

actility



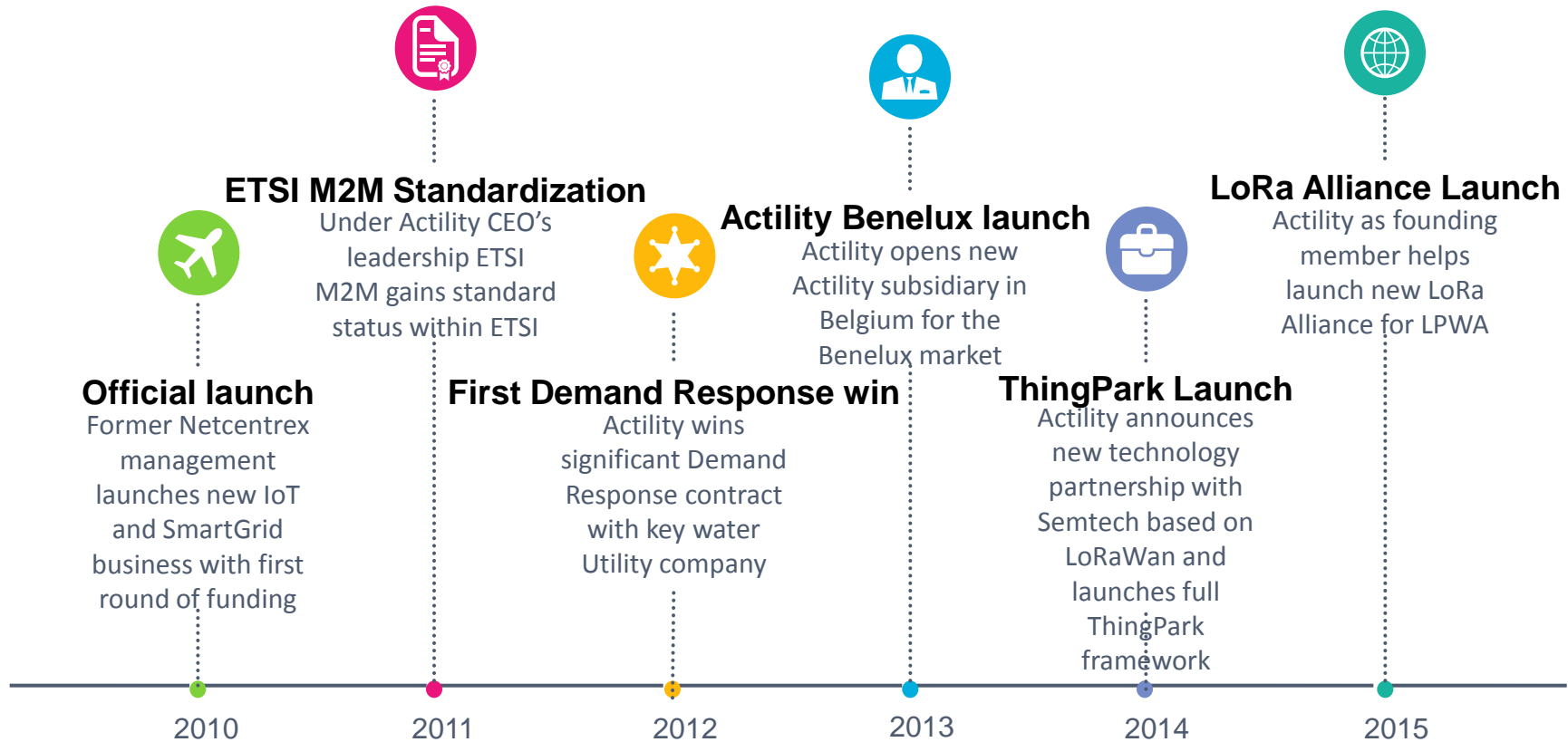
Making Things Smart

ASPROM

02/04/2015

How flexible customers can benefit from market volatility

Our history



Energy markets will benefit from IoT

Actility's SmartGrid Platforms

Smart Thermostat

Connected thermostat helps regulate household power consumption by providing user behavior patterns to Actility Platform

SmartGrid Platform

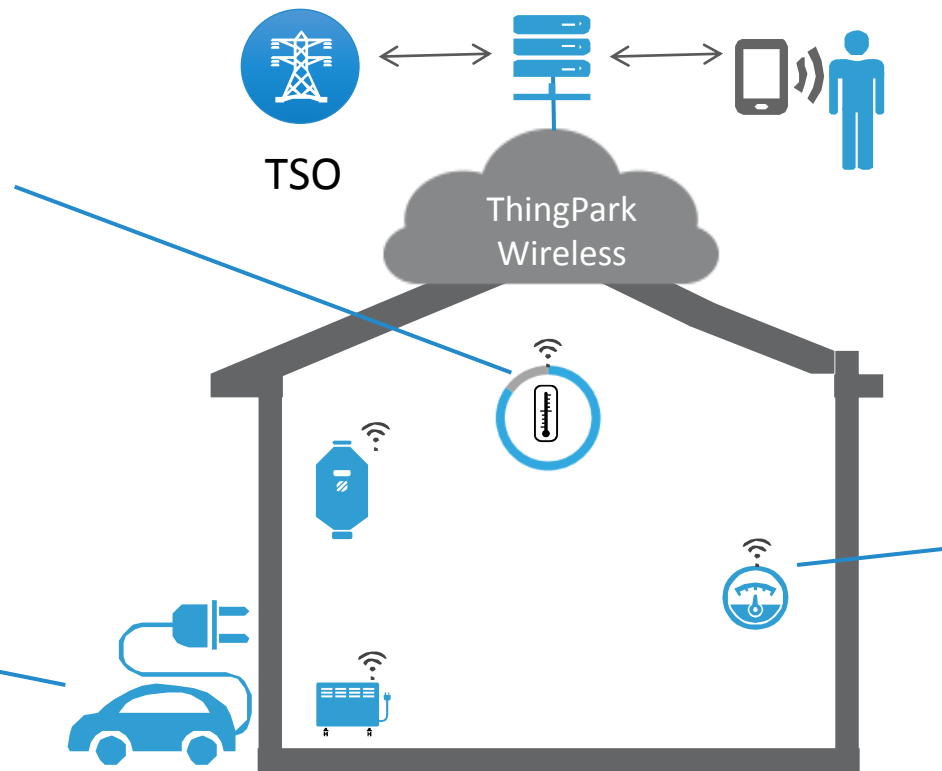
Actility's SmartGrid platforms receive large scale demand response requests from TSOs and energy management requests from end-user apps to control household appliances

Connected Smart Meters

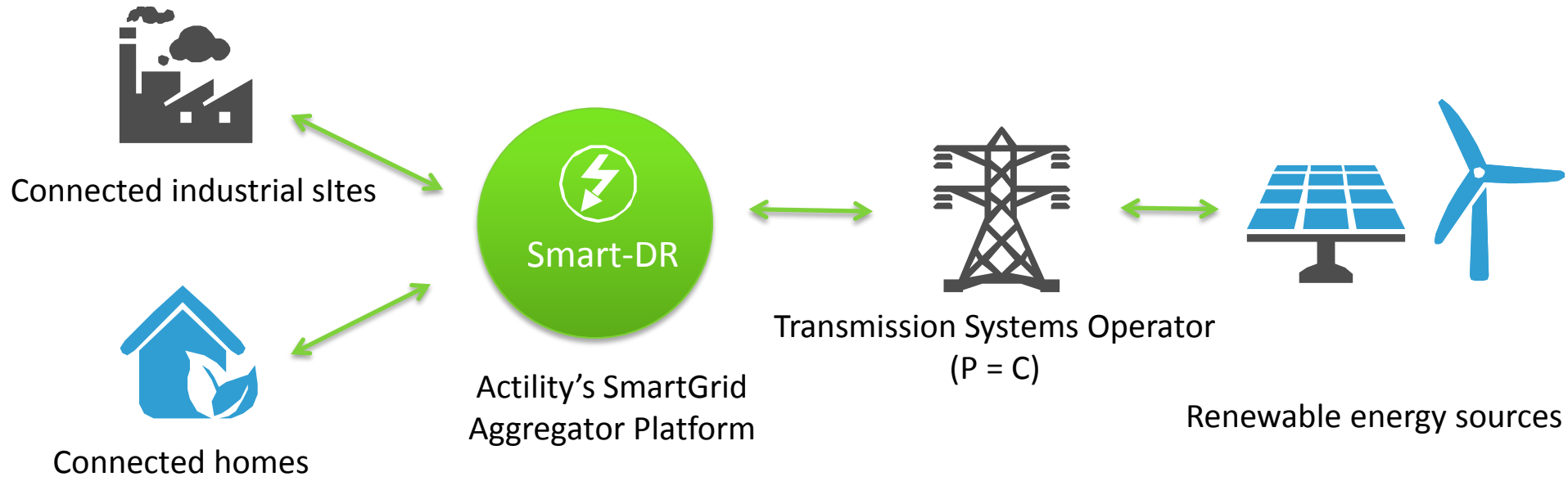
Connected Smart Meters provide real-time consumption data and allow Utilities to provide innovative pricing

EV Charging

EV Connects to a local smart charging station, connected to the Grid and to a remote charging platform via LPWA network



Actility is a pioneer in Smart Grid

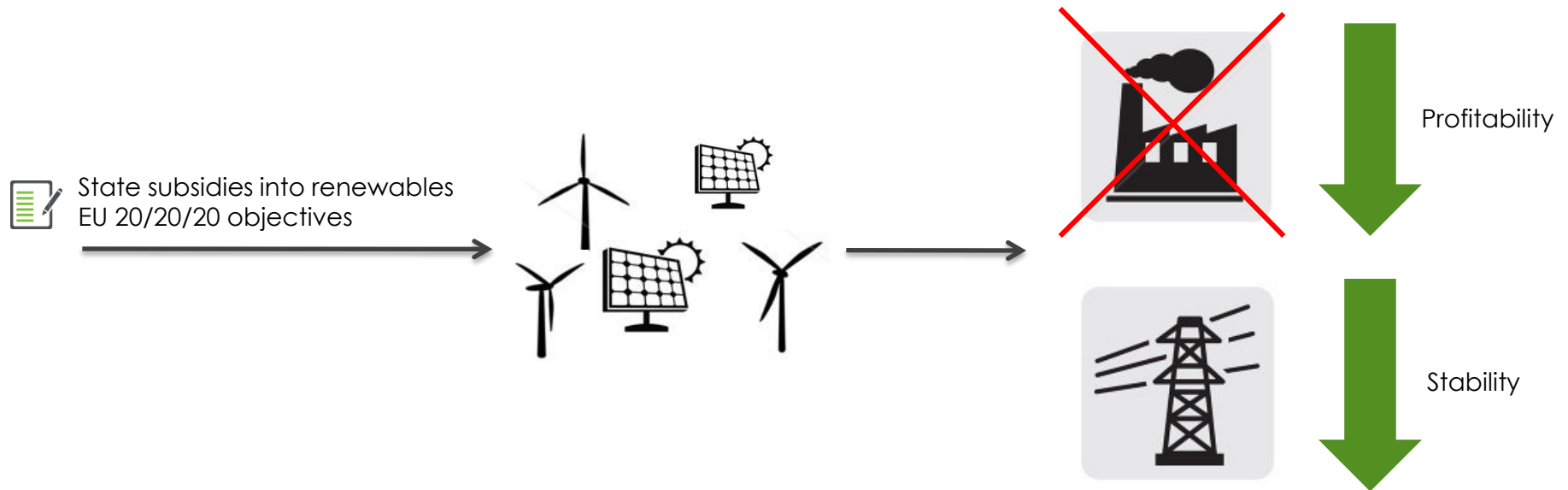


Actility is an Automated Demand Response operator in France and Belgium



The need for demand side management

The energy market is in complete transformation worldwide



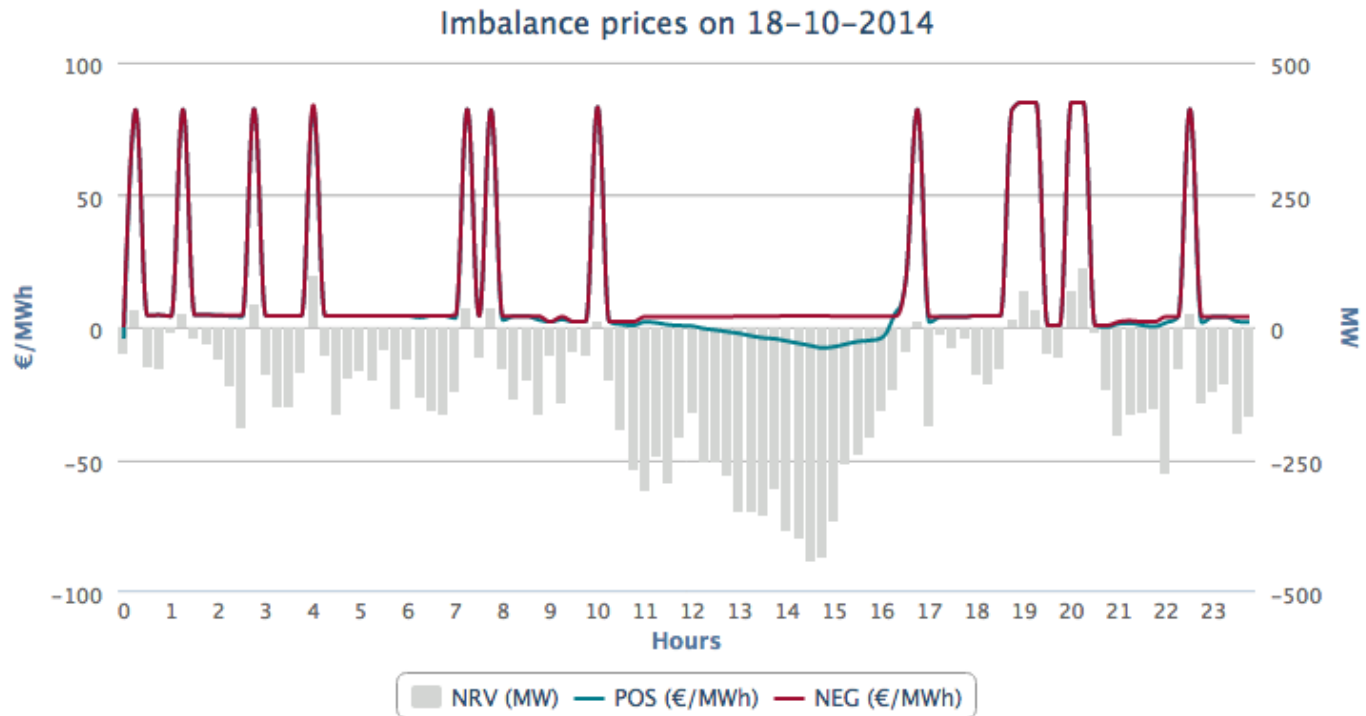
Supply market deregulation and unbundling



Pure supply margin are decreasing fast

Balancing the grid is a critical issue

- Forecasts of production and consumption are usually wrong



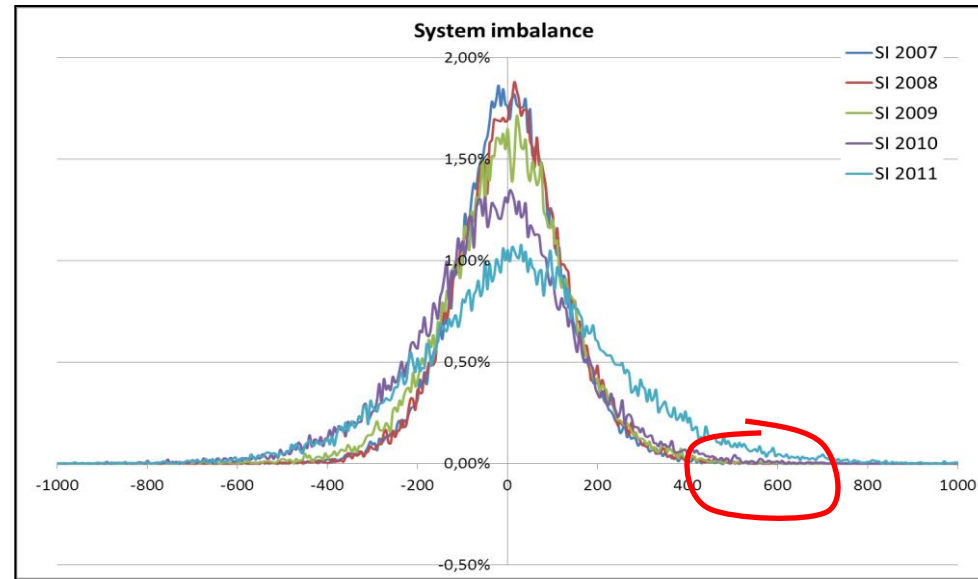
Source: www.elia.be

Market players do not usually balance their perimeter intraday for reasons other than, for instance, large production unit failure

P≠C

Renewable energies are a challenge

Increasing system imbalance yoy



- Traditional thermal powerplants were usually providing the system with upwards and downwards flexibilities.
- They are driven out of the market with the massive injection of fatal production from renewable sources (solar, wind...) with a dramatically lower marginal price.
- With more and more power stations decommissioned, the system is in dire need for more flexibility.

Demand Response is the most economically viable solution already available

A concrete DR example: water pumping in Belgium

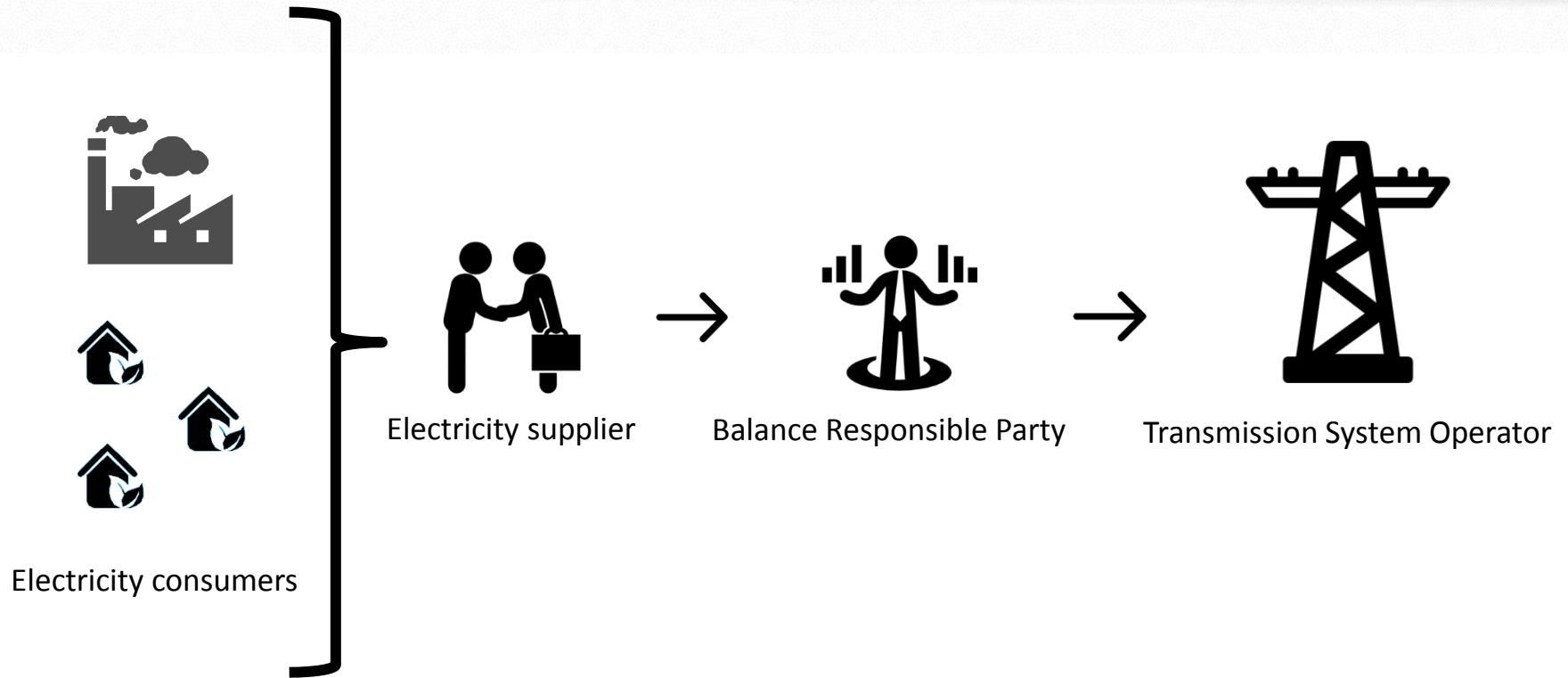
The electricity sector is at a turning point in Belgium

- ⦿ 20/20/20 objectives to meet
- ⦿ Non-renewal of frequently deficient nuclear reactors
- ⦿ Large solar and wind production to absorb

Water pumping

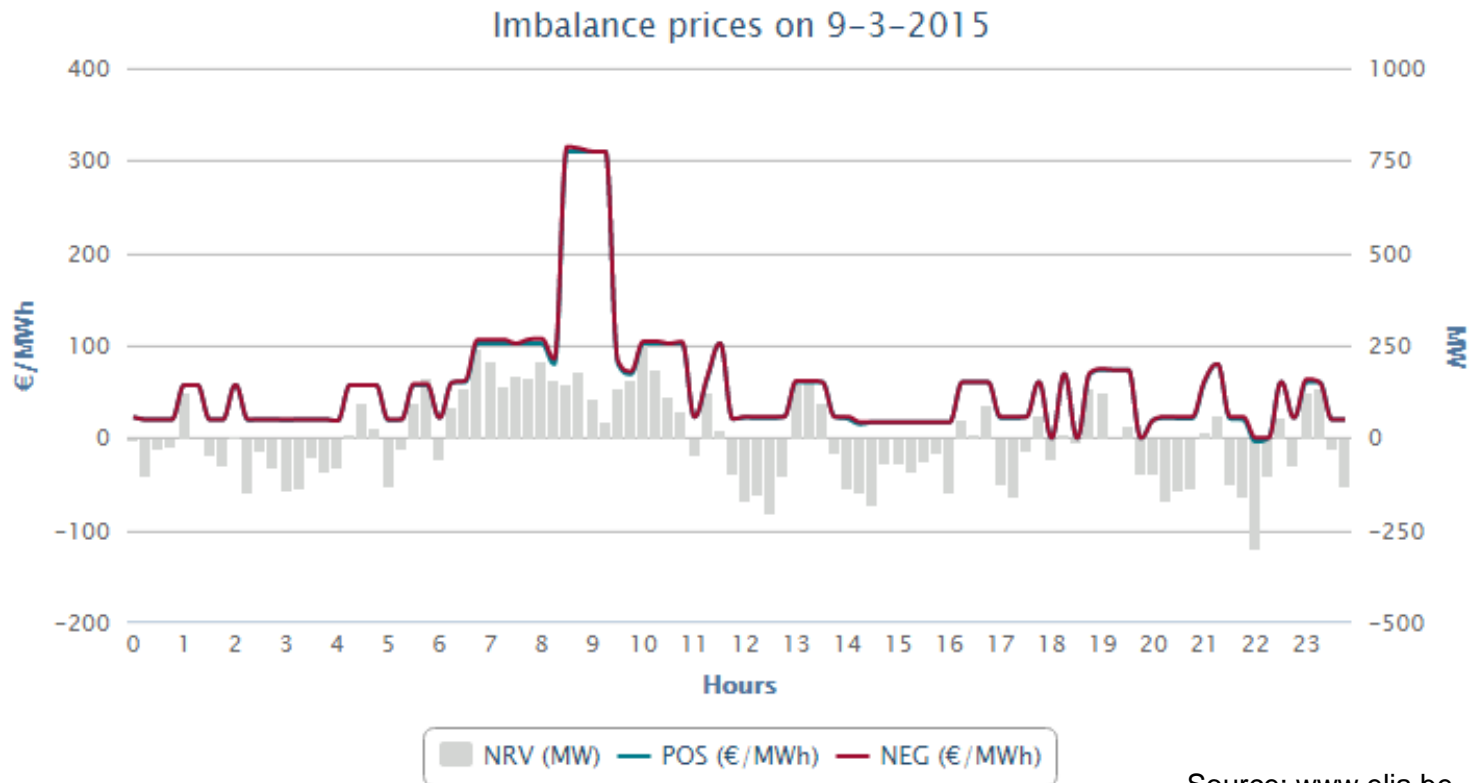
- ⦿ It is a well known flexible process
- ⦿ Water tanks provide inertia and act as a natural battery

Market structure in Belgium



Imbalances in the portfolio of the BRP are settled by the TSO

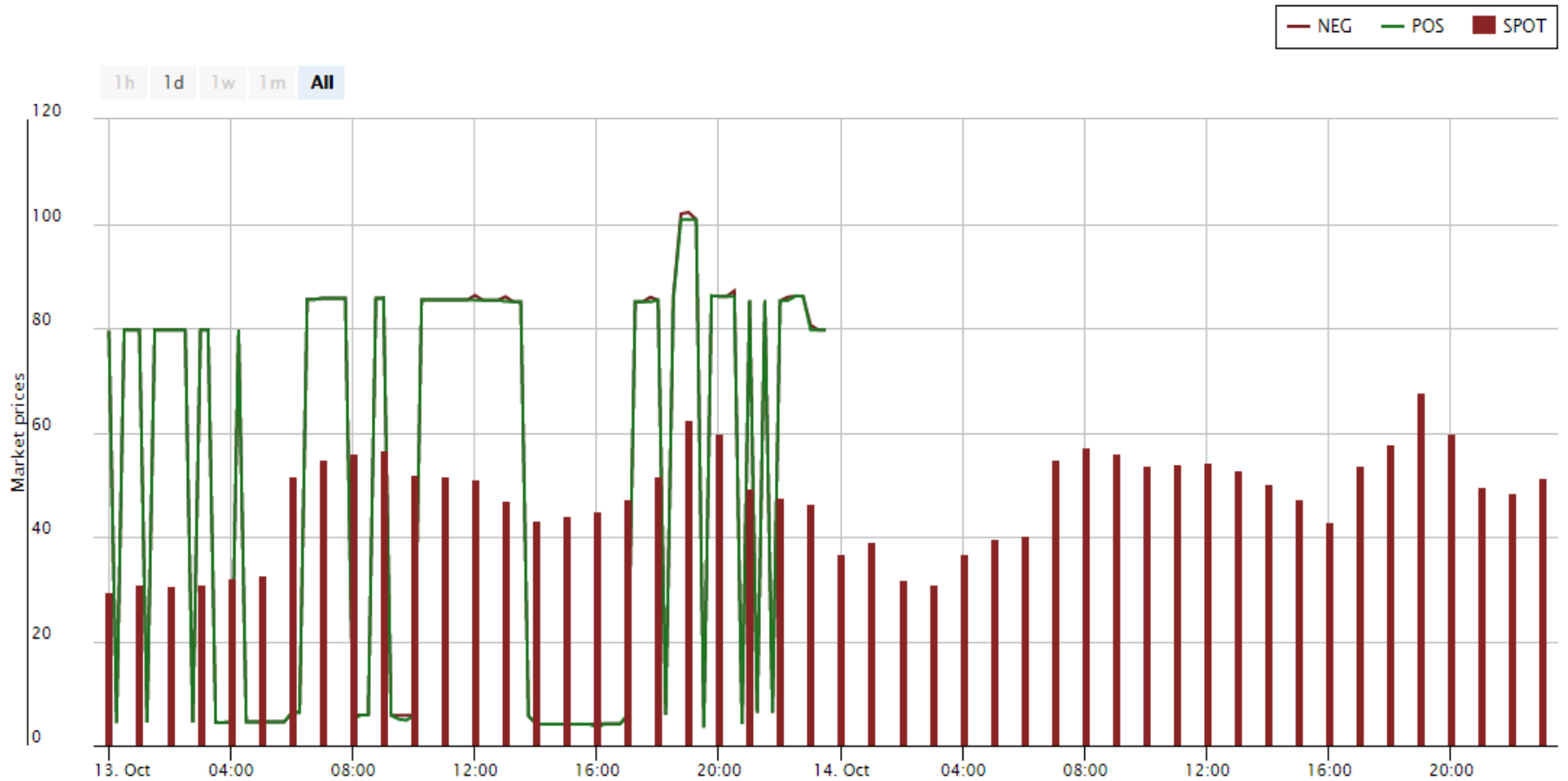
Market structure in Belgium



Source: www.elia.be

The Imbalance Mechanism in Belgium is a 15min Single Marginal Price system

SPOT price against Imbalance price



Close-to-close volatility comparison

Imbalance price vol. is roughly 4 times higher than D-1 SPOT market vol.

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2} \quad \text{where} \quad x_i = \ln\left(\frac{p_i}{p_{i-1}}\right)$$

For simplicity reasons, we have assumed $\bar{x} = 0$ in the calculations. The results were as follows :

D-1 SPOT Market : vol = 0,247

Imbalance Prices : vol = 0,9102

It has to be noted that log returns on imbalance prices are not always possible to derive as these prices get to 0 or even negative values. We eliminated the 0 values (resulting in an underestimation of the volatility) from our calculations and estimated the log returns using an abs() function.

Gain calculations

The formula depends on the agreement between the BSP and the BRP

We used the day-ahead BELPEX price as a reference in the calculations :

$$\Delta C = (C_{real} - C_{nom})$$

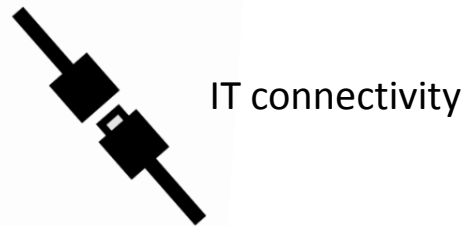
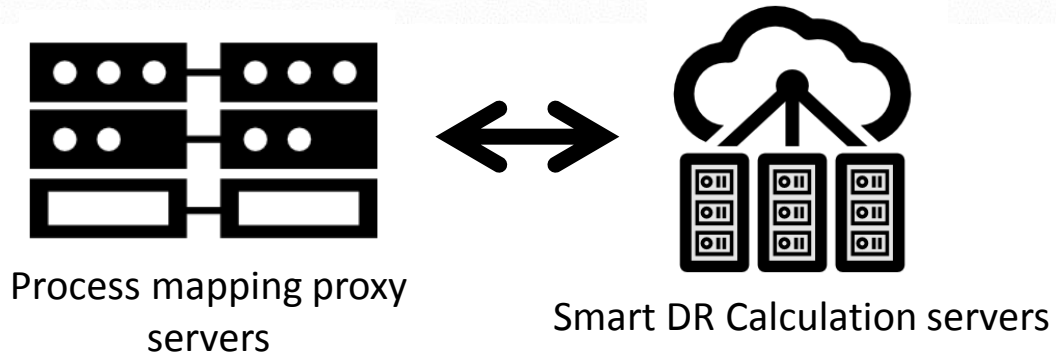
➤ Over-nomination: $\Delta C < 0$

$$\text{Gains[€]} = \Delta C \times (\text{Belpex } h - \text{imbalance POS}, h)$$

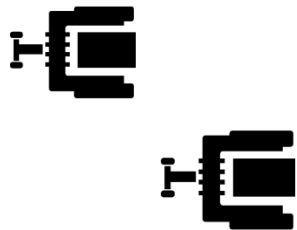
➤ Under-nomination: $\Delta C > 0$

$$\text{Gains[€]} = \Delta C \times (\text{Belpex } h - \text{imbalance NEG}, h)$$

High level project architecture



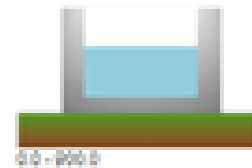
Water pumps



Customer's servers



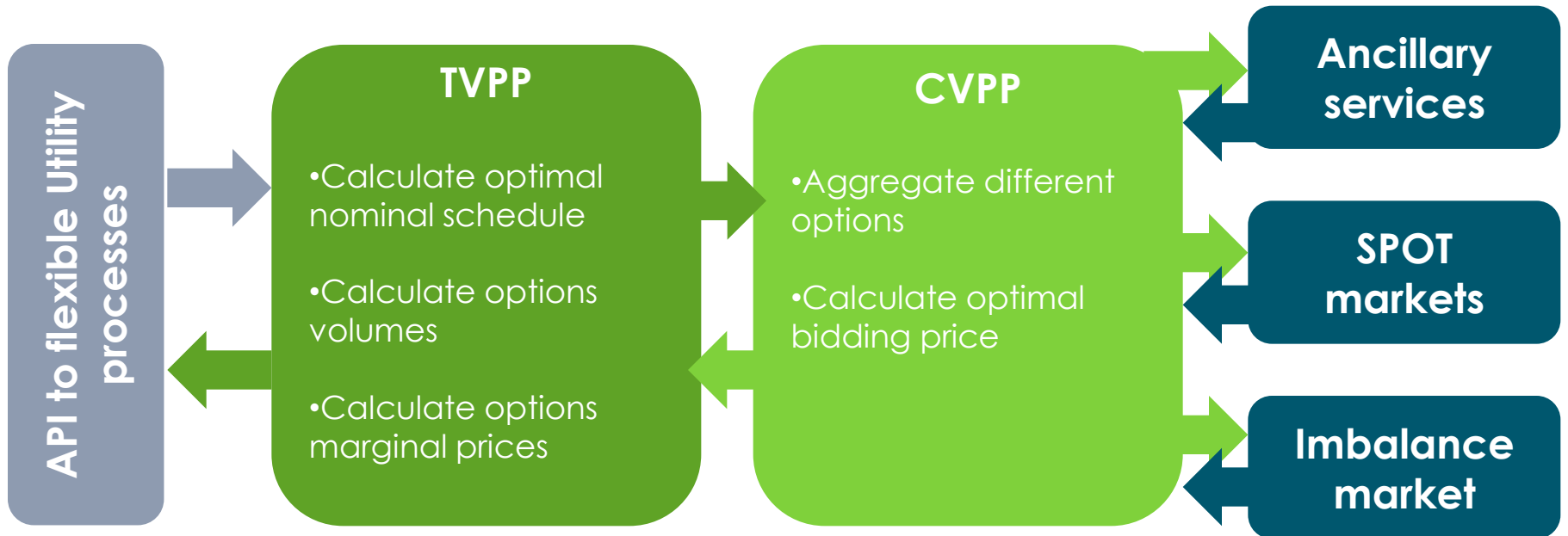
Water tanks



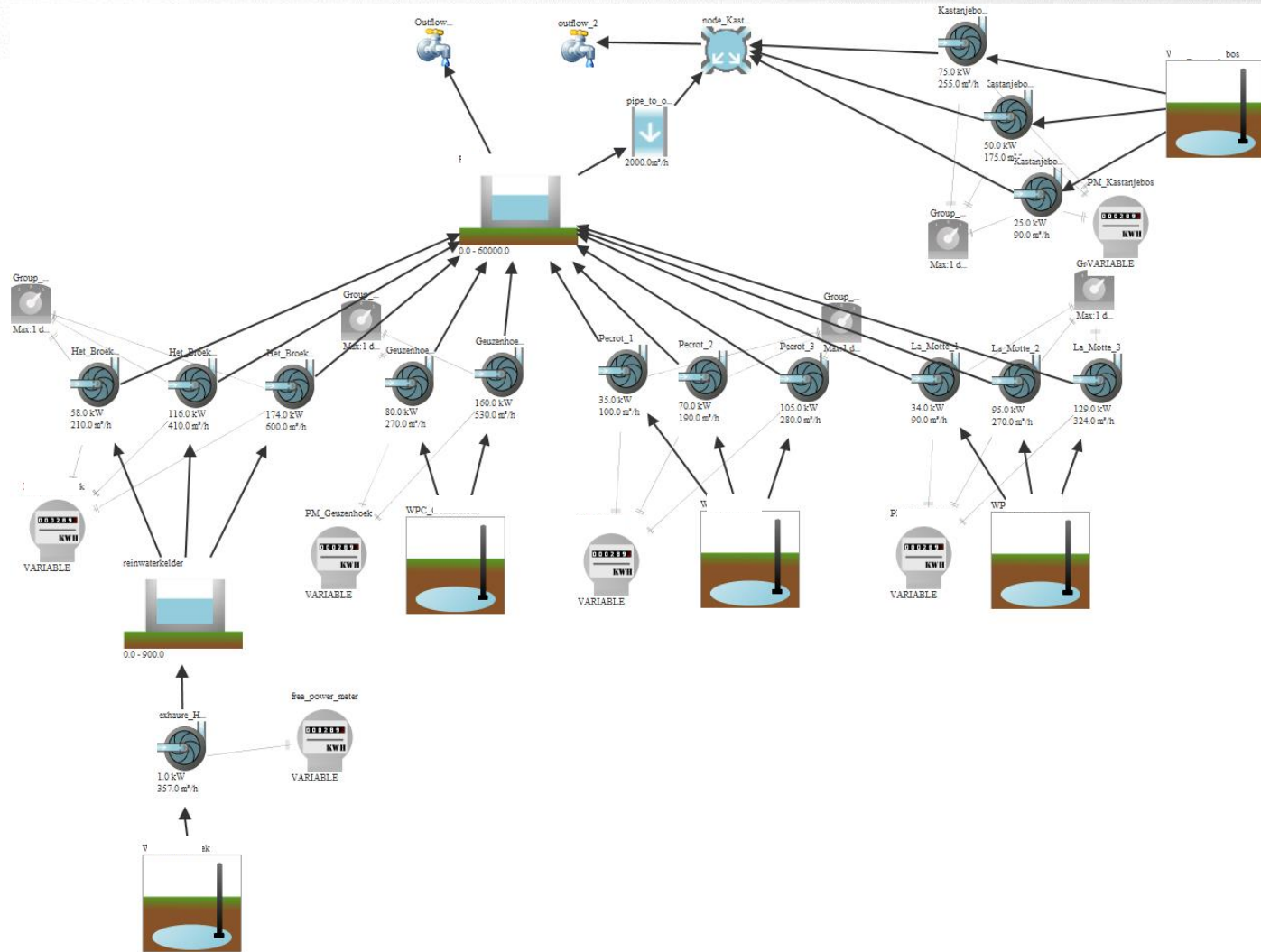
Smart DR insights

Smart DR is :

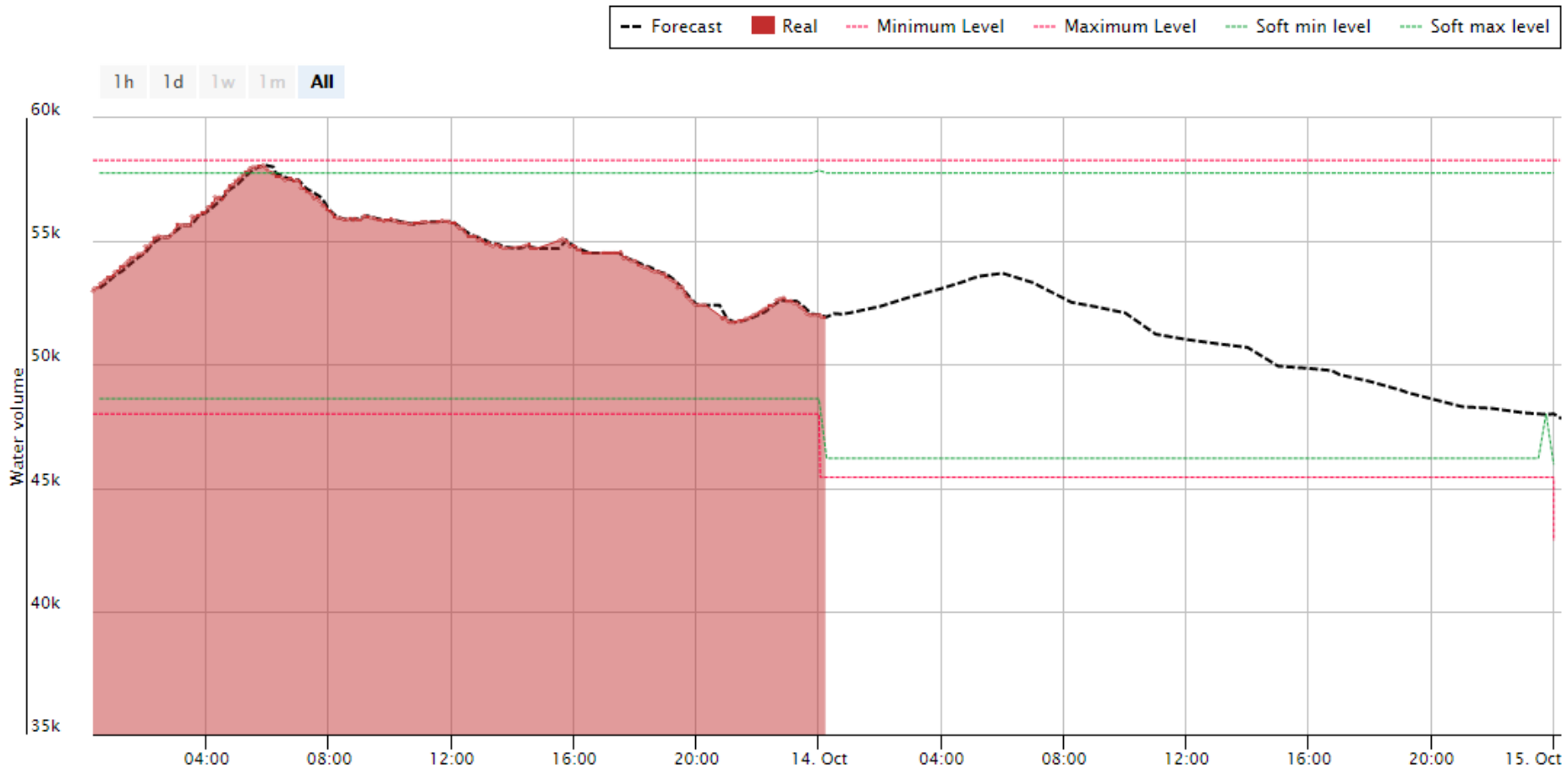
- An online tool to compute and control flexibilities (TVPP)
- A multi-market interface for flexibility bids (CVPP)



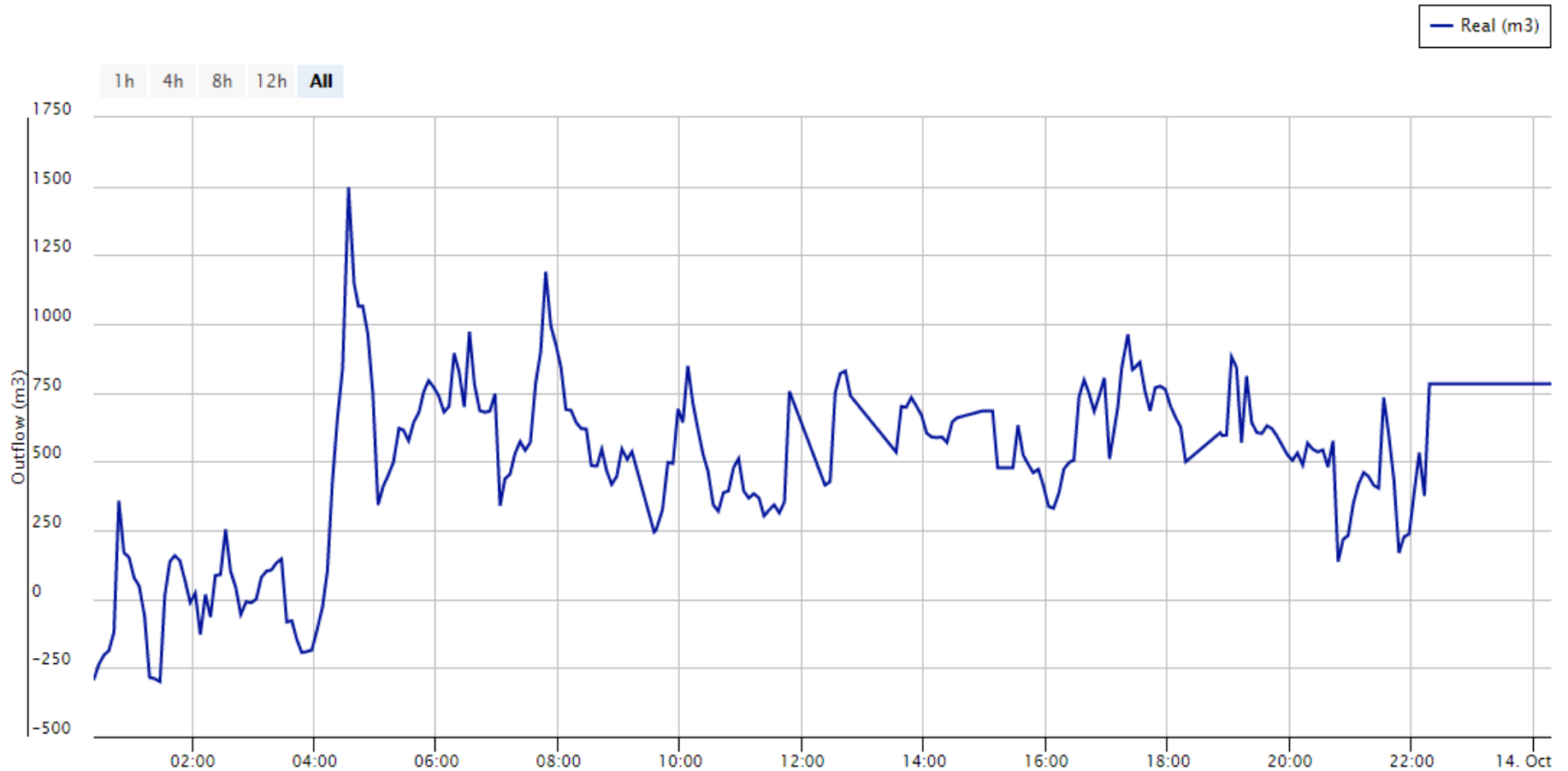
Process modelling



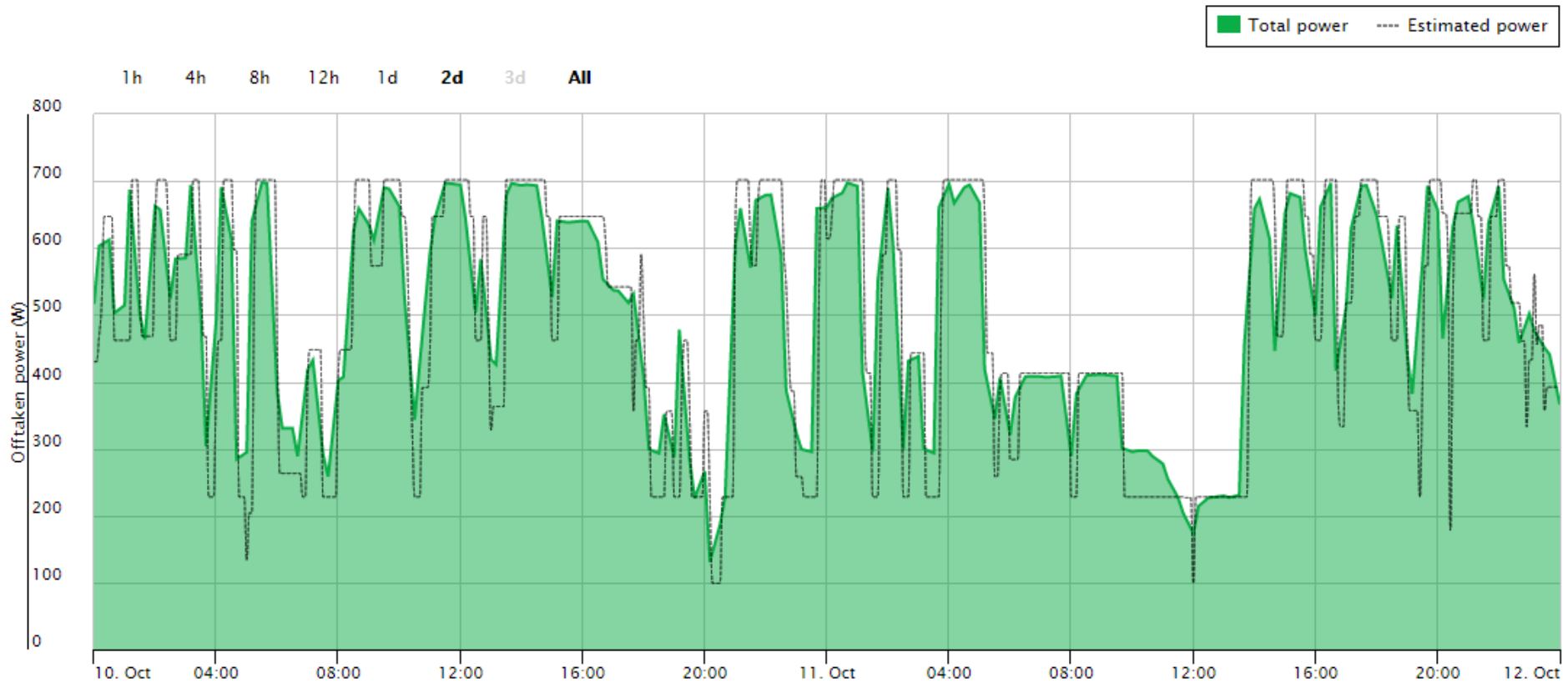
Tank levels are monitored and forecasted...



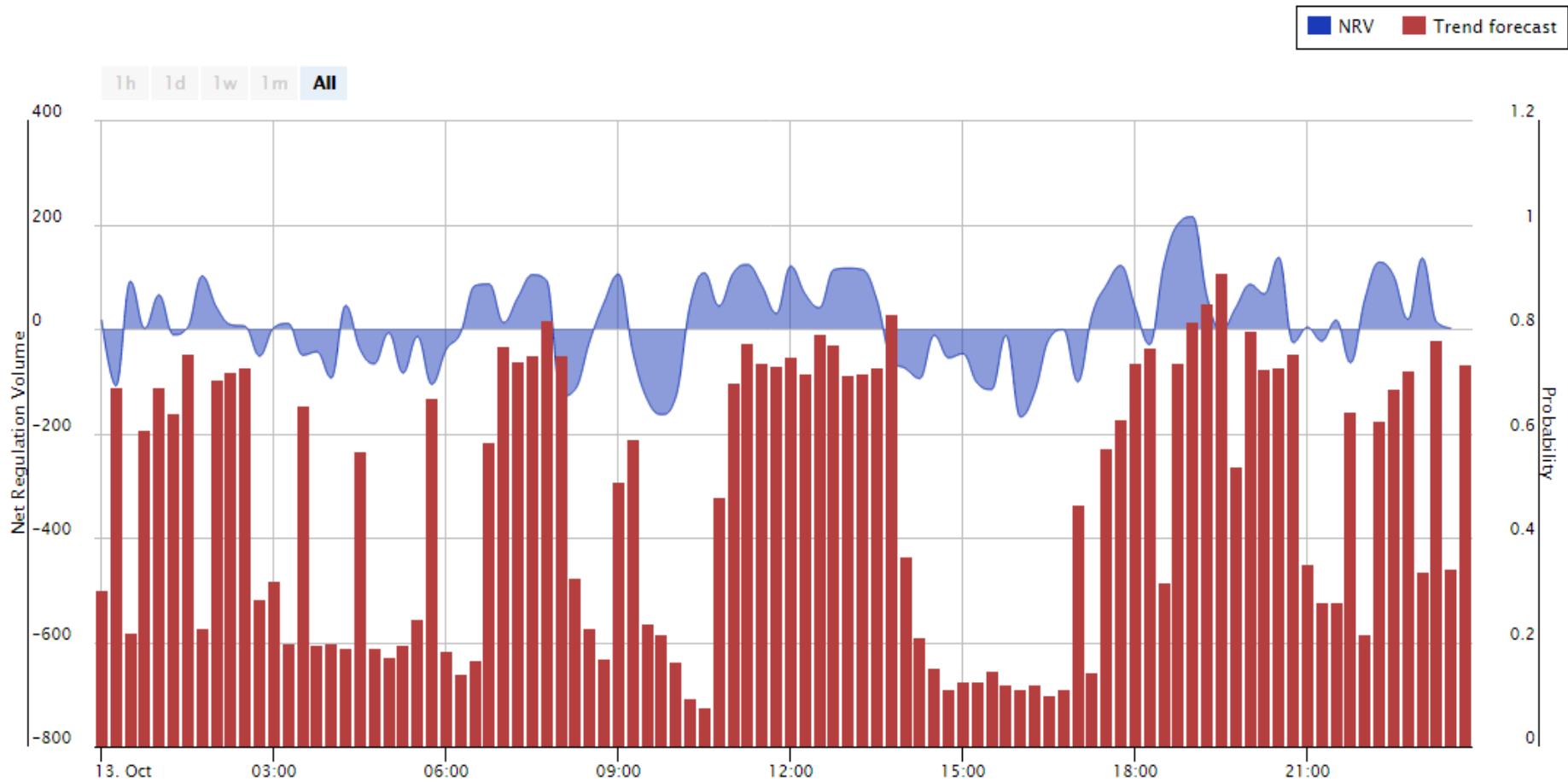
...taking into account the randomness of the outflows



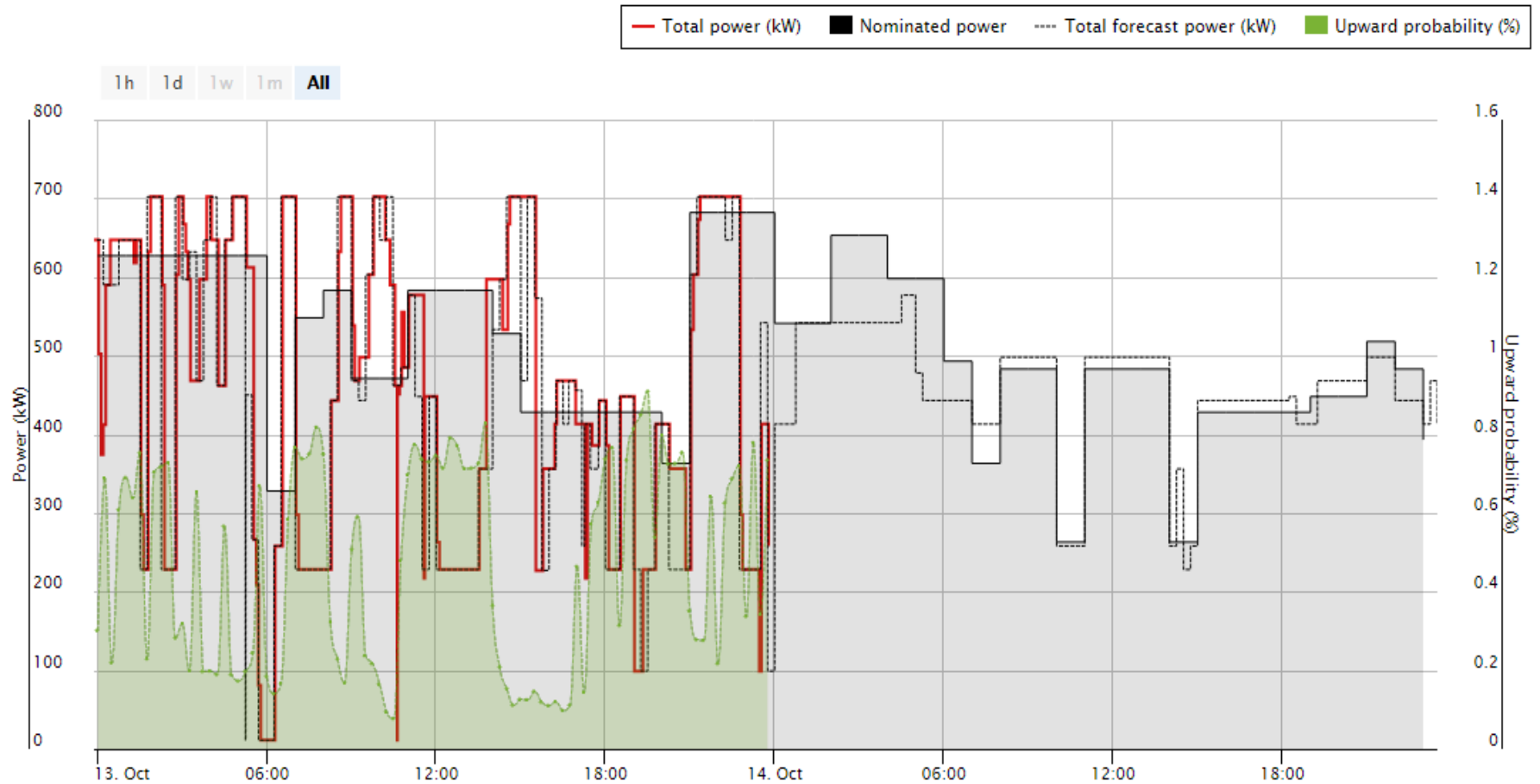
Real power consumption is estimated in real time



The system trend and Imbalance prices are forecasted

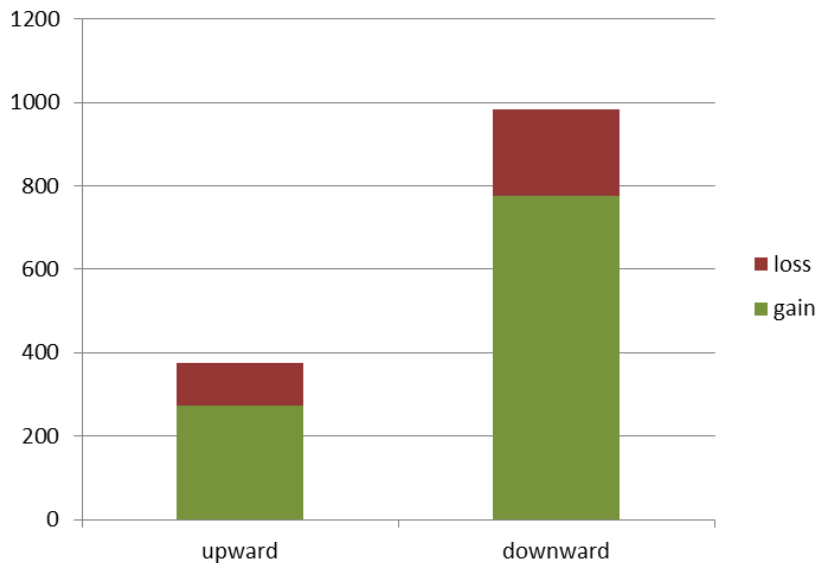


Real and nominated consumption, forecasted trend

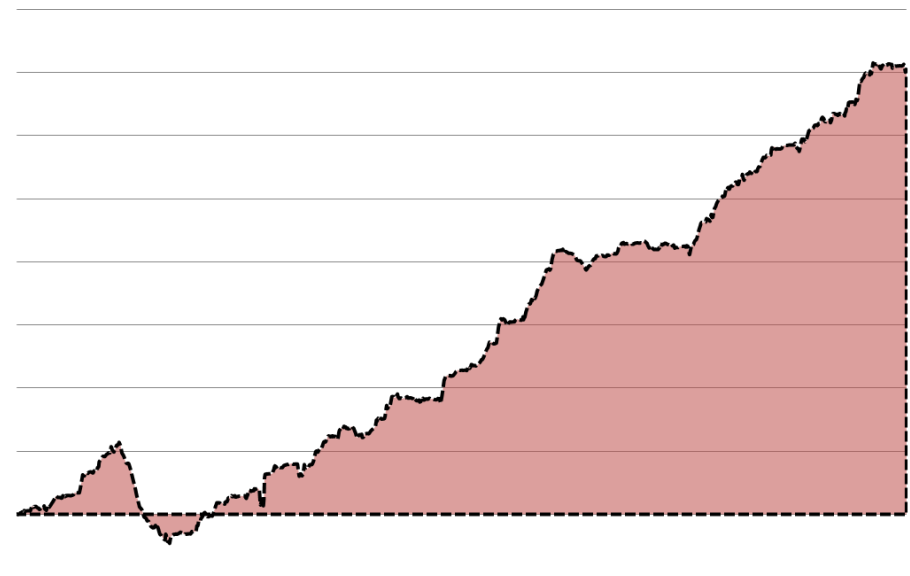


Overall performance

Win/Loss trades



Cumulated gains



Gains are steady and percentage of winning trades is above 77% overall

Key take aways

- 1 Demand response solutions are already available
- 2 Market design is key to foster the development of Demand Side management
- 3 Imbalance prices volatility is higher than SPOT market volatility
- 4 There is a real need for near real time information on the electric system (trend, imbalance prices)



Thank you for your attention!

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