of 50Hz. When the consumption is greater than production the frequency falls below the nominal value of 50Hz, correspondingly, frequency exceeds 50Hz when production is greater than consumption. This is problematic for some electric machines and appliances, which depend on the system frequency such as transformers, generators, transmission lines, commutator type electric motors, fluorescent lights, electric clocks, phonographs, video players etc. Consequently, maintaining a precise system frequency is given high priority by the system operator.

On the European level the binding rules for load-frequency control mainly results from network code for “Electricity Balancing” for the issues of “Load Frequency Control & Reserves”. The association of the European network of Transmission System Operators for Electricity (ENTSO-E) accepted both network codes and has sent them to the Agency for the Cooperation of Energy Regulators (ACER). Until these grid codes will come into force the ENTSO-E Operation Handbook (formerly UCTE Operation Handbook), a collection of principles for system operation of the European TSOs defines the European framework for carrying out load-frequency control.

2.1 Available resources for providing balancing services to the system

Hydro power plants

The control of hydropower plants depends of their type and technical characteristics of HPPs. In some technologies the ramping capacity can reach 50% per minute.

- Run of river – limited control for providing frequency support;
- Run of river with limited water level adjustment – few possibilities for control in emergency situations;
- Run of river with dam – good control capabilities and effective for the frequency support in power system.

Thermal power plants

The control of TPPs depends on the plant design, capacity of the plant, used fuel (coal, oil, natural gas, and nuclear power) and type of the steam generator (subcritical and supercritical). Ramp rate is from 10% to 40% of capacity per minute.

The nuclear power plants are characterized by high speed control, but modulation is not economically efficient and is limited due to acceleration of ageing of the reactor’s large equipment components (e.g. valves and reactor pressure vessel). The ramping range is from 3% to 5% per minute.

Gas turbines

Modern gas power plants can go from zero to full load in less than 15 minutes.
2.2 The balancing in competitive electricity markets

The concept of central control responsibility by the TSO for balancing of the system has proved as appropriate and efficient in vertically integrated markets, where are no competition between generators and suppliers. In competitive markets exists several conditions which differ from vertically integrated enterprises: participation of large number of sellers and buyers of each type of product, legal requirements for minimum barriers to customers for choosing the supplier, nondiscriminatory access to the monopolistic elements of supply chain, and transparency across all market segments. It is difficult for small customers and small producers to reach and to participate on the balancing market. In some European states a model of consolidation of small customers and small generators (principally new renewable generators) in Balancing Groups is used.

Balancing Group Model

Definition of Balancing Group: “Virtual group of suppliers and customers within which the amounts of electric energy procured and supplied are balanced”

The balance group model is the basis on which the liberalized energy markets operate in most of EU member states: Austria, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Italy, Poland, Romania, Slovenia, Spain and United Kingdom, non-EU member states Norway and Switzerland, and also contracting parties of the Energy Community Albania, Bosnia and Herzegovina, Macedonia, Monte Negro and Serbia. For the introduction of the balance group model, the unbundling of the activities as separation of grid activities from commercial activities and generation were the fundamental changes implemented to the structure of the energy sector of these countries.

The balancing group models were designed to fulfill the following tasks:

- Secure the balancing of the actual inflows into the grid as well the outflows from the grid.
- Make balancing energy available to cover the differences between the actual and estimated outflows and inflows of electricity into the grid
- Establish a system for financial settlement of balancing energy and provide similar services
- Integration of renewable energy sources into the grid

Functioning of the balancing group model

The Balancing Group is a commercial unification of consumers and producers within a Control Area. The Balancing Responsible Party or Balancing Group Representative represents the balance group in its dealing with other market players. National legislation is defining the obligations for participation in the balancing groups. In some countries participation in balancing groups is mandatory and every market participant (consumer, producer, supplier, and trader) must be

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1 In different countries the balancing responsible party, authorized to represent the balancing group to other market players is called “Balance group Manager” “Balance group Coordinator” or “Balance group Agent”
member of a Balancing Group that is registered in the control area. The balancing regulations defined the market timing units from 15 minutes to 1 hour. In some countries it requires Balancing Group to create in every 15 minutes a balance between production and consumption of electricity. The discrepancy of this balance is calculated as the balance energy. In competitive electricity market for avoiding of huge and prohibitive costs of replacing of installing of half hour or 15 minutes metering in every customer, in some countries (Germany, Austria) it was decided that customers below 100kW maximum demand would be settled using Standardized Load Profiles (SLP) and readings for customer’s existing electricity meters.

Control power and balancing energy have the same purpose — that of balancing generation and consumption. The control power is the deviation from forecast in a control area; and the balancing energy is the deviation from forecast in a balancing group. A deviation from forecast supply or demand in a balancing group, e.g. as a result of an outage, gives rise to balancing energy. The net balancing energy in all the balancing groups in a control area is the control power demand that the control area manager must meet. The total quantity of balancing energy can be many times higher than control power, as the balancing groups' needs may offset each other. The balancing energy used is invoiced to the balancing groups on the basis of the quantities recorded and the costs calculated for control power. The manner in which these costs are passed on to suppliers and consumers is a matter for the market players.

**Types of balancing groups:**
Main Types of commercial balancing groups used in EU balancing markets are:

- Trading Balancing Groups
- Supplier Balancing Groups (Mainly used to supply customers)
- Combined Balancing Groups (used for trading and supplying customers)

Balancing Groups can also be used for other purposes and in some EU member states they are called Special Balancing Groups:

- Balancing Groups for Network losses
- Balancing Groups for Green Energy
- Balancing Groups for Energy Exchange
- Cogeneration Balancing Groups
- Balancing Groups for organizing compensation programs

**The role of clearing and settlement agent in balancing market**

- The Clearing & Settlement Agent has a very important role in the system
- The Clearing & Settlement Agent is the „key player” between the Management of the Control Area and the Balance Group Representatives
- The Clearing & Settlement Agent is a company which is not an electricity company (grid operator, supplier etc),
- Clearing & Settlement Agent is independent from electricity companies.
• In some countries the the Clearing & Settlement Agent is a joint-stock company.
• Stock is held by several electricity companies, banks, the Stock Exchange, an IT company, which avoids dominant influence of one shareholder/owner.

2.3 International experience in implementation of balancing group model:
The balancing group model is broadly spread in most of the countries in Europe both EU and non EU member states. Below is a description of the characteristics of balancing group models in different European countries:

Hungary
The Hungarian TSO (MAVIR) is responsible for balancing and operates also the balancing market. The balancing market is based on a balancing group model. The establishment of a balancing group requires a contract with the TSO. Leader of a balancing group could be any market participant. The Electricity Act foresees an obligation for generators to provide balancing energy. The timeframe for imbalance settlement is 1/4h hour. The prices for balancing energy differ for each timeframe and they are calculated following a cost based approach.

Participation is mandatory for all Electricity Traders either directly (by concluding an agreement with the TSO) or becoming a member of a balancing group and assigning the balancing obligation to a balancing party. Non-domestic Electricity Traders tend to manage their balancing obligation and enter directly into a balancing agreement with the TSO. The balancing market is regulated in detail by both the Electricity Act 2007 and the Commercial Code of the TSO. The balancing party must deposit a financial guarantee with the TSO to ensure the safe settlement of the transactions. The basis of the financial guarantee is the amount paid to the TSO on average for the three preceding settlement periods.

Macedonia
The TSO (MEPSO) is responsible for balancing the electricity. According to the law, balancing energy is exclusively provided by the regulated generation company until 31 December 2014. There is no obligation for other generators to provide balancing energy. As of 1 January 2015, the TSO will – according to the Electricity Market Code - have to purchase ancillary services and relevant operational reserves under market based conditions and in a transparent, non-discriminatory and competitive way.

The balancing market is operated by the Electricity Market Operator. The balancing market organization is based on balancing groups. Such balancing groups can be formed either by a number of or a single electricity market participant. Appropriate metering as well as financial guarantees for each member of the balancing group are required.

Italy
The TSO (TERNA) is responsible for balancing and acquires the balancing energy on the balancing market that is managed by Italian Market Operator (GME).

- The allocation of balancing energy takes place based on auctions or advance contract26, whereby advance contracts are only used for short time demand.
  
  - The balancing market concept is based on balancing groups consisting of small generators (<10 MVA) per market zone and customers per market zone.
  - The timeframe for imbalance settlement is 1 hour. Penalties for not fulfilling schedules exist.
  - It is also possible to use balancing energy from abroad by using the Transmission Reliability Margin (TRM).

In Italy there is a special tariff for balancing energy from renewable energy sources. Furthermore it is possible that RES generators decide that Italian Electricity Services Operator (GSE SpA) acts as their balancing responsible party.

**Romania**

- According to the Romanian Commercial Code the **TSO is responsible** for balancing. The TSO also acts as Balancing Market Operator, responsible for:
  - registration of balancing market participants,
  - collecting and verification of offers,
  - calculating the quantities necessary for the settlement of transaction afferent to the balancing market.

- Balancing energy is provided via auctions for which pay as bid is used for price determination.

- All generators have the obligation to participate in the central balancing market that includes all Balancing Responsible Parties consisting of dispatchable units of producers and suppliers of consumers.

- According ANRE order No. 36/2005 Balancing Responsible Parties may form a balancing group if:
  - forecast of annual production does not exceed 30% of net injected electricity of the previous year
  - forecast for annual consumption does not exceeds 30% of net consumption of the previous year

**Slovenia**

- According to Slovenian legislation the TSO (ELES) is responsible for balancing.

- Market Operator operate the Balancing Market.

- The market organization is based on balancing groups.
For the establishment of a balancing group the submission of an application to the Market Operator (MO) and fulfillment of all required conditions is mandatory.

Anybody who fulfills the criteria published by Market Operator could lead a balancing group.

The leader of a balancing group also acts as Balancing Responsible Party of the group.

No Slovenian license or branch office registered in Slovenia is needed.

There is no legal obligation for generators to provide balancing energy, except the participation of units larger than 10 MW in primary frequency control.

According to the Slovenian Market Rules a balancing responsible party failing to fulfil the schedules pays additional costs for the imbalanced energy, or receives lower payment for the energy supplied above the schedules.

The Market Operator is responsible for calculation of these payments – on the basis of data provided by the TSO – as well as for the whole settlement procedures in this process.

3.0 CONCLUSIONS

Balancing markets across borders will enable cost-efficient integration of Georgian hydropower energy and will improve power system operation and overall market efficiency.

By balancing hydropower on a regional level, reserves will be optimized, requiring fewer real-time assets online. In this way, large geographical areas will reduce balancing costs. This is due to the smoothing effect of aggregating wind power and other power output on reducing its variability.

If imbalances occur, imbalance exchange between countries or systems is possible, when functional cross-border balancing markets are in place. This has the benefit of decreasing the reserves needed in the system.

Better understanding of the potential for balancing groups to participate in balancing and providing reserves to the system is needed. With current technology, balancing group mechanism can provide grid support services including balancing. This could offer significant flexibility to the system, allowing TSO to make use of inexpensive balancing resources. Finally we can conclude that market mechanisms that properly value the provision of balancing services and balancing group mechanism for all market participants in Georgia have to be put in place through proper legislative and regulatory framework.

3.1 Recommendations for creation of Balancing Groups and Balancing Responsible Parties

For introducing the balancing group model in Georgia some legal and regulatory requirements must be implemented as it is listed below:
1. Unbundling of activities, which follows the Basic Principles of EU legislation of third package:
   a) competitive field: Generation, Trading, Supply of Energy to Customers
   b) regulated field: Transmission Grid, Distribution Grid

2. Determination the duties of the Transmission Grid Operator - TSO and of the Distribution Grid Operators - DSO in a Balance Group Model:
   a. Grid operation
   b. Connecting customers to the grid
   c. Metering of customers
   d. Administration of metering points
   e. Clear definition of the metering point.
   f. Contractual relationship between Grid operators and customers, billing
   g. Delivery of data
      i. to the balance group manager (coordinator) - aggregated data
      ii. to the balance group responsible persons (aggregated data)
      iii. to the trader (aggregated data and data for every customer)
   h. Introduction of a centralized database.
   i. Defining the Supplier of Last Resort
   j. Customer switching and changing of supplier and balancing group

3. Determination of the balancing period from 15 min to 1 hour.

4. From the perspective of the customer:
   a. Determination of the contractual relations:
      • to the grid operator (usually DSO)
      • to the Trader or Supplier of energy
   b. Creation of relation between customer and balance group/balance group responsible person:
      • the customer is member of the balance group
      • usually this membership is only a factual membership, without contractual relation
      • some customers (usually large customers) are members, and have a contract with the balance group responsible person
      • can a customer set up his own balance group?

5. Differentiation of customers by preliminary settled criteria.

6. Creation of Standard Load Profiles for each type of customers:
   a) Individual load profiles – Requirement of load metering
   b) Standard Load Profiles (SLP)
   c) Georgia should collect own data and develop own SLP; Examples for using of SLP can be viewed as examples German and Austrian SLPs.
7. Customers changing a supplier, changing a balance group

a) Changes in the contractual relationships
b) Power of attorney
c) Who actually performs the change?
d) Changing a supplier is free of charge!!!
e) Invoicing/billing (separate invoices for distribution net services and energy)

8. Legal and Regulatory requirements for functioning of balancing group model

a) Electricity and Natural Gas Law to be modified and included the balancing group model
b) Including in electricity and natural gas law the unbundling of generation, network and supply activities.
c) Prepare secondary legislation for operation of balancing groups.
d) Modification of Market Rules.
e) Creation of clearing and settlement rules.
f) Defining in primary legislation of Supplier of Last Resort and creation of corresponding licensing regime and regulations.
g) Creation of General Terms and Conditions of Transmission System Operator and Distribution System Operators.
h) Development of contractual framework for Balancing Responsible Parties.
i) Development of General Terms and Conditions of Balancing Group Responsible Parties.
j) Development of General Terms and Conditions of Balancing Groups Responsible Parties (BRP)
k) Defining of different type of customers and customer groups in primary and secondary legislation.
l) Creation of standardized load profiles for each type of customers.
m) Creation of Technical and Organizational Rules (TOR) for balancing groups functioning.
n) Creation of customer switching rules and procedures
o) Creation of Supplier of Last Resort