



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

Georgia's Future Balancing Mechanism and Balancing Market



July 2014



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

INTRODUCTION

Balancing energy

- Additional supplied energy when actual load is greater than contracted supply, or
- Reduction in supplied energy when actual load is less than contracted supply
- Balancing energy volume is difference between actual and contracted hourly volume

Current balancing practice in Georgia

- Real time dispatch by GSE for balancing and operating reserves relying largely on regulated/partially regulated HPPs in summer and thermal plants plus imports in winter
- Balancing purchases/sales (including imports/exports) by ESCO settled on a monthly basis
- Guaranteed capacity contracts with four thermal units (primarily for contingency reserves)

Balancing market transitional approach

- Initiate a day-ahead planning process
- Initiate an hourly deviations balancing mechanism prior to a bid-based balancing market
- Introduce a single balancing market for day-ahead and real time requirements
- Introduce day-ahead market and ancillary services market at later dates



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING SERVICES DESCRIPTION

- Process of ensuring that **electricity supply equals consumption** at all times
 - **Planning component** - matching planned generation on a monthly, weekly, and day-ahead basis to forecast load
 - **Real time component** - matching actual generation to load through operational dispatch
- Balancing services are comprised of **energy and operating reserves**
- Day-ahead time frame – load forecast and day-ahead generation schedules to match projected generation to forecast load



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING SERVICES DESCRIPTION

- In real time, balancing services include:
 - Additional (or reduced) **energy provided by a generator** in response to instructions from the TSO to balance supply and consumption
 - Operating reserves including:
 - Primary (automatic generator response to imbalance to maintain frequency)
 - Secondary (on line spinning reserve that responds to imbalance upon instruction by TSO)
 - Contingency (stand-by capacity that is used to return primary and secondary reserve to planned levels).
 - **Demand response by customers** such as interruptible load or use of internal generation that meet the response requirements of energy balancing services



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

CURRENT BALANCING SERVICES APPROACH

- ✓ Monthly energy bilateral contracts between generators and consumers
- ✓ ESCO contracts for exports/imports for monthly and day ahead balancing
- ✓ ESCO contracts for Contracted Capacity reserve with thermal power plants
- ✓ GSE develops monthly HPP energy forecast and dispatches at average levels
- ✓ GSE schedules TPPs when HPP production is insufficient to balance system
- ✓ GSE schedules and dispatches generation to balance energy and provide operating reserve:
 - ✓ Enguri is primary resource for balancing energy and primary/secondary reserves
 - ✓ Other storage HPPs provide balancing energy and some primary/secondary reserves
 - ✓ TPPs provide contingency reserve in winter
- ✓ GSE adjusts generation daily to match monthly deliveries with bilateral contracts
- ✓ ESCO clears and settles imbalances (actual vs. contract volume) on monthly basis



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MARKET CHALLENGES

- ✓ How to transition from a non-market based dispatch and monthly settlement approach to (ultimately) day-ahead, intra-day, real time and ancillary service markets
- ✓ How to maintain ratepayer benefits of low cost regulated hydropower plants in a market environment
- ✓ How to encourage a balanced position by market participants and avoid price arbitrage between contracts and balancing market
- ✓ How to account for impact of a large regulated HPP
- ✓ How to account for very different seasonal characteristics
 - ✓ High HPP generation and exports in summer
 - ✓ Reliance on thermal and imports in winter
- ✓ Market design, IT development, implementation
- ✓ Contract reformulation
- ✓ Regulation and monitoring



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM

Concept

- Balancing Mechanism incorporates month-ahead and day-ahead planning with hourly volume deviations and marginal cost pricing (no bids) for energy balancing

Volume related process

- Hourly load forecast by MPs
- MA and DA nominations from generators not in partial pool including contracted volume and proposed balancing sales
- Congestion management and generation optimization by TSO
- Allocation of output from low cost regulated and partially regulated HPPs (and potentially high cost thermal power plants in winter) in a “partial pool” for tariff customers
- Negotiated bilateral contracts based on projected MAP and DAP imbalances
- Hourly imbalance equals difference between actual and contract volumes



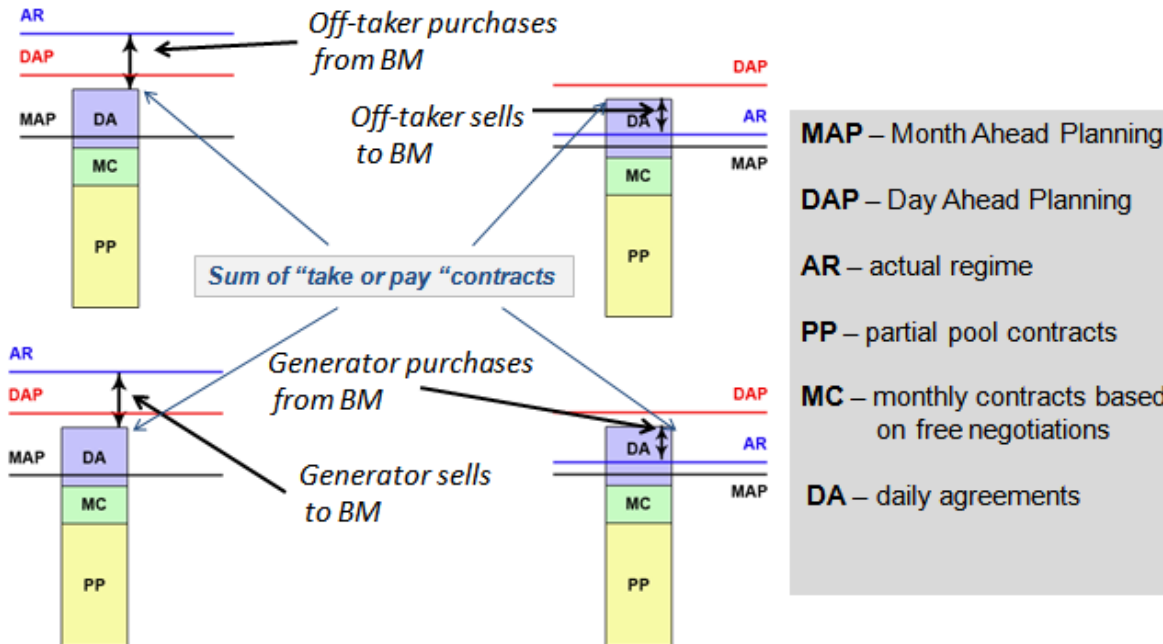
USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM PRICING OBJECTIVES

- Market participants should not have an economic incentive to rely on (or avoid) the balancing market as compared to contracting for supply (i.e. no arbitrage bias)
- Tariff customers should not see rate shock due to changes in balancing approach
- Balancing price should not be so advantageous as to discourage investment in new power plants
- All balancing sources should be considered, including exports and imports
- Balancing price should reflect system conditions, including water spillage at times
- Prior to initiating a bid based market, hourly marginal cost pricing is the best approach to achieve the objectives

Balancing Pricing



It isn't possible to use full-fledged balancing market (with price bids) at this stage of reform.

The balancing mechanism is a deviation market in reality, on which the MPs should pay for deviations as a penalty.

Balancing prices should be higher than on contracting market, but difference must be in reasonable limits to avoid a price shock.

In principle either marginal or average prices can be used on the balancing market.



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM MARGINAL COST PRICING

- Summer balancing supply - generally hydro; winter - hydro, thermal and imports
- Hourly balancing price will equal the highest cost of these sources in the hour.
- Adjustments for regulated hydro and thermal plants
 - To the extent that Enguri and Vardnili receive more than their regulated rate, they should be required to rebate some percentage to ratepayers
 - Partial pool will include some percentage of Enguri and Vardnili, five partially regulated HPPs, and TPPs output (can vary seasonally) with the remainder available in the balancing market
 - Discussion needed on marginal cost when regulated hydro is on the margin due to potential price distortion. Perhaps administratively set price (partially regulated HPP cap and zero when HPPs are spilling?)
- Highest cost import (except for MP – external bilateral contracts) will be considered in marginal cost
- Exports (contracted by ESCO) can be considered in the marginal cost calculation if interconnection is not fully loaded in the hour. Turkish day-ahead price could be considered as the marginal cost calculation in this case.



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM PREPARATION

- Standards must be developed for balancing market participation (startup time, ramp rate, AGC capability, potential customer participation)
- Generator characteristics for balancing (startup times, ramp rates, AGC) must be tested and contracts developed for primary, secondary and contingency reserves (what is required vs. what is an optional supply service? Pricing considerations?)
- Ground rules for balancing market must be developed (dead bands, penalty levels, payments to participants and non-participants for deviations)
- Bilateral energy contracts must be revised to be take or pay (except ???)
- Operating reserve contracts must be developed
- MPs are expected to form balancing groups to minimize and manage imbalances
- All commercial metering must be in place to implement hourly settlements
- Clearing and settlement entity and contracts must be developed (payment terms, collateral)



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM MA AND DA PROCESS

- MPs will provide MA and DA load forecasts and bilateral contract purchases
- Generators (except Enguri, Vardnili, and thermal plants) will provide DA schedule nominations including bilateral sales and planned balancing sales
- MO will contract for exports and imports
- TSO will use MA and DA planning process and generation optimization to schedule regulated hydro and thermal plants for projected system balance
- TSO will inform generators of schedule changes as needed for DA system balance
- MPs will contract for MA and DA supply/purchases (target would be balanced position)



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING MECHANISM SETTLEMENT

- TSO/MO will determine marginal cost each hour for energy balancing pricing
- TSO/MO will calculate hourly imbalance MWh by difference in actual vs. contracted volume
- TSO/MO will calculate imbalance revenue/payment based on marginal cost times hourly imbalance
- Difference in generation balancing obligations and actual levels are subject to penalties
- Allocation of output from low cost regulated and partially regulated HPPs and thermal power plants in a “partial pool” for tariff customers (financial transaction)



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

BALANCING GROUPS & BRPs

Balancing groups

- A set of buyers and sellers under a BRP Agreement
- Hourly nominations are submitted by all members to the MO and TSO
- Meters readings are netted by hour

Balance responsible party

- Offers their service to buyers and sellers
- Creates a balancing group
- Administer imbalance service:
 - invoice and payment to MO or TSO
 - Allocation of payments by hour to BGs members
 - Collects fees to cover payments and admin fee



LIKELY BALANCING MARKET PARTICIPANTS

Capacity Type	Winter (Mid November – Mid March)	Non-Winter (Mid March – Mid November)
Regulated HPP [1]	Active	Active
Partially Regulated HPP [2]	Active	Active
Deregulated HPP	Passive	Passive
Thermal [3]	Active	Minor
Imports	Active	Minor
Exports	Minor	Influential
Distribution Licensees	Passive	Passive
Direct Customers	Potential	Potential

- Active - Active market participant on a daily basis
- Minor - May be some sporadic activity depending on system conditions
- Passive - Seller or buyer in balancing market depending on forecast vs. actual
- Influential - Export decisions will influence bidding volume
- Potential - Depends whether direct customers have load response potential

[1] Enguri (1,320 MW) and Vardnili (220 MW) have fixed tariffs (1.17 tetri)

[2] Krhami-1, 2 (220 MW), Dzevrula (80 MW), Shaori (38 MW) and Zhinvali (130 MW) have partially regulated tariffs (9.134 tetri cap)

[3] Thermal plant at Gardabani 840 MW steam turbine capacity, 110 MW gas turbine, 230 MW combined cycle unit (under construction). 460 MW contracted for Guaranteed Capacity.



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

TRANSITION TO A BID-BASED BALANCING MARKET

- Parties will have gained experience operating in an hourly settlement environment
- Market clearing price in bid-based system replaces marginal cost calculation in balancing mechanism
- Many issues to be resolved
 - Development of bidding rules and procedures
 - Rebates to tariff customers for a portion of Enguri and Vardnili revenue above regulated rates
 - Consideration of how to treat five partially regulated HPPs
 - Timing of changes to operating reserve arrangements
 - MO role in exports/imports
- Eases some of the marginal cost calculation issues in favor of a more clearly defined bid-based clearing price
- Increases GNERC market monitoring role to prevent abuses
- Still a transitional approach pending introduction of day-ahead market



USAID
FROM THE AMERICAN PEOPLE

**HYDRO POWER AND ENERGY
PLANNING PROJECT (HPEP)**

- **Contacts:**

Sukru Bogut, COR, Senior Energy Advisor, USAID
sbogut@usaid.gov

Michael Jake Delphia, Chief of Party, USAID/HPEP
jdelphia@deloitte.com

www.hydropower.ge