ROMANIAN ENERGY REGULATORY AUTHORITY (ANRE)

ANRE

Electric energy market in Romania, present and perspectives

ELECTRIC ENERGY MARKET

market structure 2000 - 2005

- **Bilateral Contracts Market** – decentralization, regulated/free
- **Day-ahead Market** – centralized, mandatory
- **The Market on Allocation of Capacities on Interconnecting Lines** (50% - 50%)
- **System Technology Services Market (Ancillary Services Market)**

DISADVANTAGES:

- **Day ahead market based on System Marginal Price –** forecast influenced System Marginal Price;
- **Programming in D-1 – difficult**, with many stops/ starts of thermo groups;
- **Programming of Dispatching Units –** made by Day-ahead market**;**
- **System balancing:**
  - without computerized tool
  - those who supplied power adjustment received system marginal price (sometimes below costs);
  - elimination of congestions – costs supported by producers;

ELECTRIC ENERGY MARKET
- market structure 2005-2012

- **Bilateral Contracts Market** – centralized/discentralized, regulated/free
- **Day-ahead Market** – centralized market, voluntary, subsequently the PZU operator becomes counterparty, the system gives warranty for buyers
- **Balancing Market** – mandatory centralized market for all producers that own DU, operated by dispatcher, congestion management mechanism
- **Ancillary Services Market/System Technology Services (STS) Market** – regulated/irregulated, operated by the dispatcher, the necessary volume of STS is established by the dispatcher
- **The Market on allocation of capacities of Interconnecting lines** – voluntary centralized market, 50%/50% until 2010.
- **The market of green certificates** – to boost production from renewable sources organized in accordance with EU requirements.

ELECTRIC ENERGY MARKET
- market structure 2005-2012

ADVANTAGES

- **System balancing–** using market mechanisms
  - Those who supply power adjustment receive at least the offered price
  - Those who cause imbalances in the system pay the disequilibrium price
  - Eliminating congestions – costs supported by TSO
- **Offers the warranty of a performance of obligations on previous PE contracts**
- **Auto programming of Dispatchable Units**

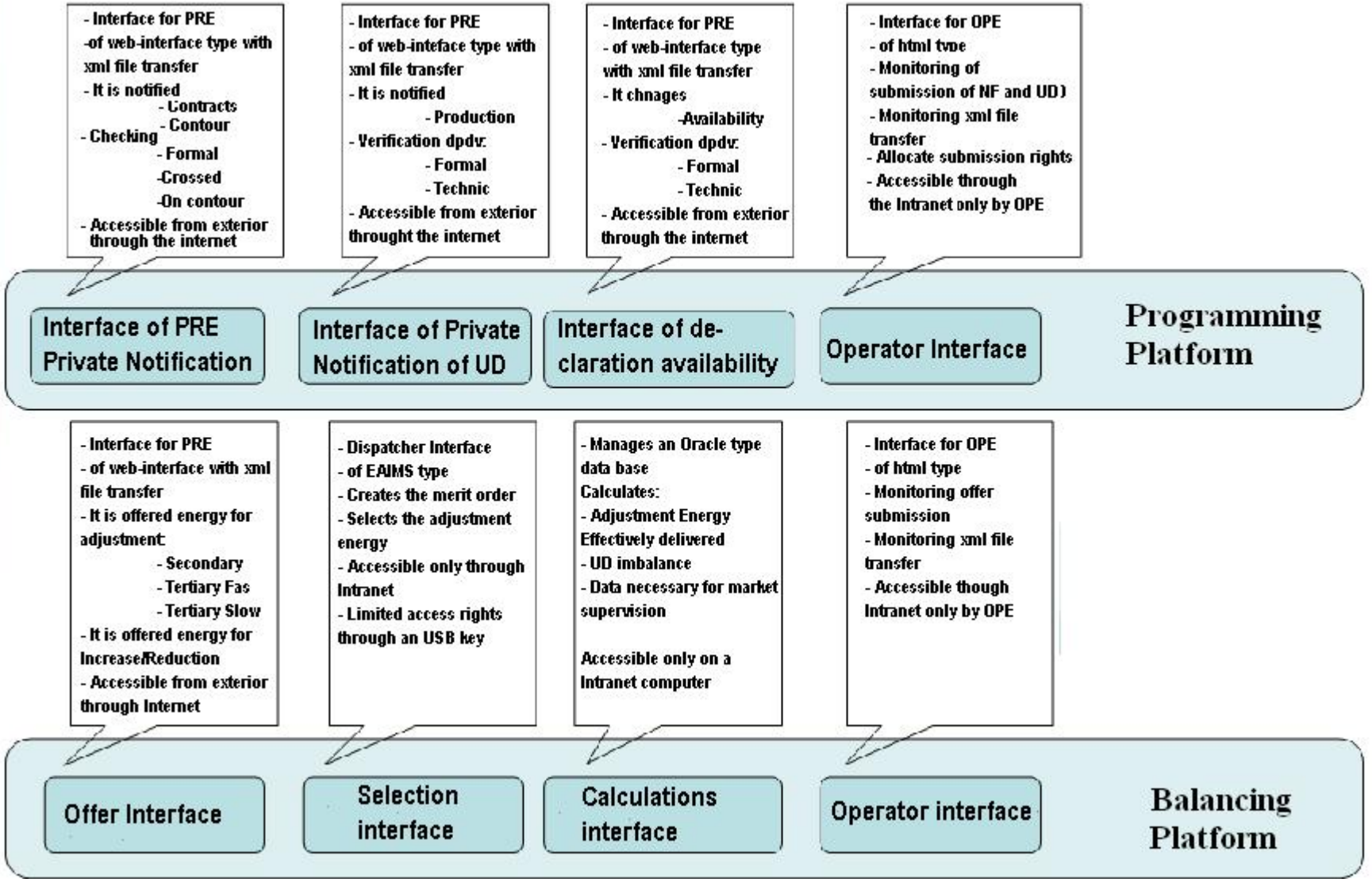
ELECTRIC ENERGY MARKET
- market structure dupa 2012

- **Bilateral Contracts Market** – centralized, voluntary
  (o regulated component until 2017)
- **Day-ahead Market** – voluntary centralized market, coupled in November 2014, default allocation of border coupled capacity
- **Intra-daily Market** – centralized, voluntary, with continuous correlation from 2014
- **Balancing Market** – mandatory centralized market
- **Ancillary services/System Technology Services Market** – regulated/non-regulated
- **The Market on allocation of capacities of Interconnecting lines** –
  voluntary centralized market, bilaterally organized from 2010 with annual, monthly, daily and intra-daily allocation
- **The market of green certificates**– organized in accordance with EU requirements.

BALANCING MARKET

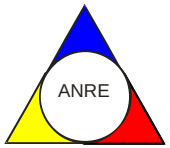
- Operated by the dispatcher on a dedicated computer platform (hard si soft)
- Transactions are done in real time
- Participants at Balancing Market introduce physical notifications and offers in computer platform
- Computer platform contains a database with technical features of Dispatchable Units (DU)
- The offer is unique (the same offer for all categories of power adjustment)
- The platform establishes the participation of DU at merit order on adjustment categories depending on qualifications of each DU
- Selection of balancing energy, as needed, is based on merit order of offers automatically generated by the computer platform, for the requested timeframe
- Requested timeframe is between 15 minutes minimum and until the end of trading maximum

BALANCING MARKET
computer structure



BALANCING MARKET (BM)

information exchange



PRE(or PZU)

PRE

PPE

Programming Platform

Measure Op.

Measure Op.

Operator Measurement (OMEPA)

Operator Reimbursment (OPCOM)

NF exchange PRE

NF Cons/Prod agregate

NF exchange PRE

NFCons/Prod agregate

NF each DU

NF each DU

Aggregate Measure PRE

Liabilities

DU Measure

Dez. DU+en.real.

Selected Offers

BM Offers

Selected Power Adjustment

BM interface reimbursement

PE sector selection

Intermediary calculations

BM platform

RFP - RS

BRS

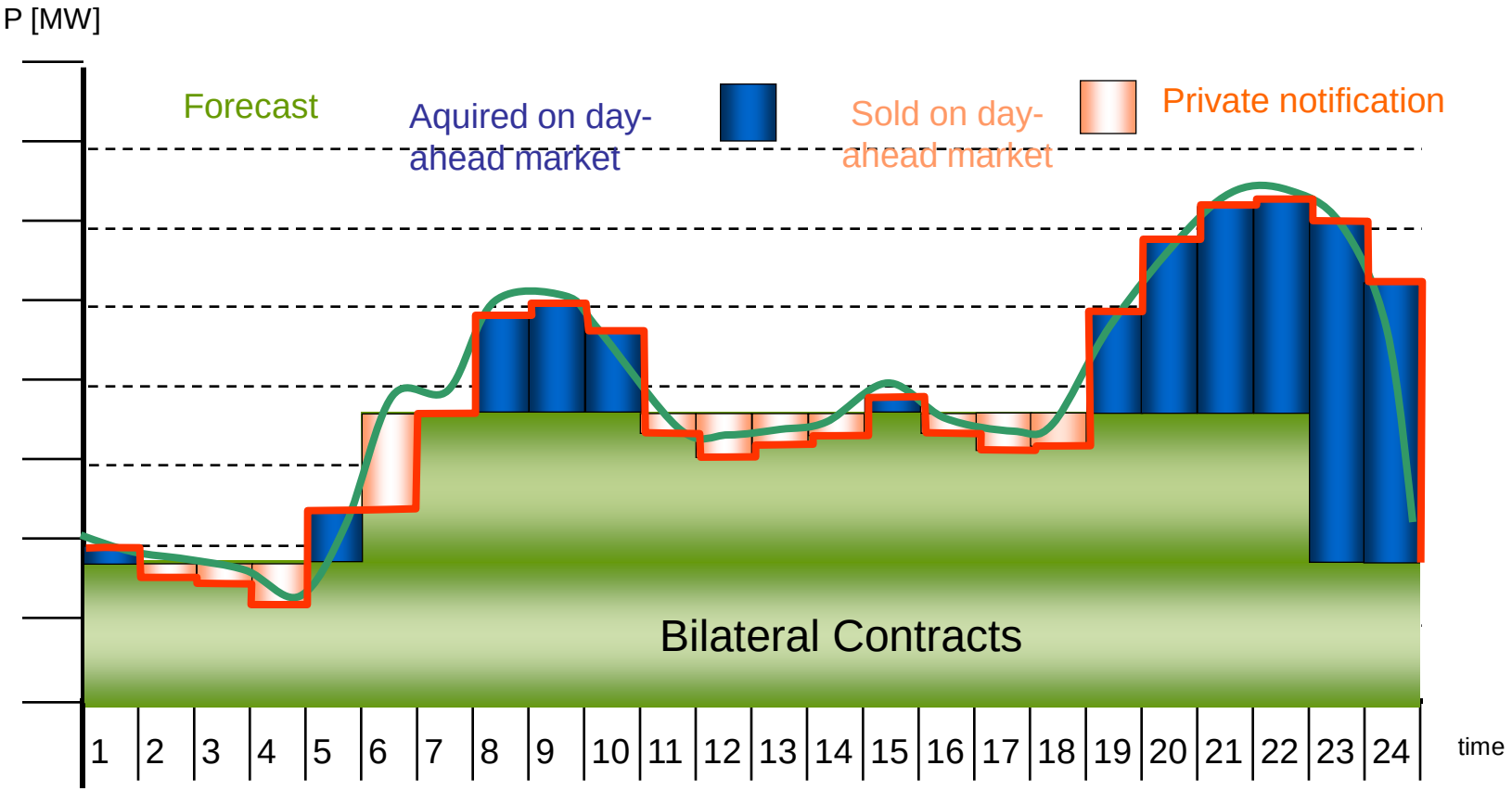
RT Order

RT Order Main RTU

RS Order

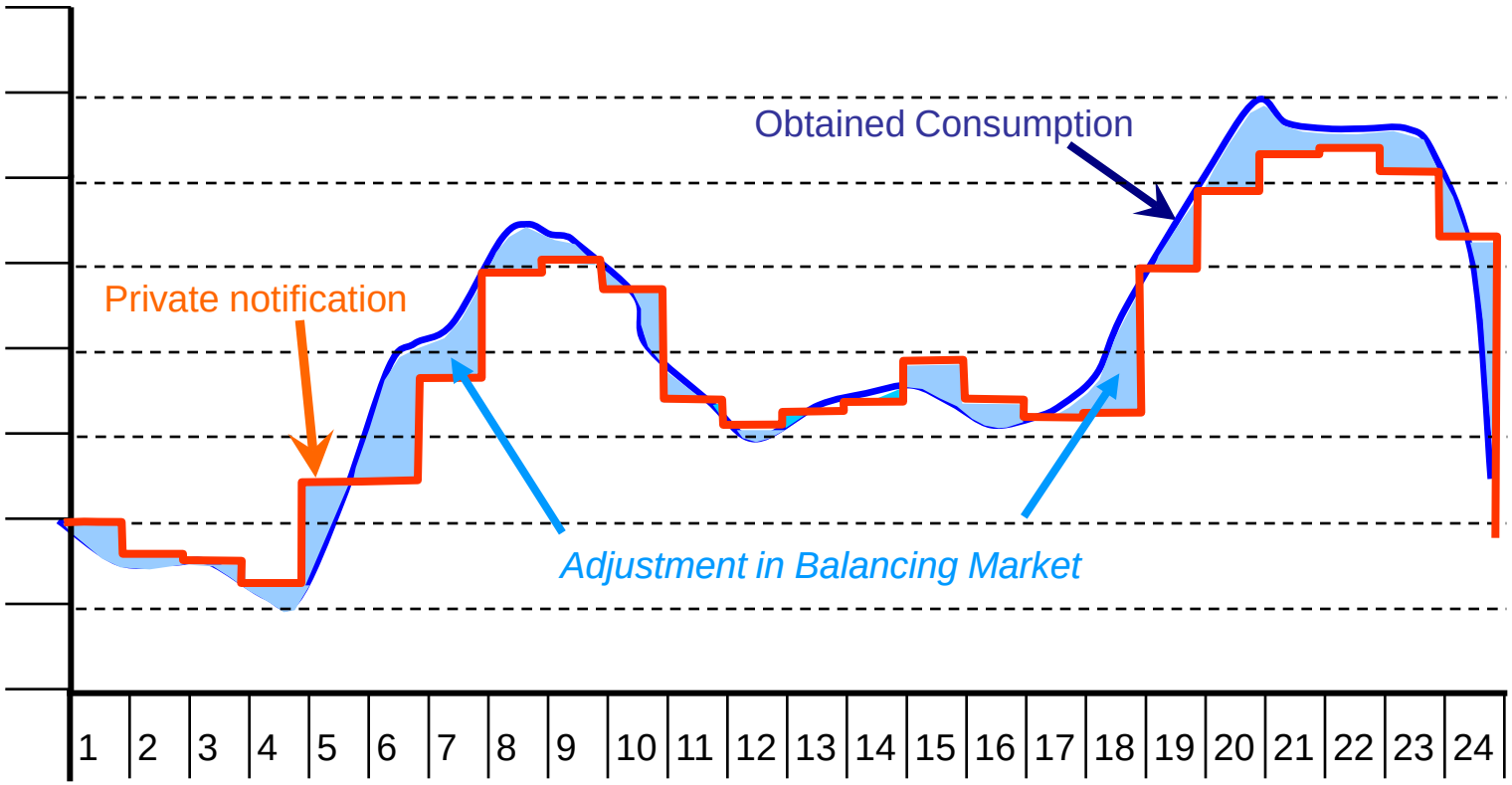
BALANCING MARKET

Coverage of consumption needs with contractual obligations



BALANCING MARKET

Production adjustment using balancing market



BALANCING MARKET

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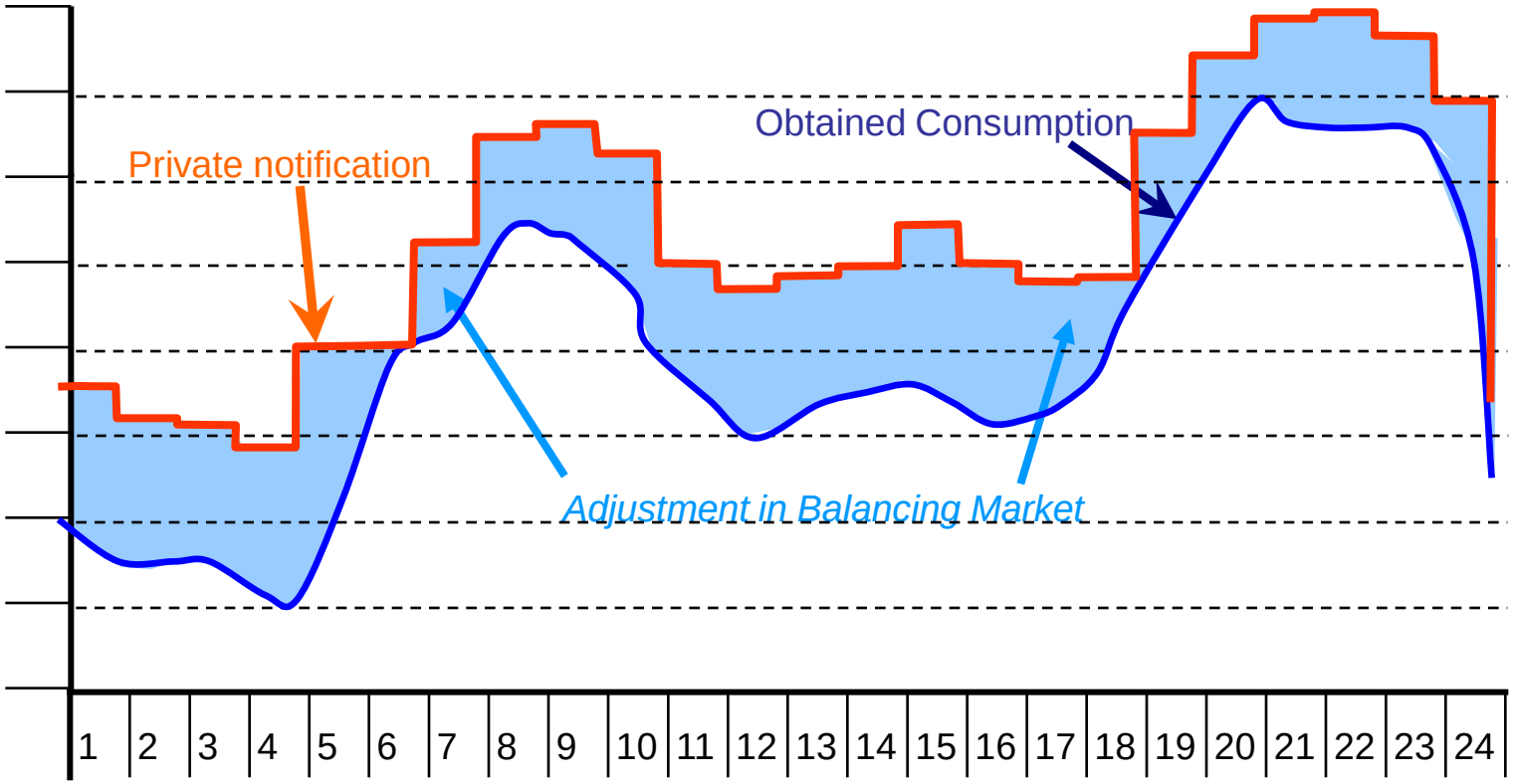
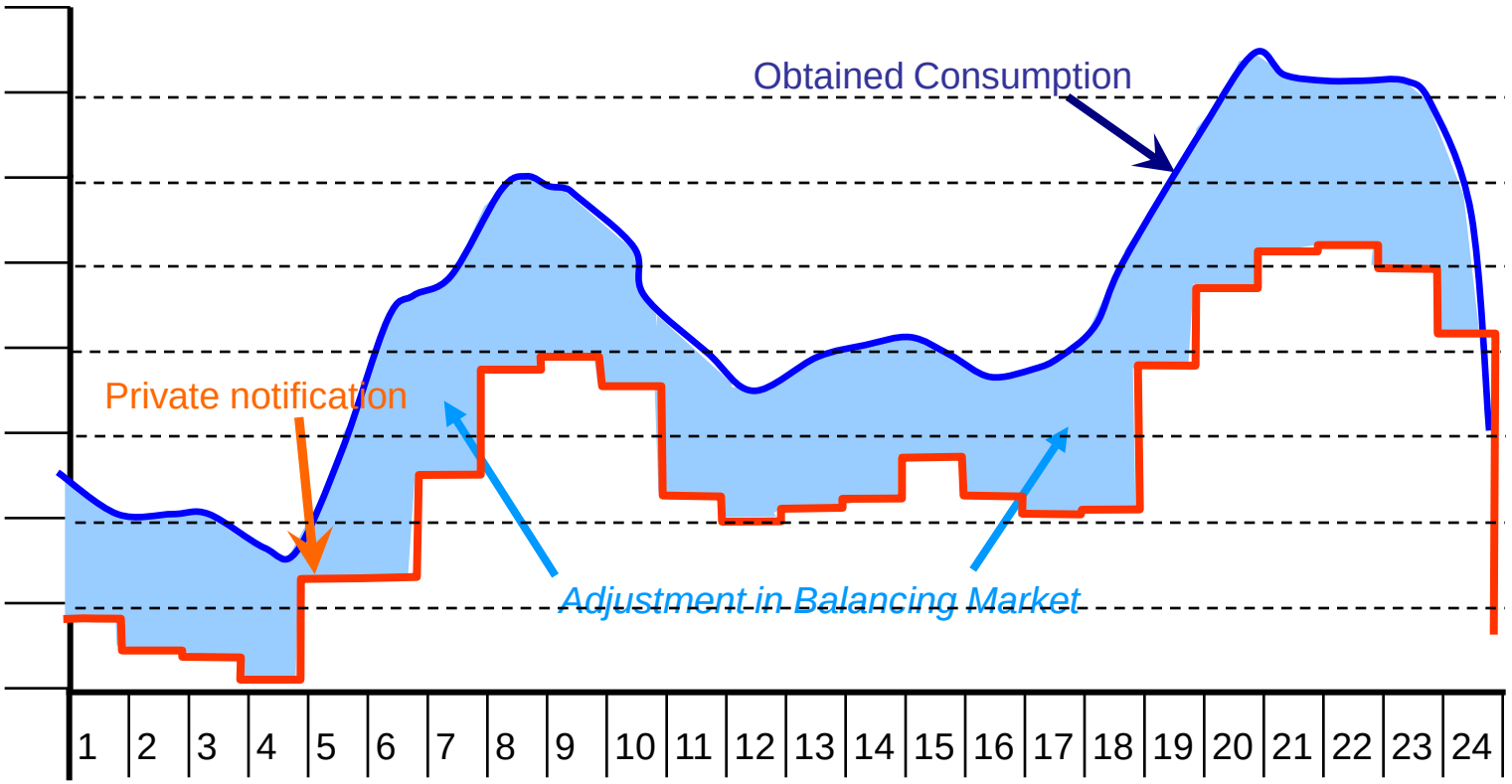


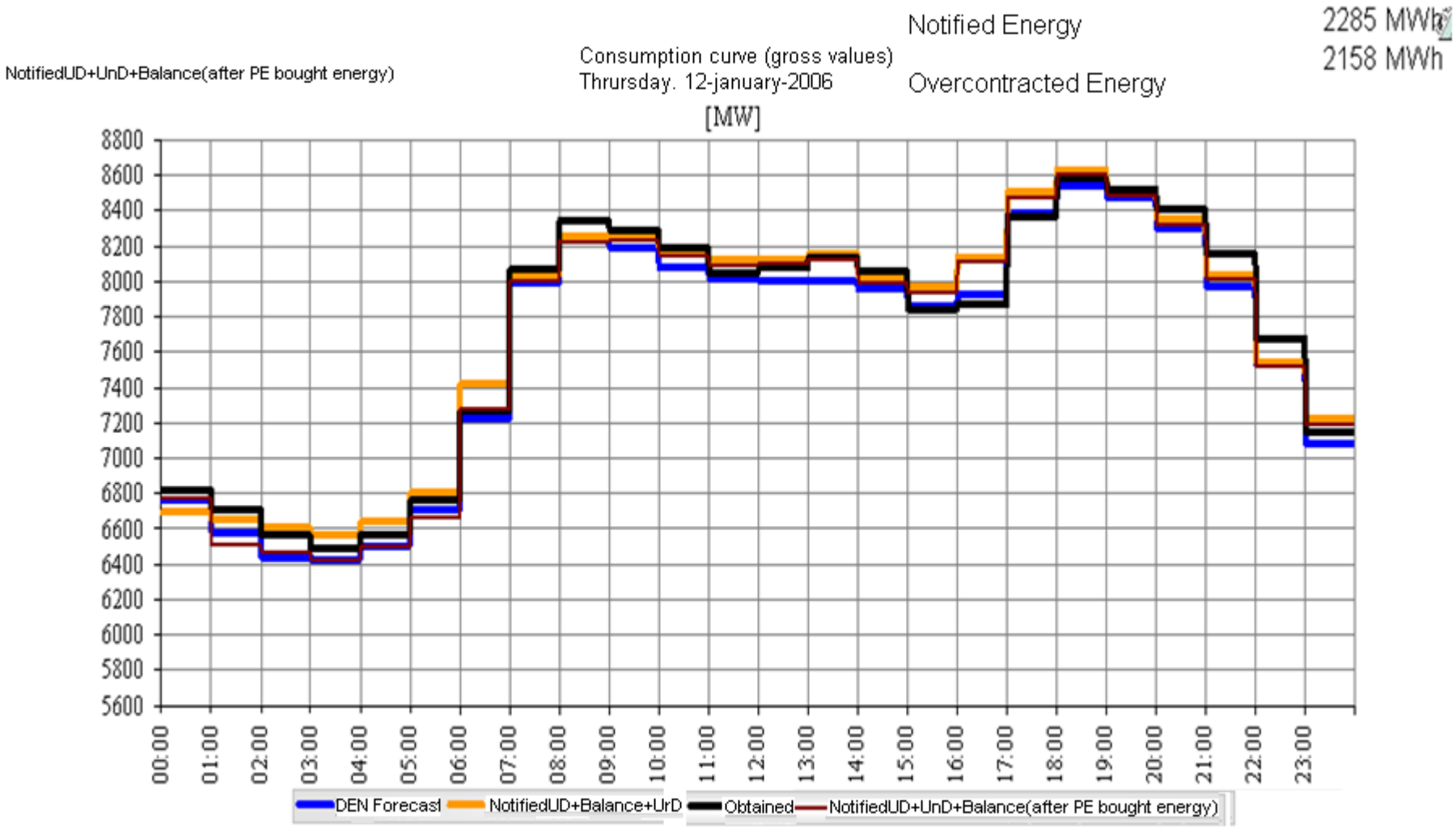
BALANCING MARKET

Production adjustment using balancing market



BALANCING MARKET

Coverage of Consumption with NF



BALANCING MARKET

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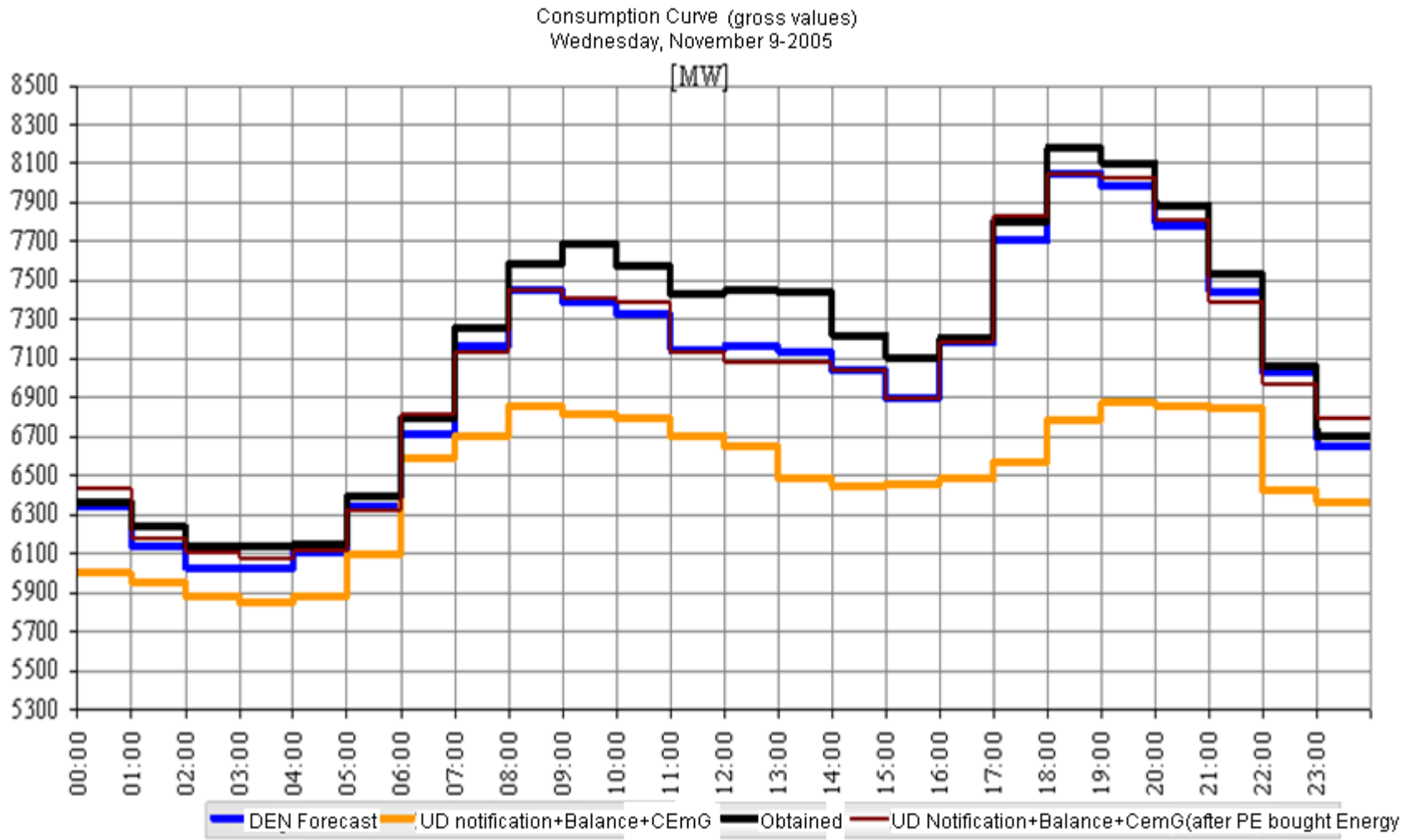

BALANCING MARKET

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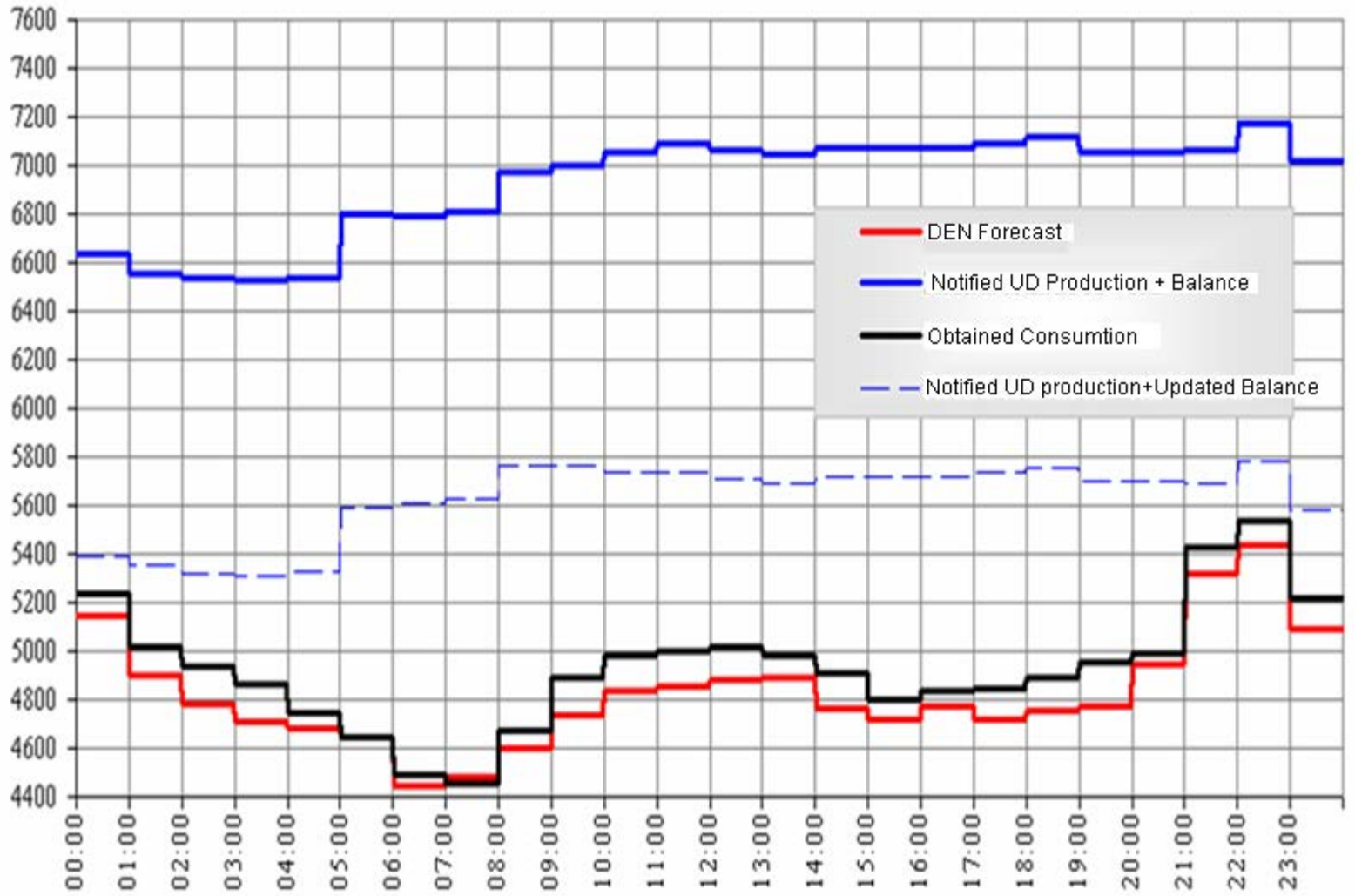
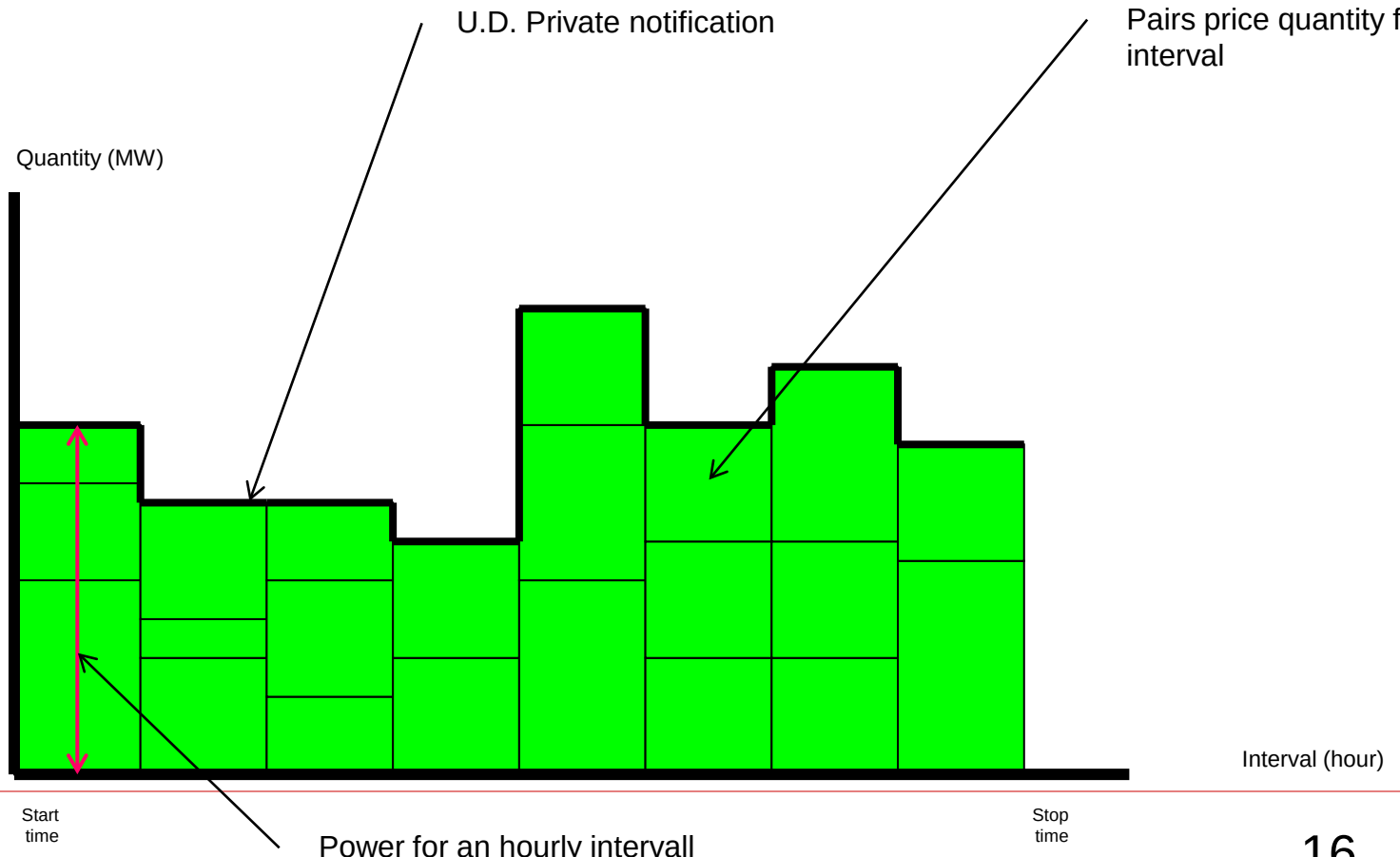


BALANCING MARKET

Switching off thermo groups

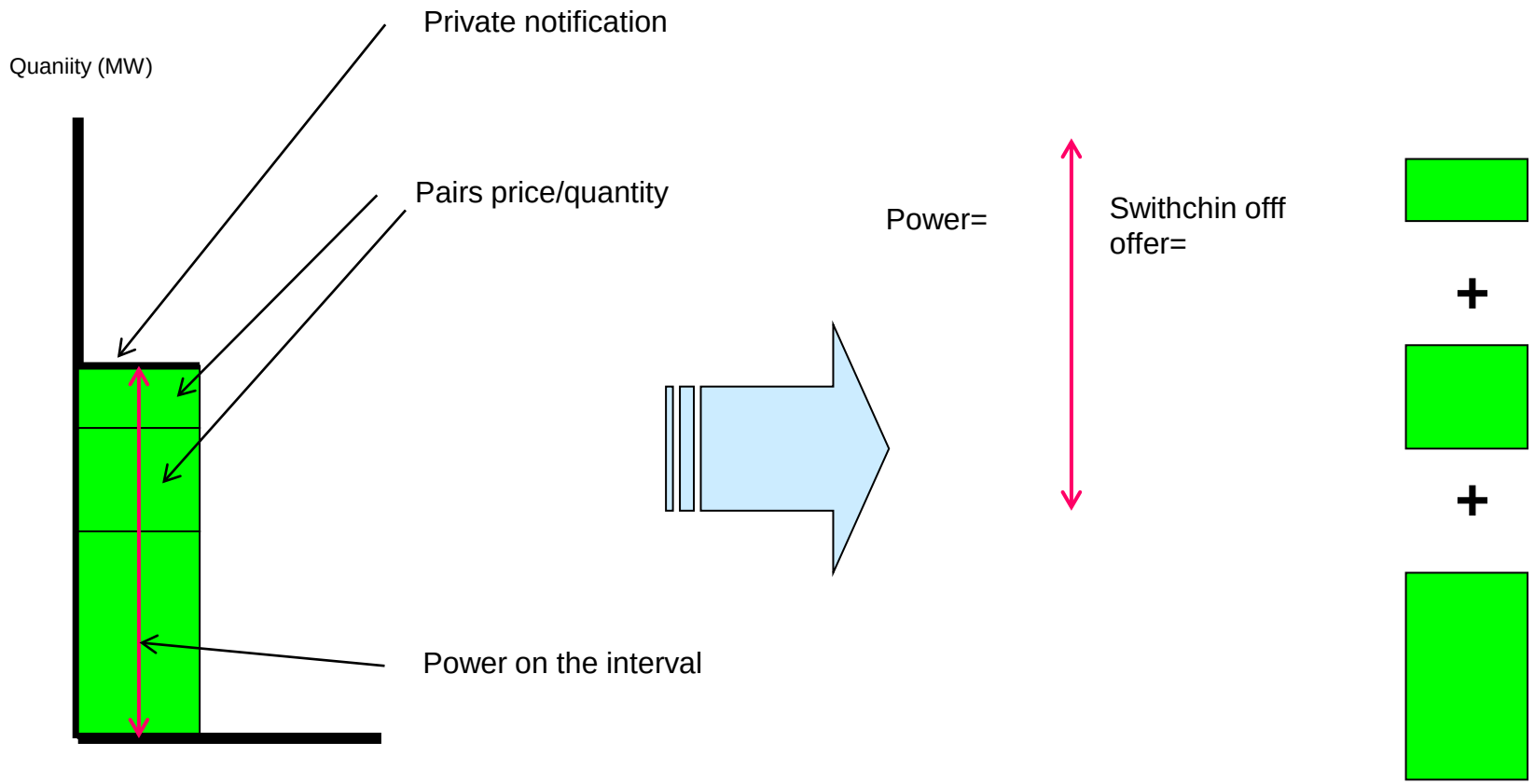
- on selected timeframe, usually, the hourly notifications and price offers differ



BALANCING MARKET

Switching off thermo groups

- for each hourly interval low power=notified power



BALANCING MARKET

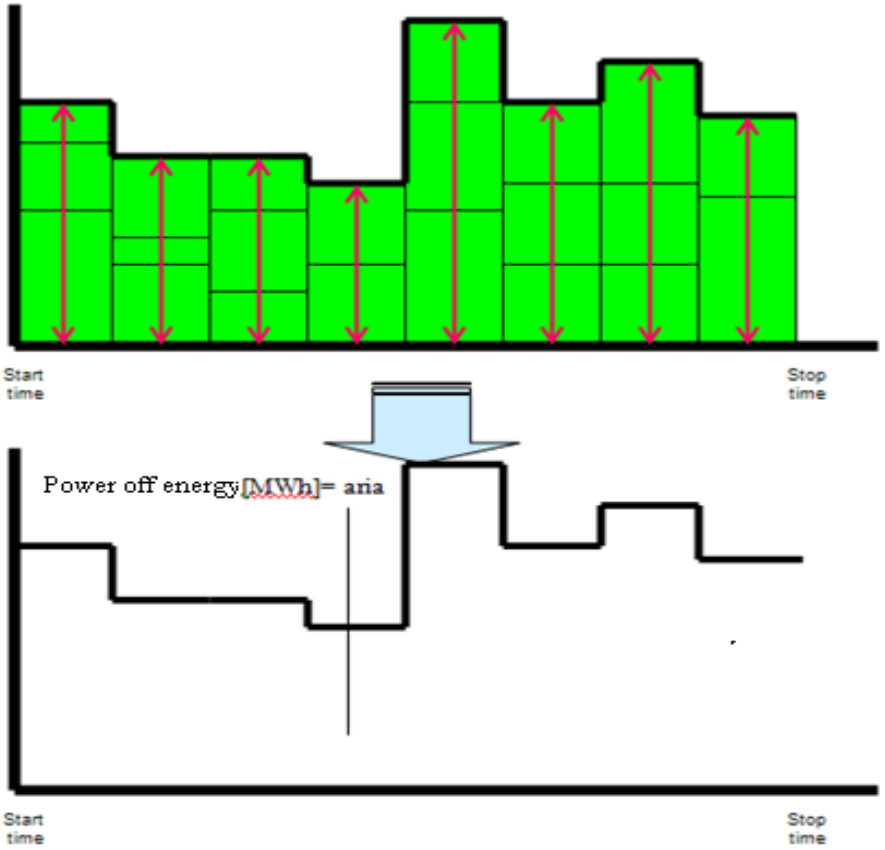
Switching off thermo groups

Power off offer [lei]= $\sum_{j=1}^{m} \sum_{i}$

where

n=no.of pairs price quanity
Qj the quantit of pair i
pi=price of quantity Qj

m=no,of intervals



Switching off thermo groups

$$\text{Average Power Off } [MW] = \frac{\text{Power off Energy } [MWh]}{\text{no.of intervals } [h]}$$

$$\text{Power off average price } [lei/h] = \frac{\text{Power off offer } [lei]}{\text{no.of intervals } [h]}$$

$$\text{Average price per power off MWh } [lei/MWh] = \frac{\text{Power off average price } [lei/h]}{\text{Average power off } [MW]}$$

The process is resumed until the exhaustion of dispatchable units that are in the merit order.

Switching off thermo groups

Based on this last indice (Average price pe MWh power off) is created merit order in a descending order of this indice.

Selection order from this merit order is made beginning with dispatchable unit with the highest price depending on the following technical conditions:

- to monitor, as much as possible, the operation of a heating plant with minimum one boiler;
- would be preffered keeping in reserve of certain groups (boilers) in front of powering off others, even if this thing doesn't fully respect the merit order;
- to avoid power off of groups that would introduce network congestions;
- To establish the power off volumes so as there enough tertiary fast reserve during rush hours (cf.pct.5.2), and at the same time, to be able to retrieve the power holes without power off of thermo groups

Starting of thermo groups according the start charts

- Maximum three types of Starting Charts are accepted for a DU, namely:
  - for starting DU from a cold state;
  - for starting DU from a warm state
  - for starting DU from a hot state

-the charts will have a whole number of hours with maximum four hourly intervals for thermo groups and maximum six hourly intervals for groups with combined cycle,
-- Hourly intervals that will be considered at settlement of the selection time in each hourly interval will be declared an hourly average power impose required by technical regulations
The values from these charts are placed in the DAMAS platform of PE and selected on request.

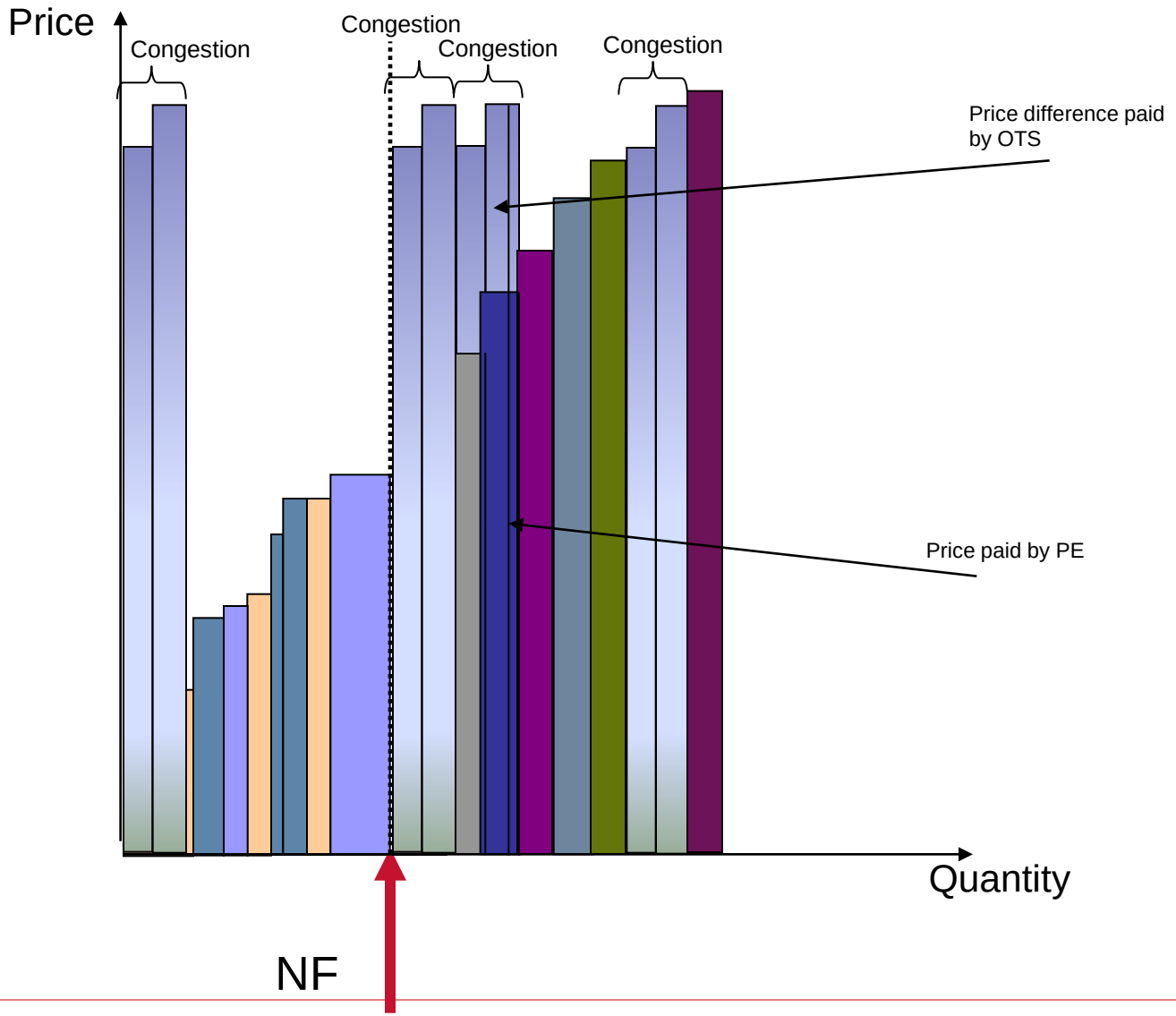
BALANCING MARKET

Using hydropower plants with storage with limited energy available;

- It is observed a maximum quantity of energy on increase and decrease
- the respective offers appears in merit order until the exhausting of a certain quantity
- The selection of a certain quantity in one direction increases, respectively the available quantity (selectable) in another direction

- **ADVANTAGES**:
- the daily limit of rate variation in the lake is observed (for seasonal storage lakes)
- the daily scheduled energy is observed (with maximum permitted deviations) in the lakes with daily regulation (Iron Gates)

CONGESTION MANAGEMENT



BALANCING MARKET
Perspectives

1. Secondary adjustment costs from the Marginal Cost to the Offer Price plus Band Incentive;
2. Compensation for participation in primary adjustment;
3. Compensation of imbalance at shifting from one power tier to another;
4. Penalties per DU for failure to use the entire balancing energy and for imbalance from the notification
5. Penalties per DU for failure to use the entire balancing energy and for imbalance from the notification
6. Reditribution of additional costs and income per PE proportionally with obtained imbalances

BALANCING MARKET
Perspectives

1. The costs with secondary adjustment: from the Marginal Cost to Offer Price plus band Incentive

Example for January 2010

	Cost [lei]	
Offer price	2 039 147	100 %
Marginal price	8 796 050	431 %
Offer+band Incentive **(f = 0,5)**	2 139 595	140 %

2. Compensation of participation on primary adjustment

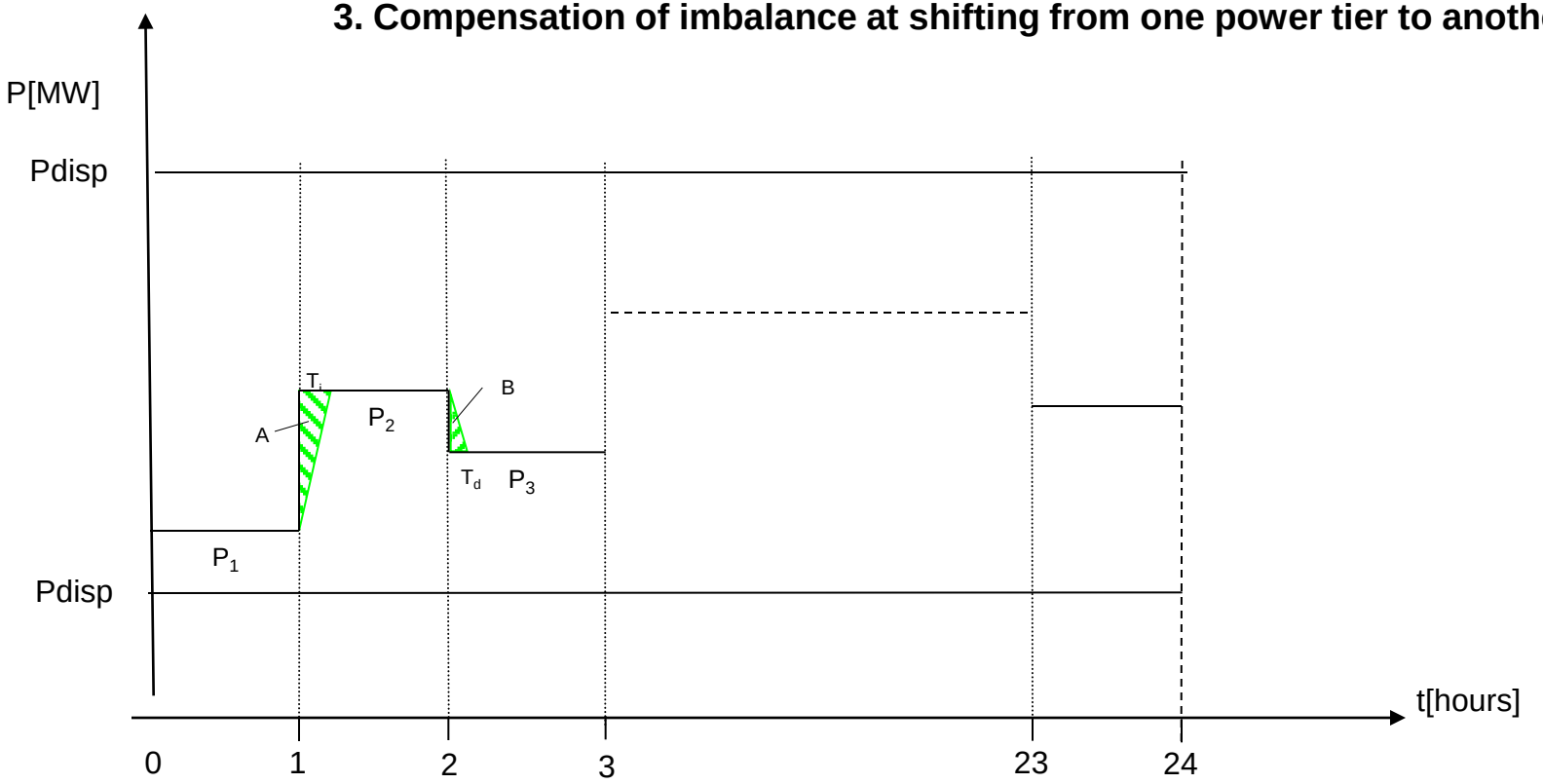
$$E_{np} = df/200 * R_{ez\,p}$$

- E_{np} - Energy supplied additionally (with plus or minus);
- df - prercentage deviation (in mHz), $df = f_{nom} - f_{mas.orar}$;
- $R_{ez\,p}$ - Primary adjustment reserve available for a deviation of frequency of 200 mHz.

Start time Stop time

BALANCING MARKET
Perspectives

3. Compensation of imbalance at shifting from one power tier to another



A – Default order to reduce the power

T_i – Time needed to increase the power from level P_1 to level P_2.

$T_i=(P_2-P_1)$/The speed of power increase

The resulted energy is paid by producers according to daily offers valid in interval 2

$$E=\frac{T_i\times(P_2-P_1)}{2}=\frac{(P_2-P_1)^2}{2\times v_i}[MWh]$$

B – Deafault order to increase the power

T_d – Time needed to reduce the power from level P_2 to the level P_3

$T_d=(P_2-P_3)$/The speed of power decrease

The resulted energy is paid by producers according to daily offers valid in interval 3

$$E=\frac{T_d\times(P_2-P_3)}{2}=\frac{(P_2-P_3)^2}{2\times v_d}[MWh]$$

BALANCING MARKET
Perspectives

4. Penalties per DU for failure to obtain full balancing energy and for imbalance from notification

-The balancing energy is paid at the level of dispatcher disposition
-Penalties apply for failure to obtain the full balancing energy
-Penalties apply for DU imbalance from the notification

ADVANTAGES:
-It stimulated the producers to operate on schedule

BALANCING MARKET
Perspectives

5. Penalties per DU for failure to obtain full balancing energy and for imbalance from notification

-The balancing energy is paid at the level of dispatcher disposition
-Penalties apply for failure to obtain the full balancing energy
-Penalties apply for DU imbalance from the notification

ADVANTAGES:
-It stimulated the producers to operate on schedule

BALANCING MARKET
Perspective

6. Redistribution of additional costs and income per PE proportionally with obtained imbalances

- Currently the redistribution of additional costs and incomes per PE is made proportionally to obtained consumption
-There are also other participants that produce imbalances
-It is proposed redistribution of additional costs and incomes per PE proportionally with the contribution to the system imbalance

ADVANTAGES:
- An equitable redistribution

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