



# **CEER Workshop for the Benchmarking Report on Power Losses**

## **PROCUREMENT OF GRID LOSSES by Austrian Power Grid AG**

Brussels, 06.10.2016

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# Content



- Coordinated procurement of grid losses at APG
- Concept of Procurement
- Process of Procurement
- Risk Management
- IT-Systems & Implementation
- Experience and recommendation?

# Coordinated procurement of grid losses at APG

# Starting Point



- Before 2010 all system operators (TSO and DSOs) in Austria have procured their grid losses by themselves.
  - The Austrian regulator E-Control set up an incentive scheme to develop a coordinated procurement of grid losses in Austria.
- E-Control initiated a consultation of options for a common procurement of grid losses (April 2009).
- APG offered to set up that coordinated procurement scheme based on common agreements/standards.
- In 2010 APG started with the coordinated procurement scheme of grid losses.

# Main figures



- A public consultation led to the following basic points:
  - Coordinated (centralised) procurement of grid losses;
  - Purchasing of standard products based on regular tenders;
  - Daily buying/selling of shortfall quantities on the spot market;
  - Central handling and clearing of residual imbalances;
  - Pan-European tendering (if possible).
- APG took over the service of procuring the grid losses.
  - Sum of all grid losses in Austria approx. 3,3 TWh per year.
  - Currently 97% of Austrian grid losses are procured by APG.
  - Financial volume: approx. 100 - 200 MEUR per year.

## ■ Towards National Regulatory Authority:

- APG reports the current status of procurement to ECA on a regular basis.
- E.g. participating system operators, contract details, concepts, ...

## ■ Towards system operators:

- Commonly elaborated contracts/deals.
- Provide information for participating system operators on a regular basis.
- Common workshops with participating system operators on a regular basis.

## ■ Towards supplier:

- Elaboration of contracts on the basis of EFET standards and adaptations in close reconciliation with EFET representatives
- Workshop with suppliers.
- Elaboration of transparent market information.

# Regular Reporting

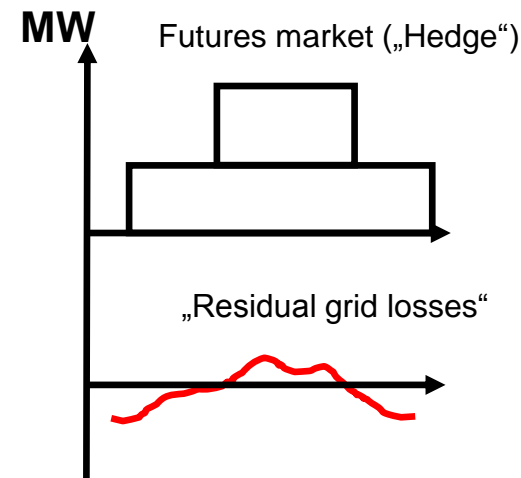
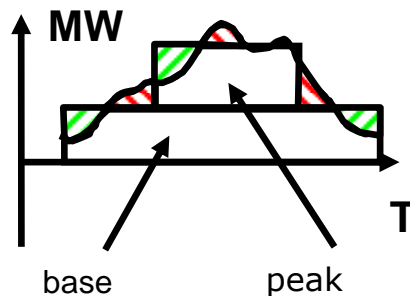
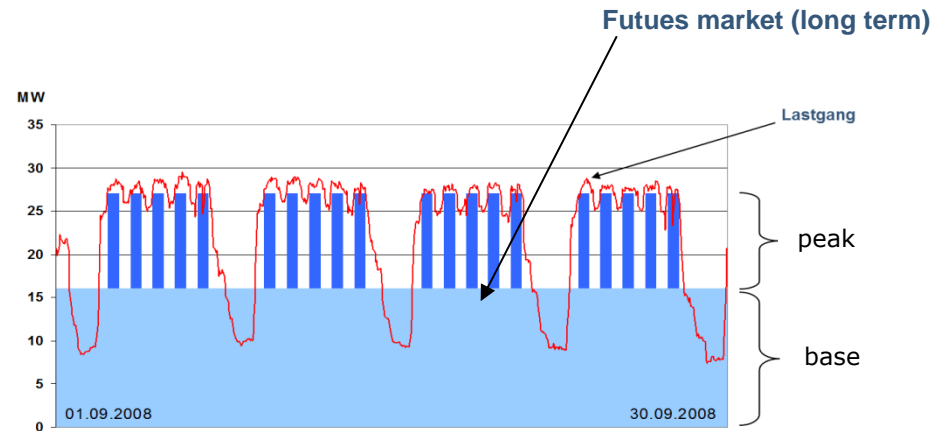
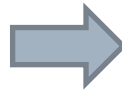
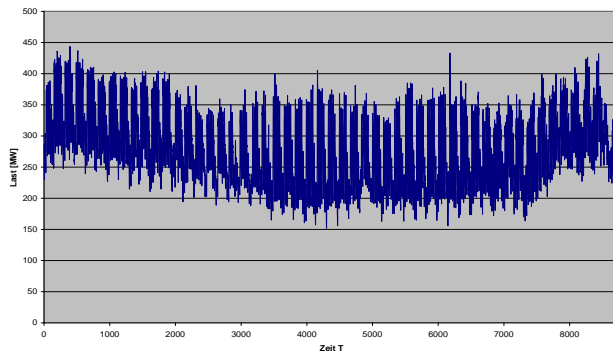
- Towards National Regulatory Authority:
  - E-Control gets a report about the procurement status monthly.
  - E.g. prices, costs, participating system operators, concluded deals...
- Towards system operators:
  - Every system operator gets a individual monthly report containing the results of the previous month.
  - E.g. volumes, prices, individually procured volumes (per system operator).
  - Also the quality of the forecasts of TSOs/DSOs is monitored.
- Towards suppliers:
  - Continuous anonymised information on the tendering system (internet).
  - Submission of „Deal Sheet Information“ after every concluded deal.

# Concept of Procurement



# Concept of Procurement Portfolio-Management Process

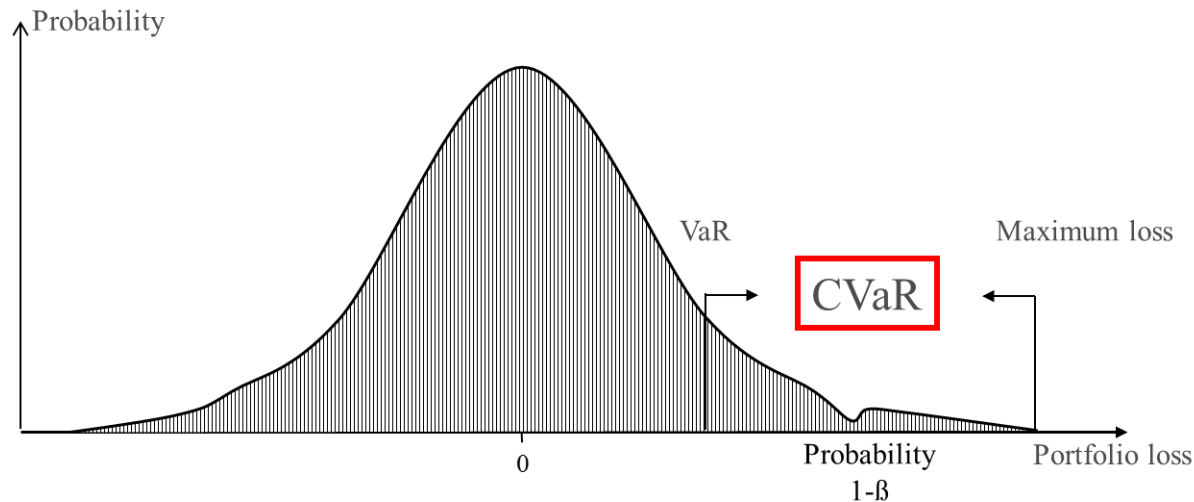
- Portfolio needs to be divided in different tradeable products (long term standard products) in order to minimize the risk – under various boundary conditions!



# Concept of Procurement Portfolio-Management Process



- 3 different portfoliomanagement principles have been evaluated:
  - Volume minimized:  $\text{Min: } \sum_t (\text{Load\_forecast}_t - \text{Hedge}_t)^2$
  - Cost minimized:  $\text{Min: } \sum_t ((\text{HPFC}_t * (\text{Load\_forecast}_t - \text{Hedge}_t))^2)$
  - Risk minimized:  $\text{Min: CVaR}(\text{residual grid losses})$



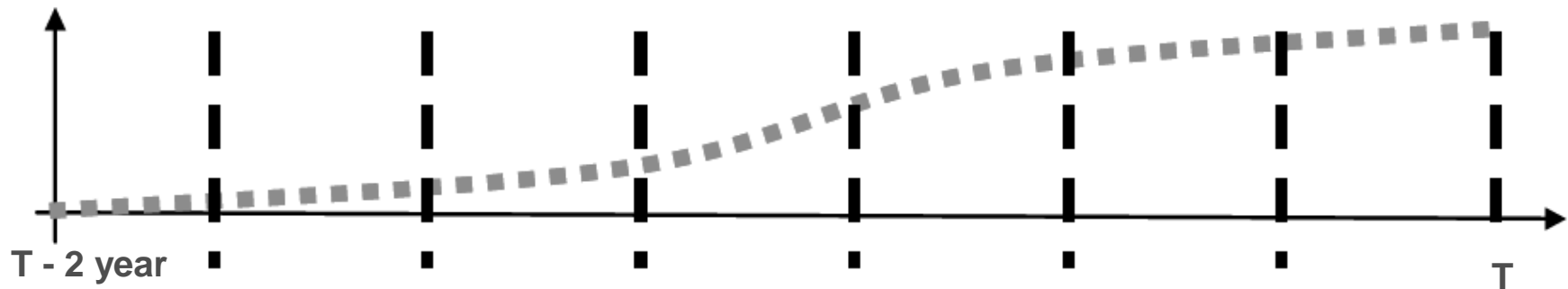
# Procurement Order Strategy



## Assumption:

- Price volatilities and market liquidity for forward products vary:
  - Long-term range ( $> 2$  years): Low volatility, low liquidity
  - Mid-term range ( $> 6$  month;  $< 1,5$  year): Medium volatility, medium liquidity
  - Short-term range ( $< 6$  month): High volatility, high liquidity

## → S – shaped order strategy



- Order strategy defines how much and which products should be bought.
- Based on weekly tenders the relevant standard products are procured.

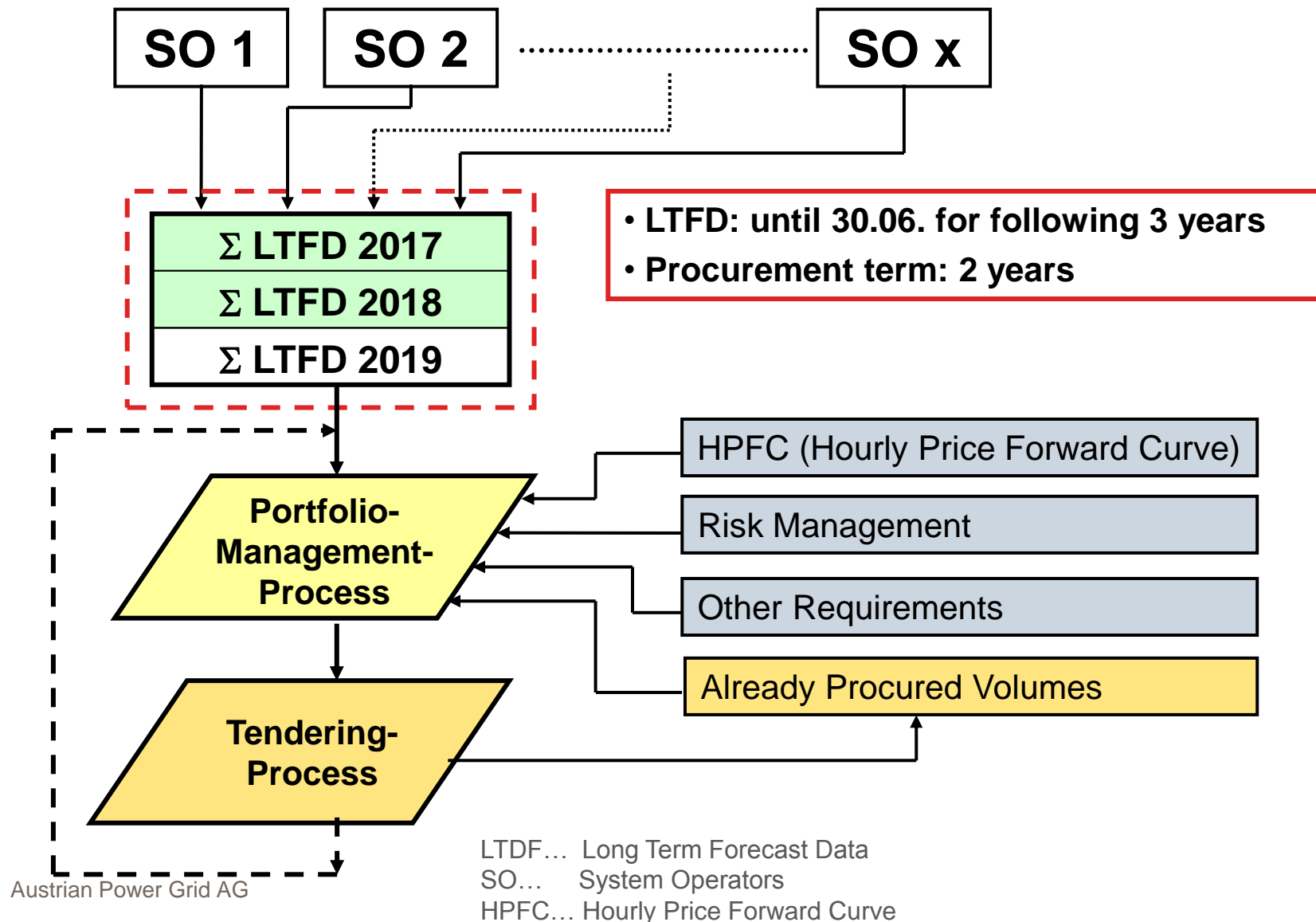
# Procurement Process

# Procurement Process – Overview



- System operators send their Long-Term-Forecast-Data (LTFD) of their grid losses to APG, once a year for the three forthcoming years.
- APG procures the grid losses using a web-based tendering platform according to specific requirements (minimizing risk based on CVaR approach).
- System operators send their Short-Term-Forecast-Data (STFD) of their grid losses to APG (day-ahead).
- APG buys/sells the difference between the accumulated STFD and the accumulated already procured volumes at PX.
- The costs for the procurement of grid losses are settled monthly between APG and system operators and traders.

# Concept of Procurement Long-Term Procurement Process



# Concept of Procurement

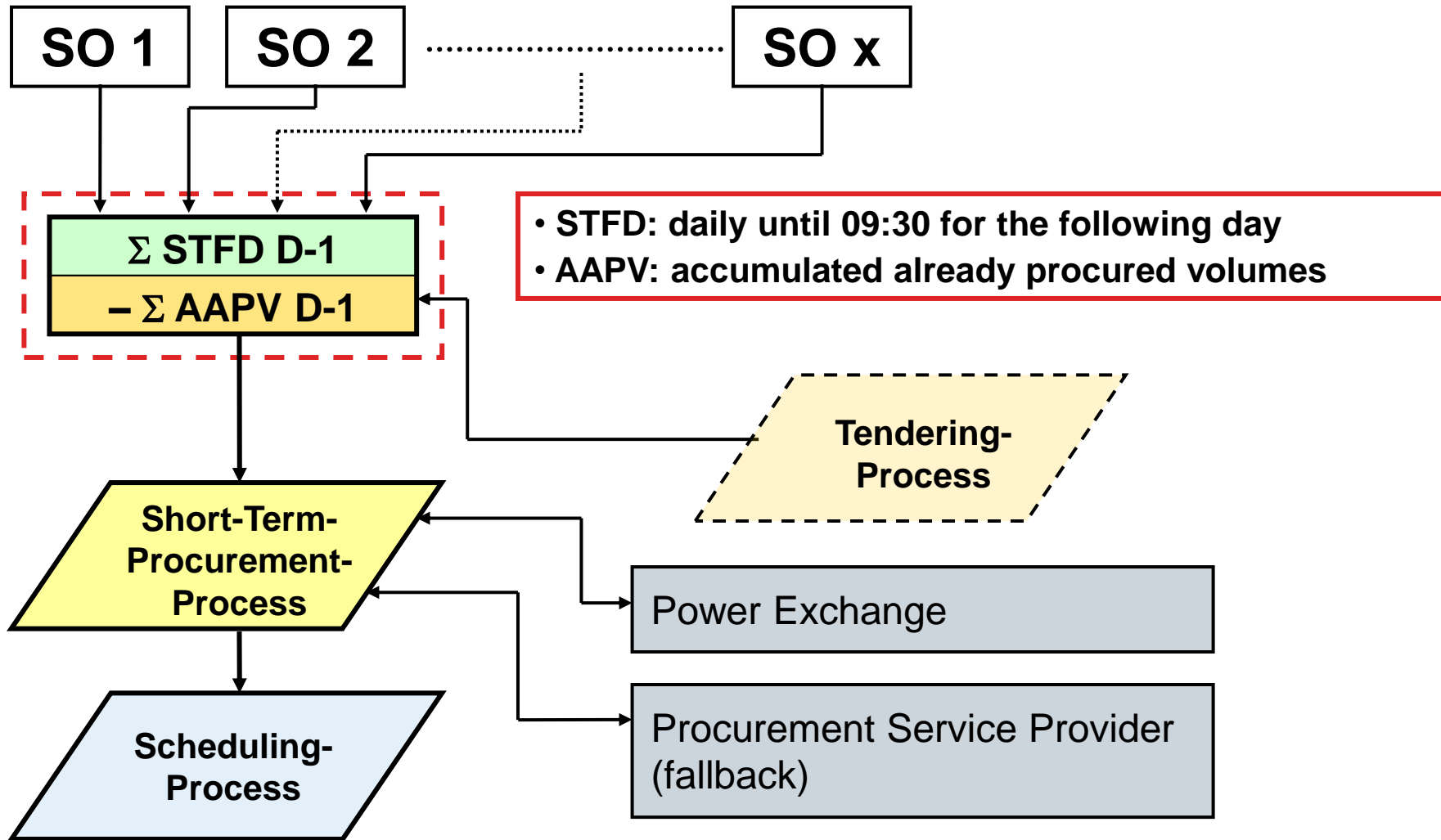
## Long-Term Procurement Process



- Update of the current portfolio
  - Aggregation of all LTFD from DSOs and TSOs.
  - Determination of the current open position (difference between the accumulated LTFD and the accumulated already procured volumes).
- Update of the current portfolio
  - Mainly driven by risk management (CVaR).
- Determination of the parameters for the next tender
  - standard products (base, peak, yearly, monthly), volumes.
- Weekly tenders at the web-based system
  - Base/Peak standard products (usually in 5 MW steps).
  - International traders participating.

# Concept of Procurement

## Short-Term Procurement Process





# Concept of Procurement

## Short-Term Procurement Process



- Update of the current portfolio
  - Aggregation of all STFD.
- Determination of the difference between STFD and AAPV (accumulated already procured volumes)
  - Application of alternate strategies in case of missing STFD.
- Procurement of the differential schedule at Power Exchange
  - at latest until 10:00
  - as „market orders“ at the spot market
- Daily submission of schedules according to Austrian market rules.

# Concept of Procurement Settlement Price



- Cost components of the Settlement price:
  - Cost of already realised trades (“Hedges”);
  - Forecasted costs of future Hedges;
  - Forecasted costs of spot market activities;
  - Administrative costs;
  - Transaction costs (exchange);
  - Forecasted costs for imbalance settlement;
  - Accrued profits and losses from the previous year(s).

→ One fixed settlement price for one year for all DSOs/TSOs

# Risk Mangement

# What risks to consider?

(Overview)



- Usually the following kind of risks are given:

**Market Risk**

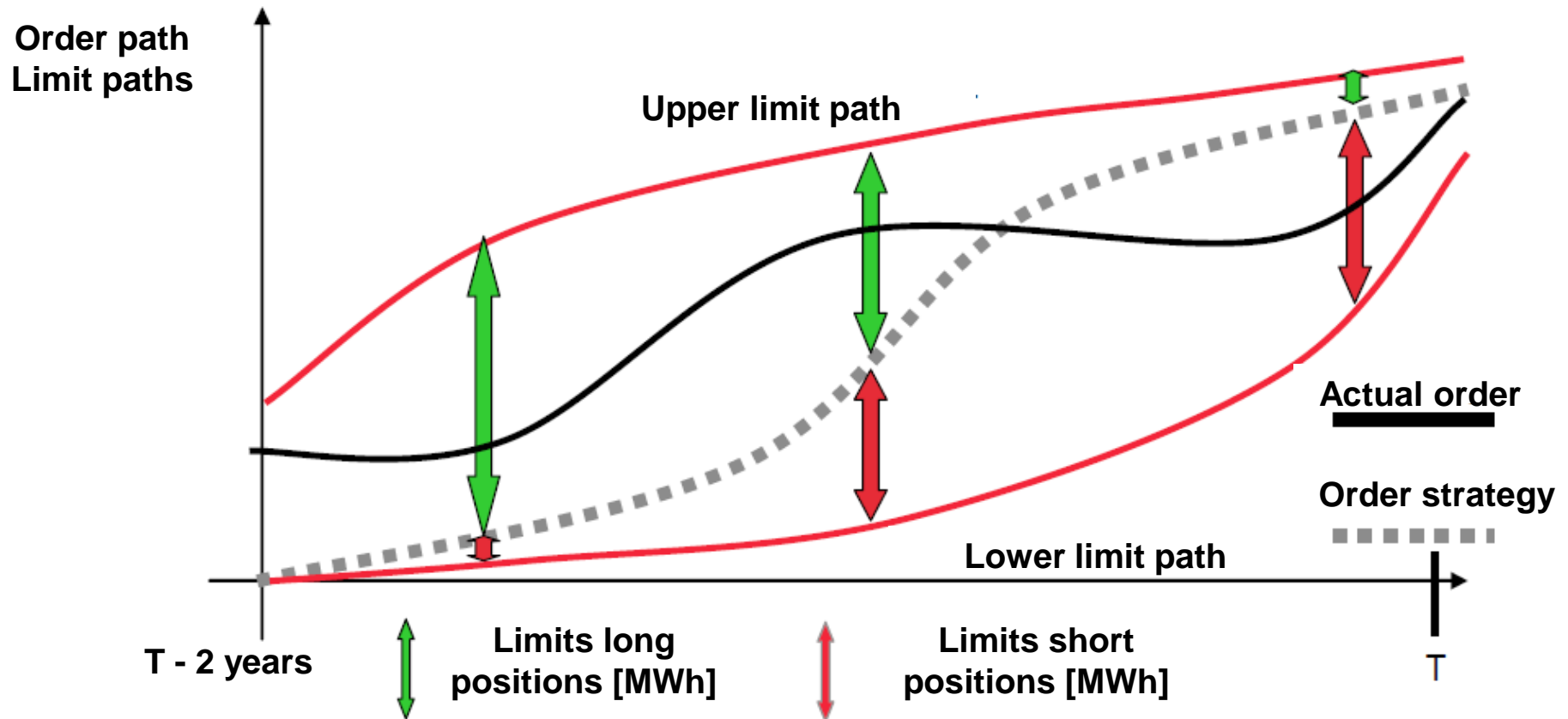
**Credit Risk**

**Operational  
Risk**

- APG is considering (and monitoring) the following risks:

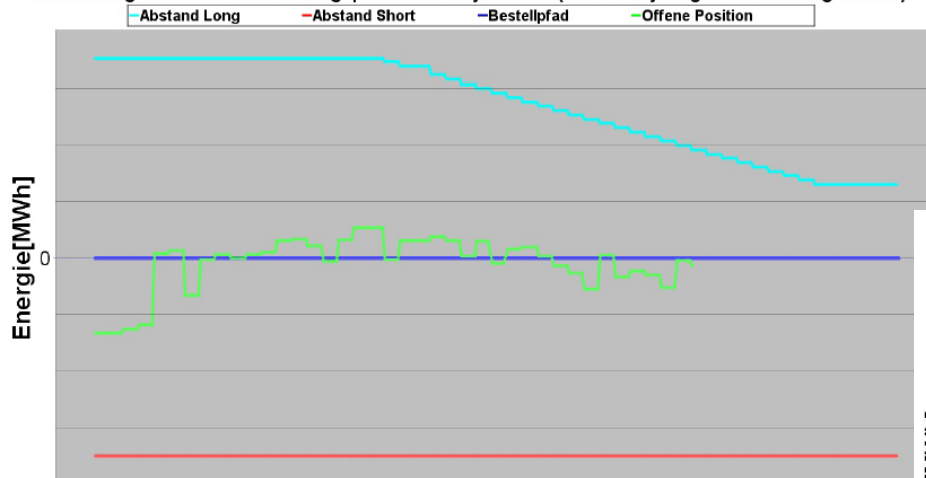
- VAR (1 day)
  - VaR dyn. (7 days)
  - CVaR (1 day)
  - CVaR dyn. (7 days)
  - Stop-Loss
  - Draw Down
  - P&L
  - Credit Risk
  - Positon Limits
    - Long
    - Short
    - Open positions
    - etc.
- Strict Rulebooks!

# Example – Limit Concept

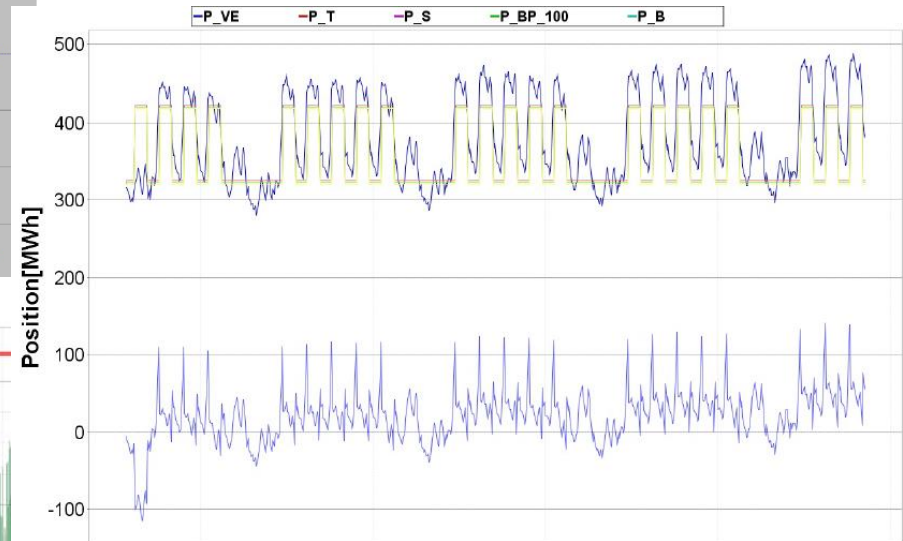
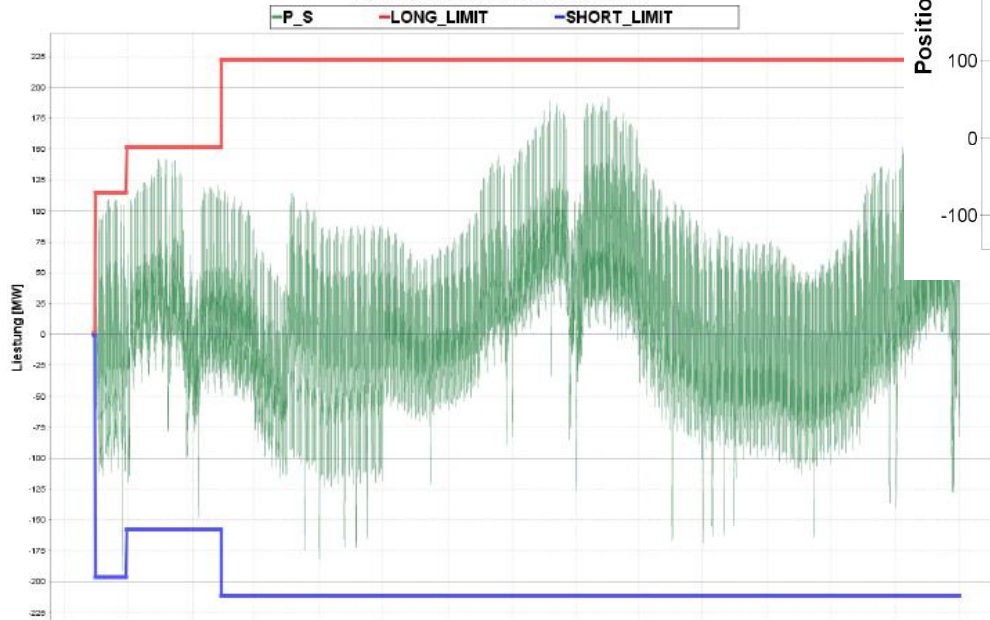


# Example – Limit Concept (monitoring)

Darstellung der Differenz des Mengeprofils - Lieferjahr 2017 (inkl. unterjähriger Beschaffung in 2017)



Stundenscharfe Positionsmitte



2016 Monat 11

# IT-Systems & Implementation

# Optimisation Tools (HPFC, CVaR)



HPFC Parameters

HPFC Date: 23.01.2014

calculate HPFC calculate Simulations import HPFC import Sim

HPFC Years (incl. current): 3

HPFC-Factors: C\_2010\_01\_01-2013\_09\_30.mat

Error-Models: C\_2010\_01\_01-2013\_09\_30.mat

Number of Simulations: 1000

Save to: C:\bet89 Daten\01 HPFC\02 APG\neutral\

Open HPFC Open Sim

Graphical Output

☐ MPFC ☐ DFFC ☐ HPFC ☐ Simulations

update

Calibration

HPFC Fit

Start Date: 01.01.2010 End Date: 30.06.2013

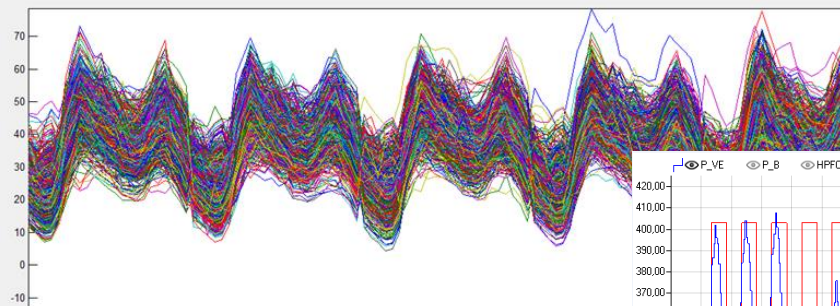
☒ Futurefactors ☒ Spotfactors

Error Fits

Start Date: 01.01.2010 End Date: 30.06.2013

☒ MPFC ☒ DFFC ☒ HPFC

Data Source: EPEX Spot



HPFC generation (1000)

VEB APG - Berechnung - VEB\_PFM\_2016-05-12\_vom\_2016-05-10

Neue Berechnung Berechnung öffnen Neue Analyse Analyse öffnen Initialisieren Berechnen Löschen

Eingabe

Name: VEB\_PFM\_2016-05-12\_vom\_2016-05-10

Allgemein

Berechnungsdatum: 10.05.2016

Beschaffungsjahr: 2016 2017 2018

Aktivierungsdatum: 12.05.2016 12.05.2016 12.05.2016

P\_VE vom: 09.05.2016 09.05.2016 09.05.2016

P\_B vom: 09.05.2016 09.05.2016 09.05.2016

HPFC: 09.05.2016 09.05.2016 09.05.2016

HPFC Simulationen: 09.05.2016 09.05.2016 09.05.2016

Anzahl Simulationen: 1000 1000 1000

Konfidenzintervall: 0,85 0,85 0,85

Bestellpfad Aktivierungsdatum: 12.05.2016 12.05.2016 12.05.2016

Zu beschaffende VE [MWh]: 3.054.002,012 3.041.681,073 3.042.152,764

Bereits beschaffte VE [MWh]: 2.909.989,000 1.990.830,000 341.100,000

11,21 %

-109.172,000

175.200,000

0,00 %

5,000

☐

☒ BY2018

☒ PY2018

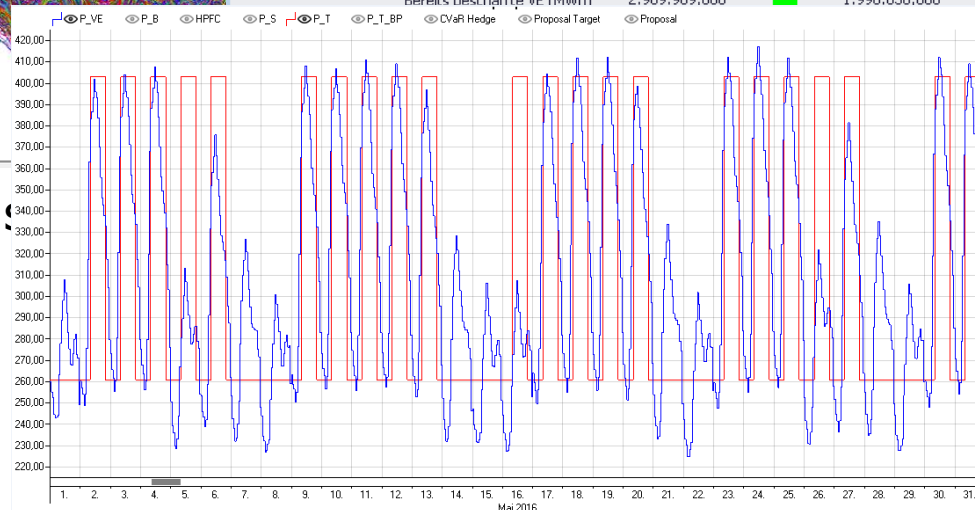
Ergebnisse

als Tabelle

Diagramme

Sonstiges

Berechnungs-Log



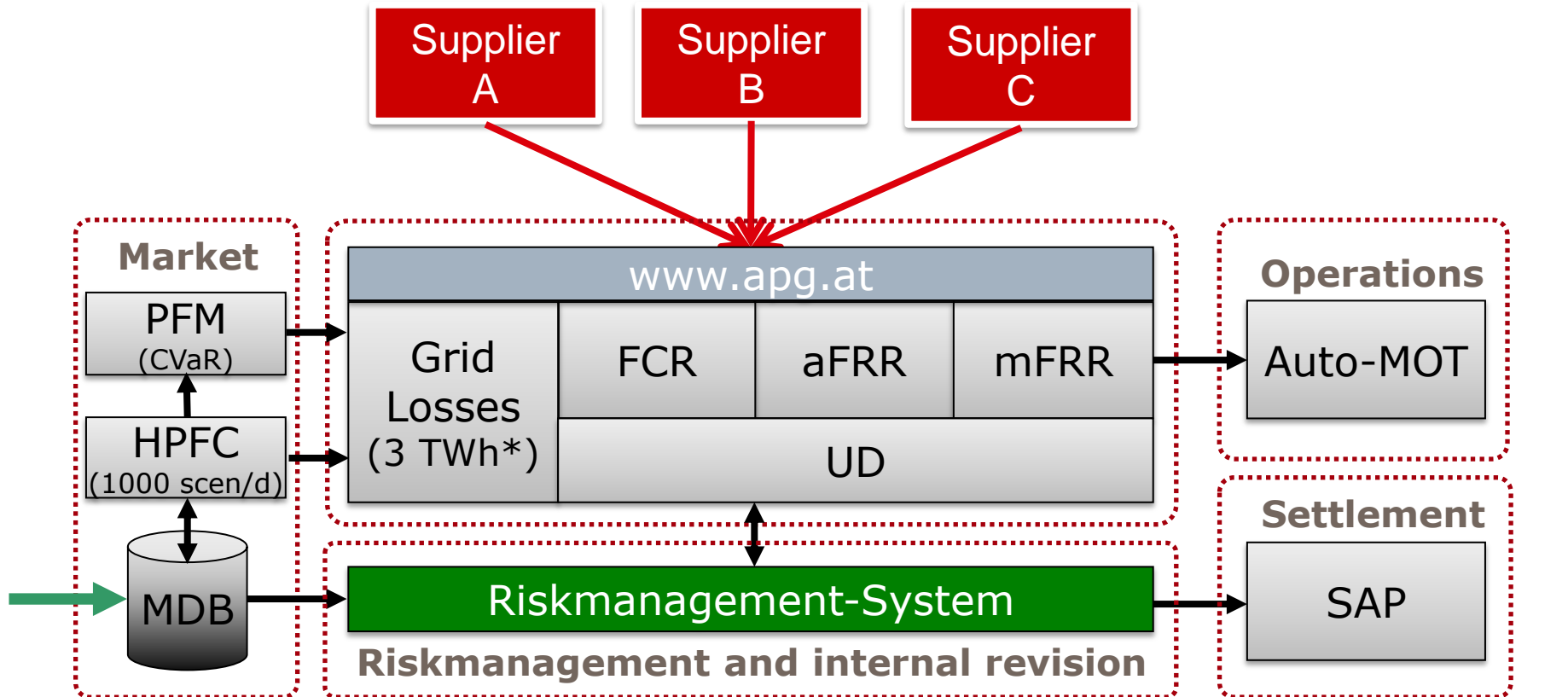
## Product recommendation



# APG Tendering System



**“One-Stop-Market” for the procurement of balancing services as well as grid losses in Austria:**



FCR... Frequency Containment Reserve    aFRR... aut. Frequency Restoration Reserve    UD.. Unintentional Deviation  
 mFRR... man. Frequency Restoration Reserve    HPFC... Hourly Price Forward Curve  
 Auto-MOT.. Merit Order Tool    PFM... Portfoliomanagement    MDB.. Market Database

\*) for TSO and DSQs  
 Austrian Power Grid AG

# IT-Systems & Implementation

## APG Website



- Transparent market information all relevant data is published on our webpage: <http://www.apg.at/en/market>



- Via the tendering system the grid losses are procured and relevant information and results are published:  
<https://www.apg.at/emwebapgrem/startApp.do>

Experience and recommendation?

# Experience and Recommendation?



- In principle well working concept and processes.
  - Prices are closely following wholesale prices.
  - Further development possibilities
    - PX traded long term products,
    - purely financial hedging,...
- 
- In principle that concept is applicable to other TSOs/DSOs.
  - In order to enable competition at least 2 TWh p.a. shall be available (ca. 5 MW per week).
  - Transparency; involvement of market is key!!
  - Use standard contracts (e.g. EFET) if possible.