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**Hydropower Investment
Promotion Project (HIPP)**

***Concept of the Day Ahead
Planning on the Georgian
Electricity Market***

January 2013



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Phases of transition to the new market model in accordance with GEMM 2015

Phase 0 – the existing system of bi-lateral contract accounting remain in effect no later than start of BSTP;

Phase 1 – development of the “Day-ahead planning” system (DAP) for market participants and its implementation for direct contract accounting on hourly basis;

Phase 2 – development of a concept of direct contracting (long-term, yet hourly-based) and of a new hourly mechanism for settlement calculations by the market operator (ESCO);

Phase 3 – Development and introduction of the hourly Balancing Market (BM);

Phase 4 – development and implementation of the Day Ahead Market (DAM).



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The purpose of this presentation is to present proposed methodology of the Day-Ahead Planning (DAP) for new Georgian electricity market.

As a result, planned monthly or annual volumes of electricity in GWh must be broken down by the hours (MW) for each market participant.

Post-DAP tasks include:

- Hourly planning of the required consumption/generation for market participants for the month/year ahead
- Hourly bi-lateral contracts schedule development and implementation
- Hourly Balancing Market creation
- Day-Ahead Market implementation
- Hourly possible Georgian export and required import determination
- Trade with neighboring countries



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Current situation

Currently the planning (month, year) and direct contracting on the Georgian market is being realized by monthly volumes of electricity.

Almost all large and medium size HPPs generally traded on direct contracts (only 4.2% and 3.5% of electricity from these units passed through ESCO in 2011 and 2012 respectively).

Considering that direct contracts are signed on annual basis, a question arises: **Is the settlement based on annual/monthly forecast or adjusted for each month?**

In case of EnergoPro's HPPs **100% of generation pass on direct contracts**, as they have signed flexible contracts in which a volatility of $\pm 10\%$ is considered.

It's obvious that **corrections have been made.**



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Current situation (continue)

Currently in Georgia the **monthly balancing mechanism** is used.

The average price of the balancing market drastically differs by months and varies from \$10 /MWh in summer months to \$60/MWh in non-summer months.

The volumes of electricity flowing through the current balancing market make annually the value of about 15 % (up to 5 % in summer months and up to 20 % in non-summer months).

In addition, the TPP dispatch is determined by dispatch order.

currently consumers pay for **guaranteed reserve capacity**, charged in a monthly rate in tetri/kWh.

This approach can't be assumed as an optimal one. There is a good probability that with high deviations by hours and days that the total deviation on a monthly profile may come close to zero.



Specifics of the developed DAP methodology

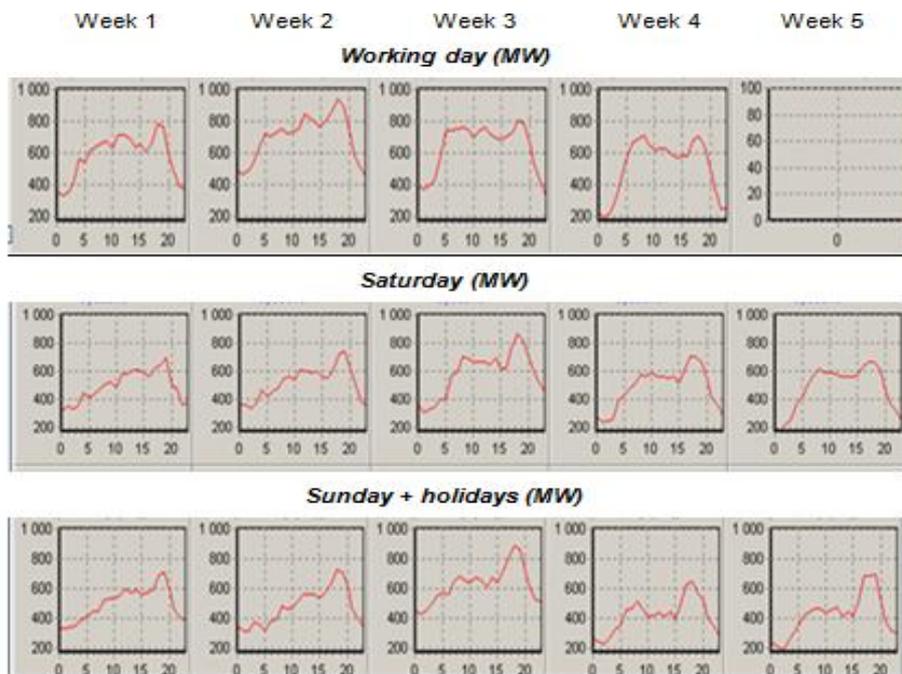
The accuracy of planning will depend on several factors:

- ***Annual/Monthly/Daily planning.***
- ***Splitting by types of days***
 - Week-days, Saturdays, Sundays+holidays or
 - Mondays, Tuesday-Fridays, Saturdays, Sundays+holidays .
- Unfortunately, ***the metering database currently installed at GSE is*** not complete but it is the only source to obtain historical data required for this methodology.
- ***The historical data*** to be used in the analysis could be collected from the past one to three years.



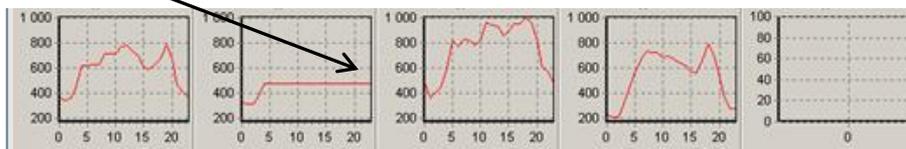
Proposed methodology

Processing of historical data



Filtering of the historical data

Data of this day should be ignored





Proposed methodology (continued)

Calculations of hourly curves for market participants for the planned period

The monthly figure in GWh should be transformed into MW for each hour of the month.

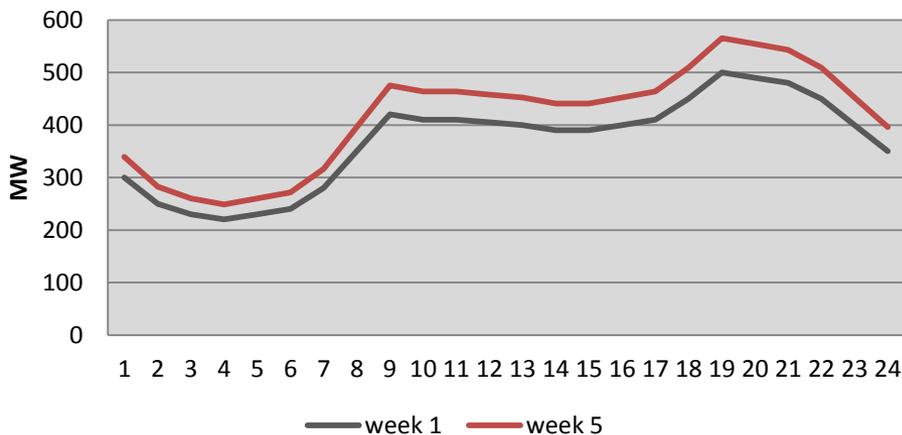
Monthly planned volume	Volume for working days	Volume for Saturdays	Volume for <u>Sundays+holidays</u>
272	206	35.6	30.4

Week 1	Week 2	Week 3	Week 4	Week 5	Total
44.3	45.7	47.4	48.6	20.0	206.0

Based on the received shapes of curves, the weighted coefficients for each hour of the week are being defined, according to which we receive daily hourly curves.

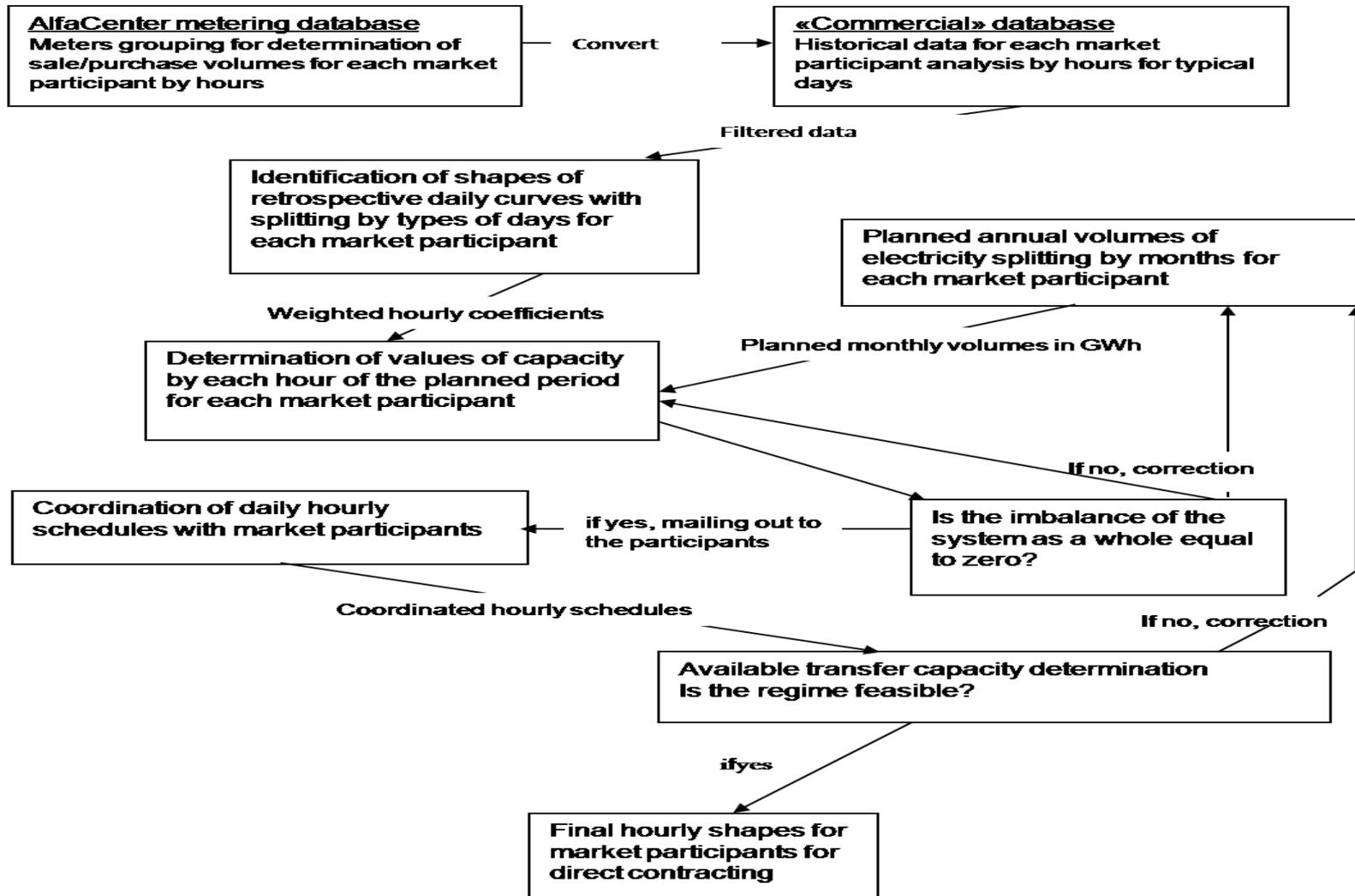
In principle, we can get the same curves on working days for each week as well as to differentiate them.

Daily planning load curves for working days of the first and the fifth weeks





Software structure and information flows





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The proposed methodology and hourly direct contracts

Some problems may occur while including 100% DAP into direct contracts in accordance with GEMM 2015.

The proposed mechanism of developing DAP schedules will not create problems for the energy off-takers.

The problem for generators is that splitting of the planned volume of electricity according to the certain shapes of curves may result in the following situations:

- *Increase of the capacity above the technically allowable maximum at peak hours;*
- *Decrease of the capacity below the allowable minimum at night hours.*

Considering the load growth tendency in Georgia, the second option could be practically excluded.



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The proposed methodology and hourly direct contracts (continue)

For the “run-of-river” HPPs the first situation is also hardly probable.

Construction of new HPPS may as well remove this problem

What relates to the **large regulating HPPs**, then, though this possibility theoretically exists.

There are **two options** to put the regime into the allowable range:

- **To reduce the planned volume of electricity** by preserving the shape of the daily curve;
- **To re-dispatch the volume of electricity** that goes beyond the technical limitations range on the other hours of the day (the daily volume remains unchanged while the shape of the curve is distorted).



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The proposed methodology and hourly direct contracts (continue)

So, what needs to be done?

First of all, it is necessary to evaluate the probability of occurrence of such cases.

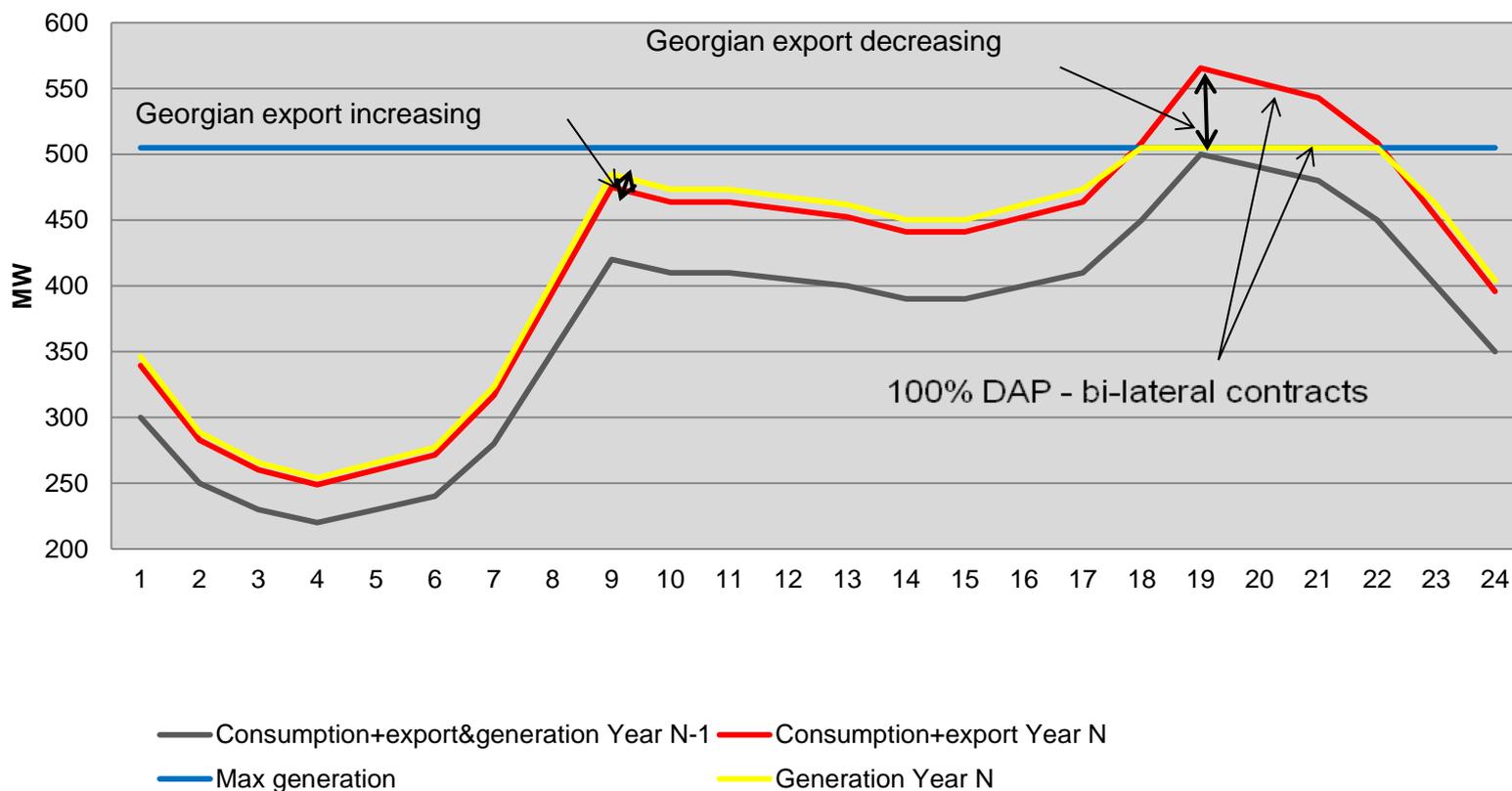
If the problem any how occurs, it will be necessary to develop **special activities**.

The following options are considered below for new mechanism of direct contracts:

- Direct contracts are for 100% of the domestic consumption with Georgian export regulation in summer months;
- Direct contracts are for 100% of the domestic consumption with Georgian import regulation in non-summer months;

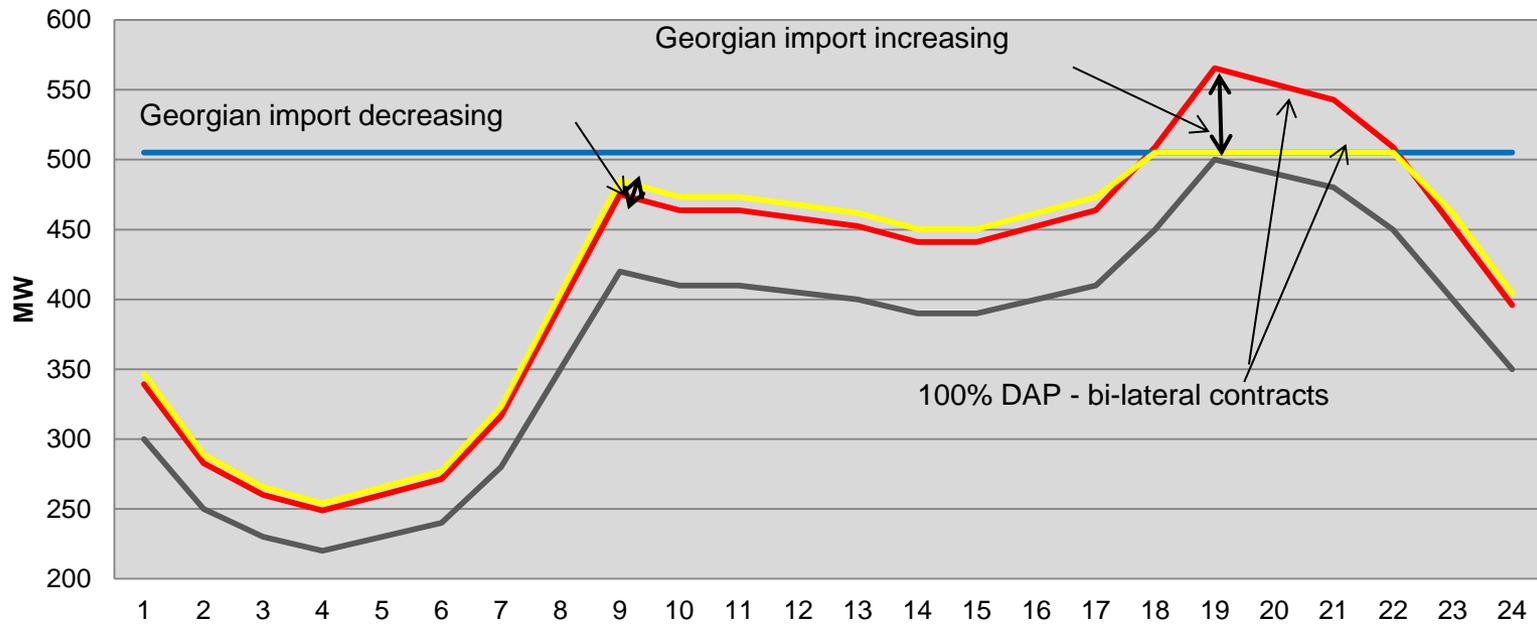


Option 1: Bi-lateral contracts volume – 100% of DAP. Summer – Georgian export





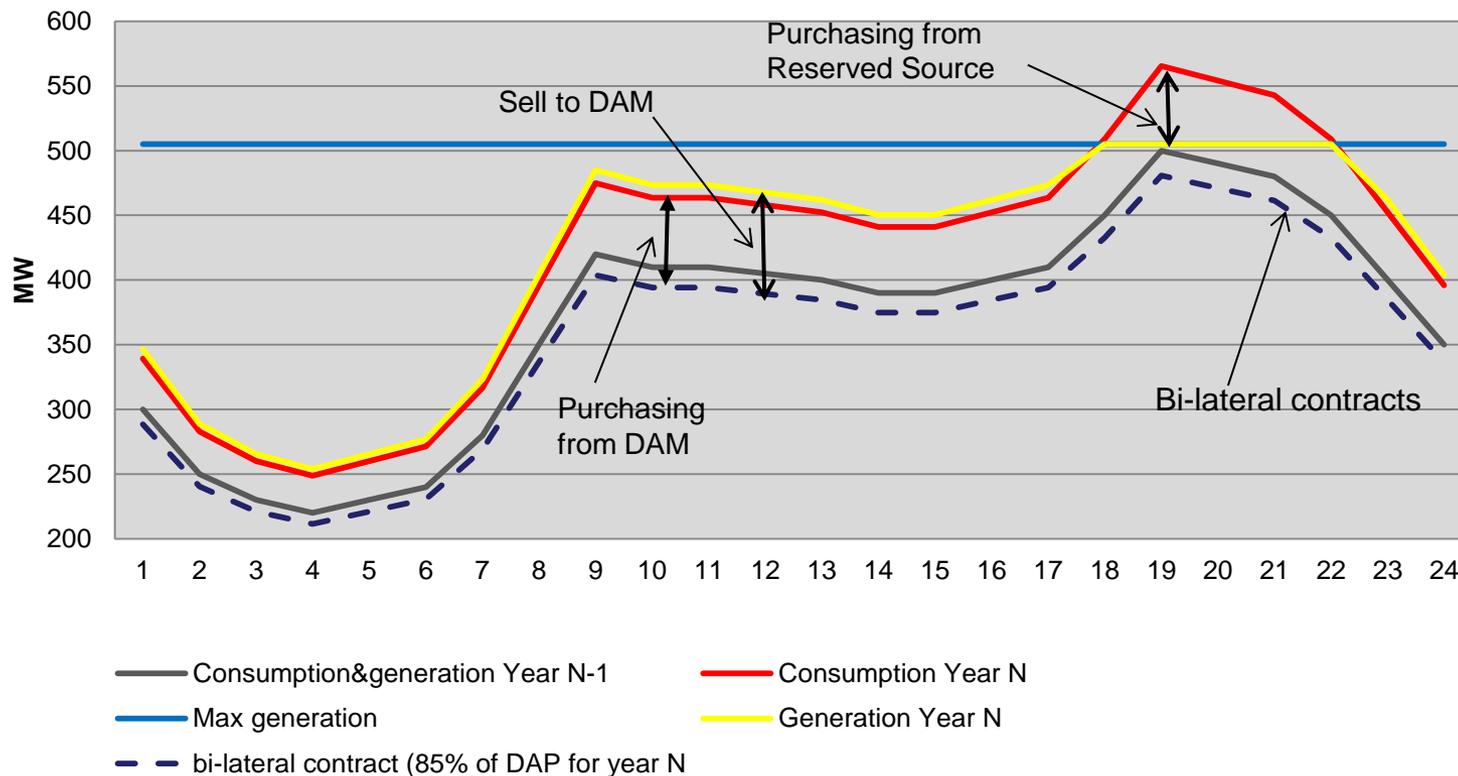
Option 2: Bi-lateral contracts volume – 100% of DAP. Winter – Georgian import



— Consumption & generation + import Year N-1 — Consumption Year N — Max generation — Generation Year N



Option 3: Bi-lateral contracts volume – 85% of DAP (example)



The optimal percentage of volume of DAP for bi-lateral contracts should be determined after simulations



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Conclusion

For successful transition to hourly planning (DAP) the following works to be performed :

1. To align the conceptual design with all stakeholders
2. To develop detail algorithms for DAP
3. To organize working group to develop database and software ASAP
4. To begin simulations
5. To make adjustments in software based on simulation results
6. To select the schedule of annual balancing direct contracts
7. To begin hourly balancing mechanism development



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Thank you