
H2020
FutureFlow

FutureFlow

cyberNOC – Flexibility Aggregation Platform

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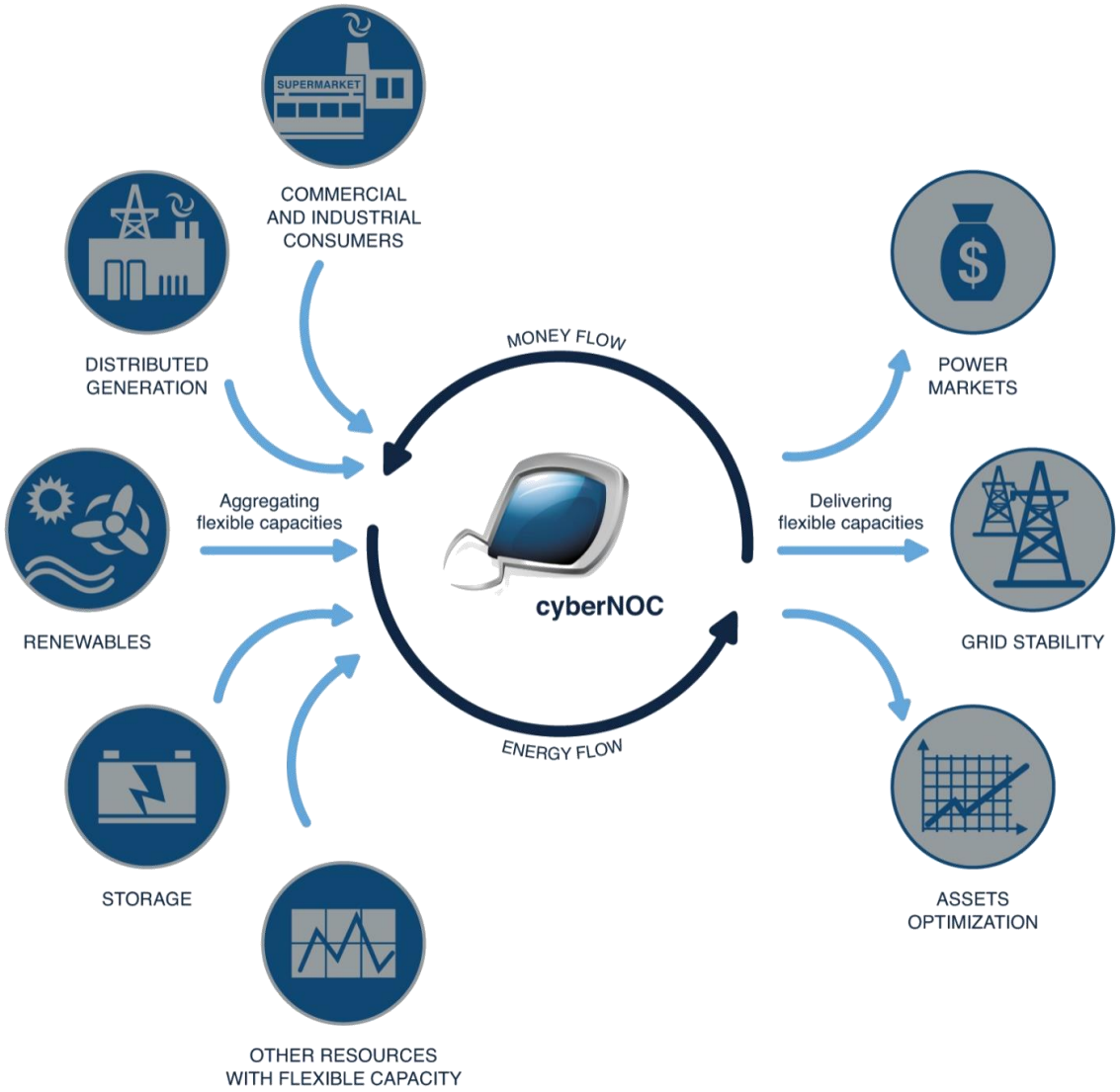
CYBERGRID

The FutureFlow project – developing an International market for most advanced frequency services in EU

About cyberGRID

- Founded in 2010 in Vienna
- Focused on **development and deployment of flexibility aggregation platforms (DR, VPP & VB)** and related consultancy services
- Founder of Smart Energy Demand Coalition (now SmartEn)
- Member of ESMIG, ETIP SNET, EU Battery Alliance, BRIDGE
- Research partners: AIT, TU Graz, TU Wien, RSE, EIMV, etc.
- Flexibility innovation partner in several Horizon 2020 projects (Flexiciency, FutureFlow, InteGrid, CrossBow, Magnitude …)
- Commercial operations in aFRR and mFRR balancing markets in Austria and Slovenia

Monetizing Flexibilities



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cyberNOC dashboard

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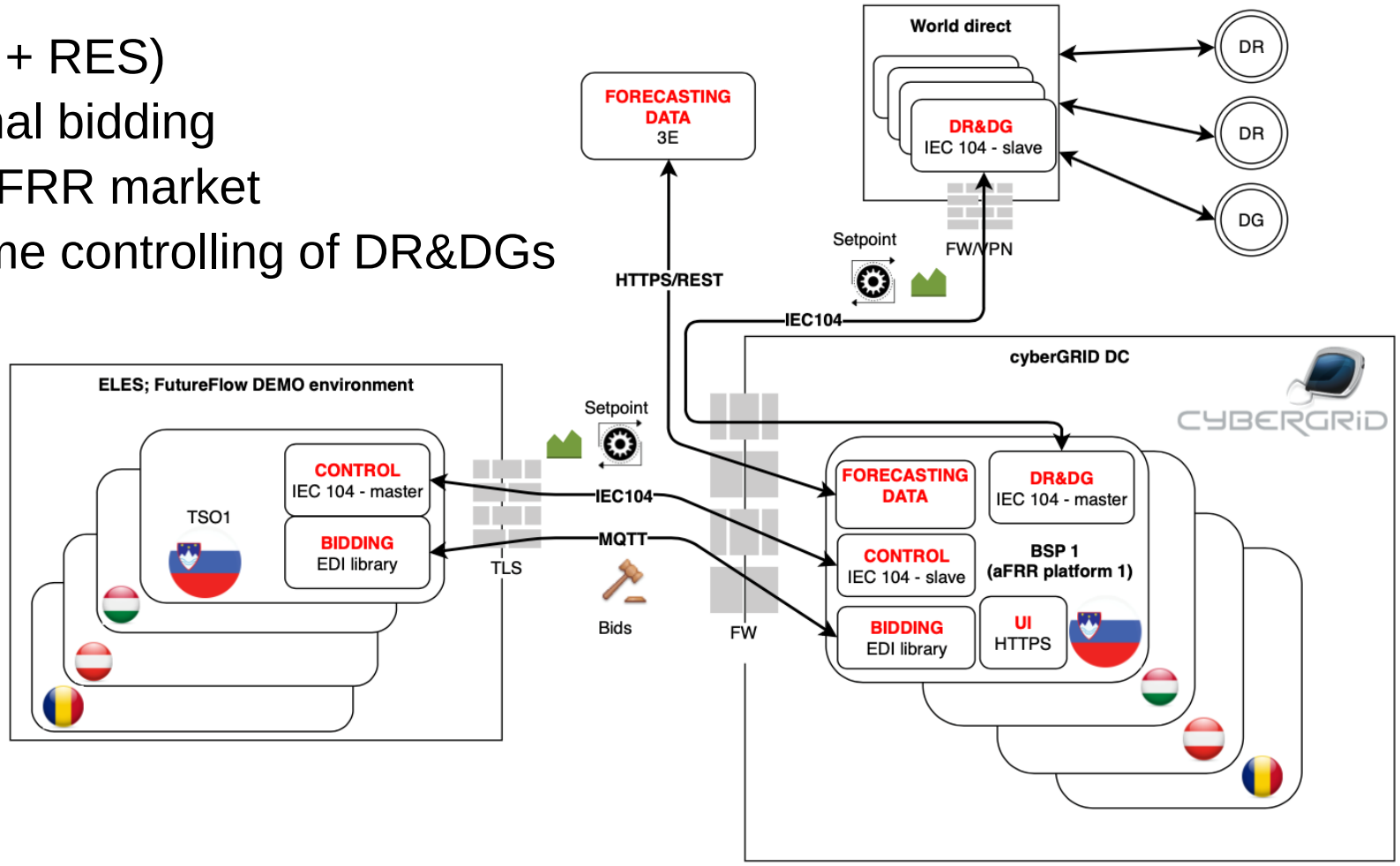
FutureFlow aFRR aggregation platform

- Aggregation of DR&DGs from 4 EU MS
- Interfacing with 106 DR&DGs (monitoring and control)
- Forecasting (C&I + RES)
- Automatic marginal bidding
- Interfacing with aFRR market
- Automatic real-time controlling of DR&DGs



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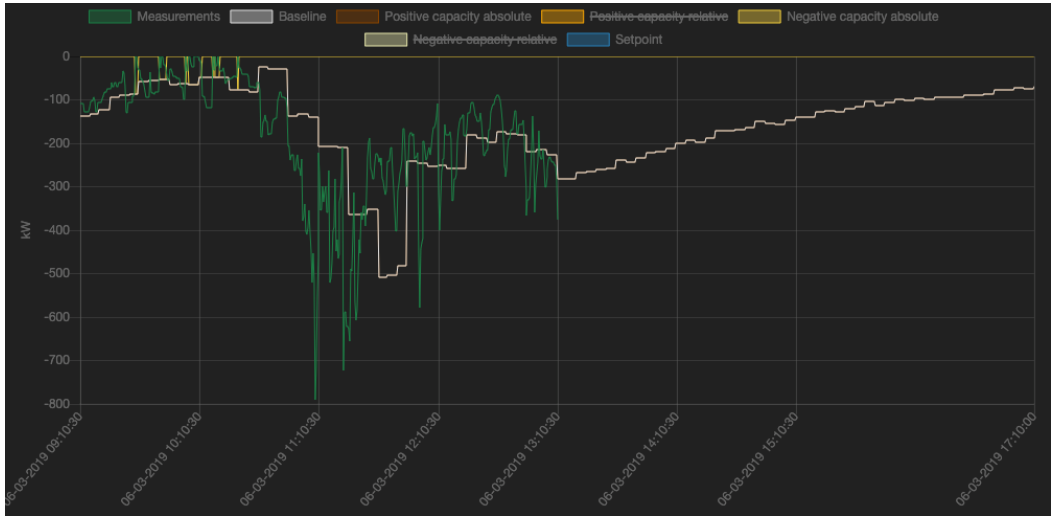
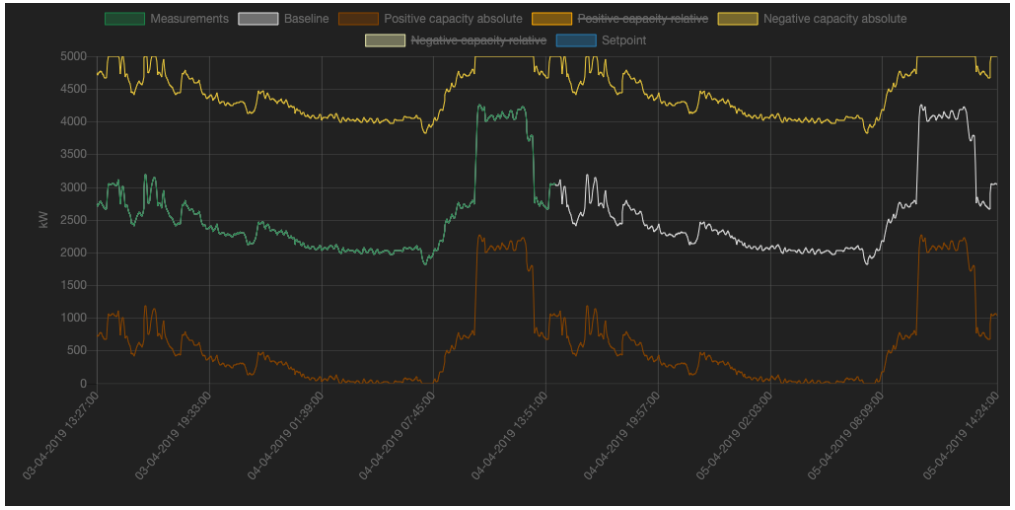
Improved forecasting

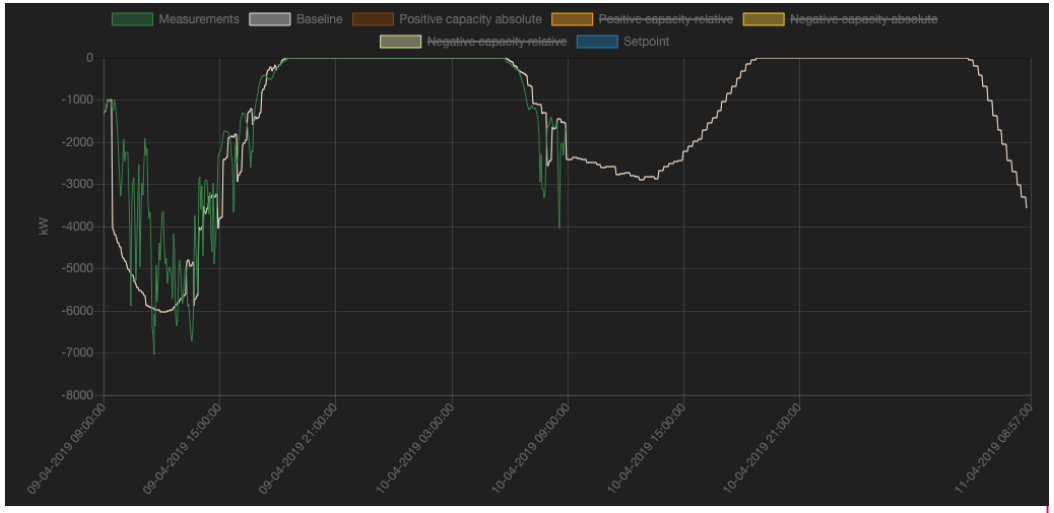
- C&I forecasting:
  - Based on weighted historic data
  - Separate for weekdays, weekends & holidays
- RES forecasting (3E):
  - Numerical Weather Prediction Forecasts (ECMWF, GFS, ICON)
  - Advanced power models of wind park & solar plant
  - Improve forecast accuracy
    - Continuous training against measurements or satellite data
    - Day-ahead: train & combine with Analog Ensembles or Gradient Boosting
    - Intraday correction: Train Time-Series Model for each horizon independently



RES forecasting (Wind in SLO)



C&I Forecasting



RES forecasting (Solar in RO)

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Automatic bidding to regional aFRR market

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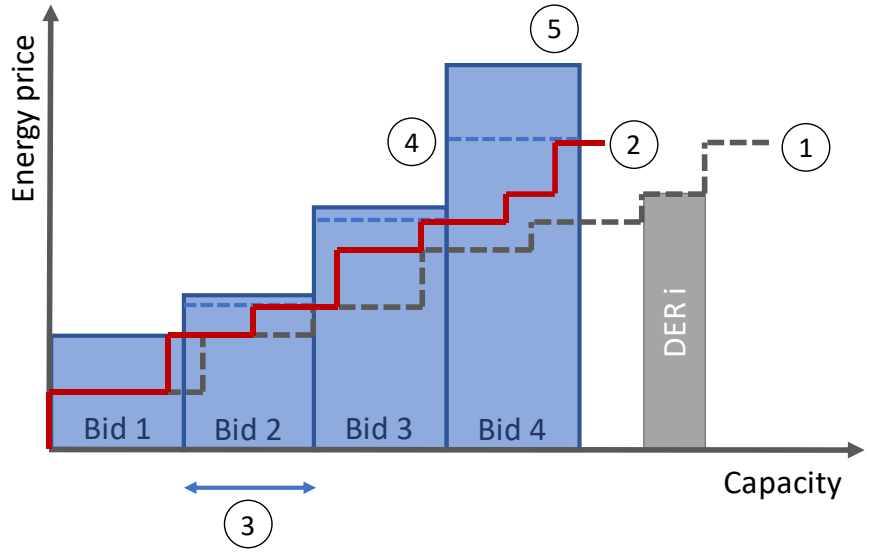
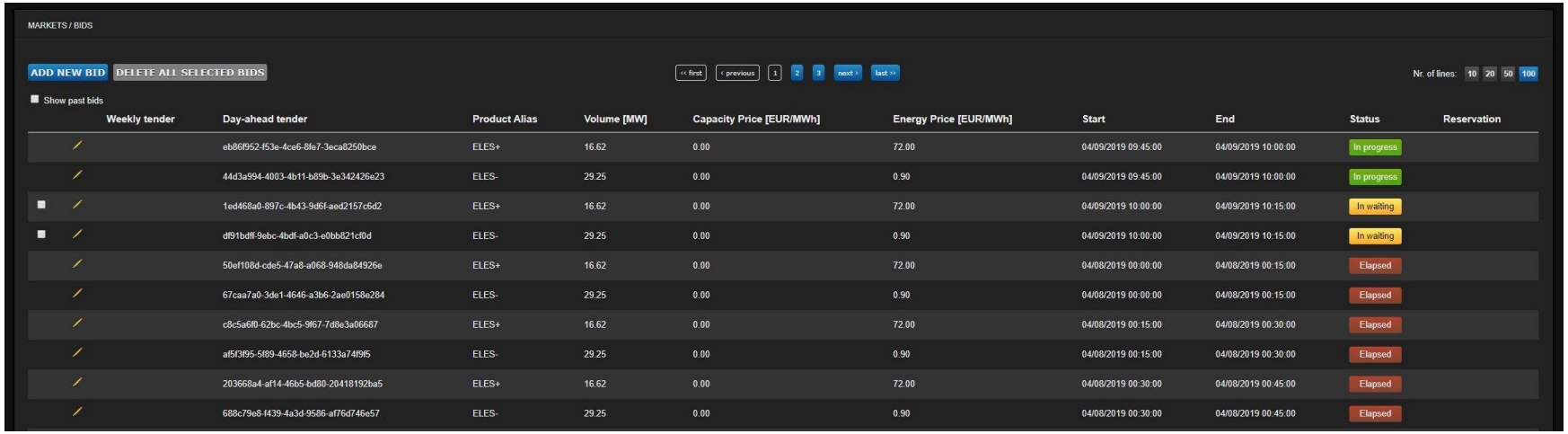
Enabling automatic energy bidding based on the market rules

1. Create **internal merit order** based on the DR & DG in the pool
2. Apply the **backup policy** of VPP operator
3. Select the **bid size** (market rule)
4. **Minimum bid price** is calculated (DR & DG marginal costs)
5. **Bid price based on the revenue optimization** strategy by VPP operator
6. Submitting bids to local TSO to be forwarded to aFRR market



Bids are generated every hour automatically


MARKETS / BIDS

ADD NEW BID | DELETE ALL SELECTED BIDS | « first | ‹ previous | 1 | 2 | 3 | next › | last »

Nr. of lines: 10 20 50 100

Show past bids

Weekly tender	Day-ahead tender	Product Alias	Volume [MW]	Capacity Price [EUR/MWh]	Energy Price [EUR/MWh]	Start	End	Status	Reservation
	eb86f952-f53e-4ce6-8fe7-3eca8250bce	ELES+	16.62	0.00	72.00	04/09/2019 09:45:00	04/09/2019 10:00:00	In progress	
	44d3a994-4003-4b11-b89b-3e342426e23	ELES-	29.25	0.00	0.90	04/09/2019 09:45:00	04/09/2019 10:00:00	In progress	
	1ed468a0-897c-4b43-9d6f-aed2157c6d2	ELES+	16.62	0.00	72.00	04/09/2019 10:00:00	04/09/2019 10:15:00	In waiting	
	df91bdff-9ebc-4bdf-a0c3-e0bb821cf0d	ELES-	29.25	0.00	0.90	04/09/2019 10:00:00	04/09/2019 10:15:00	In waiting	
	50ef108d-cde5-47a8-a068-948da84926e	ELES+	16.62	0.00	72.00	04/08/2019 00:00:00	04/08/2019 00:15:00	Elapsed	
	67caa7a0-3de1-4646-a3b6-2ae0158e284	ELES-	29.25	0.00	0.90	04/08/2019 00:00:00	04/08/2019 00:15:00	Elapsed	
	c8c5a6f0-62bc-4bc5-9f67-7d8e3a06687	ELES+	16.62	0.00	72.00	04/08/2019 00:15:00	04/08/2019 00:30:00	Elapsed	
	af5f3f95-5f89-4658-be2d-6133a74f9f5	ELES-	29.25	0.00	0.90	04/08/2019 00:15:00	04/08/2019 00:30:00	Elapsed	
	203668a4-af14-46b5-bd80-20418192ba5	ELES+	16.62	0.00	72.00	04/08/2019 00:30:00	04/08/2019 00:45:00	Elapsed	
	688c79e8-f439-4a3d-9586-af76d746e57	ELES-	29.25	0.00	0.90	04/08/2019 00:30:00	04/08/2019 00:45:00	Elapsed	

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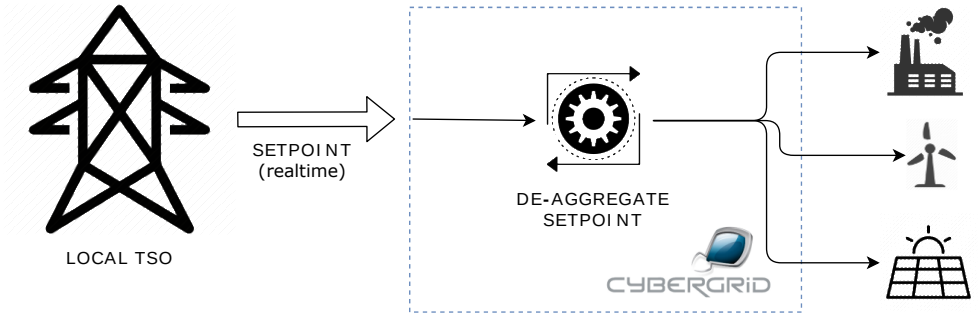
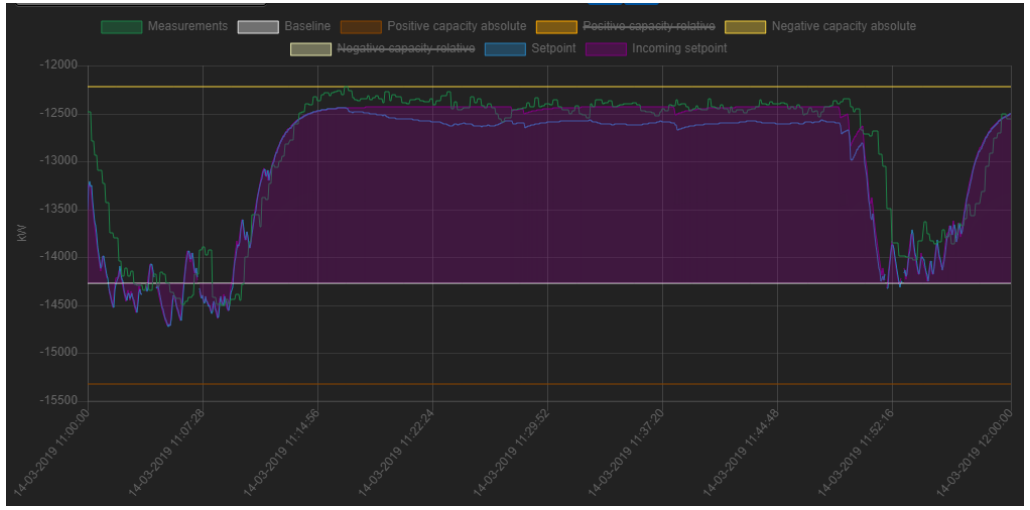
Real-time activation control

Processing of received activation message (setpoint) from the connected TSO and de-aggregating received setpoint for controlling individual DR&DG

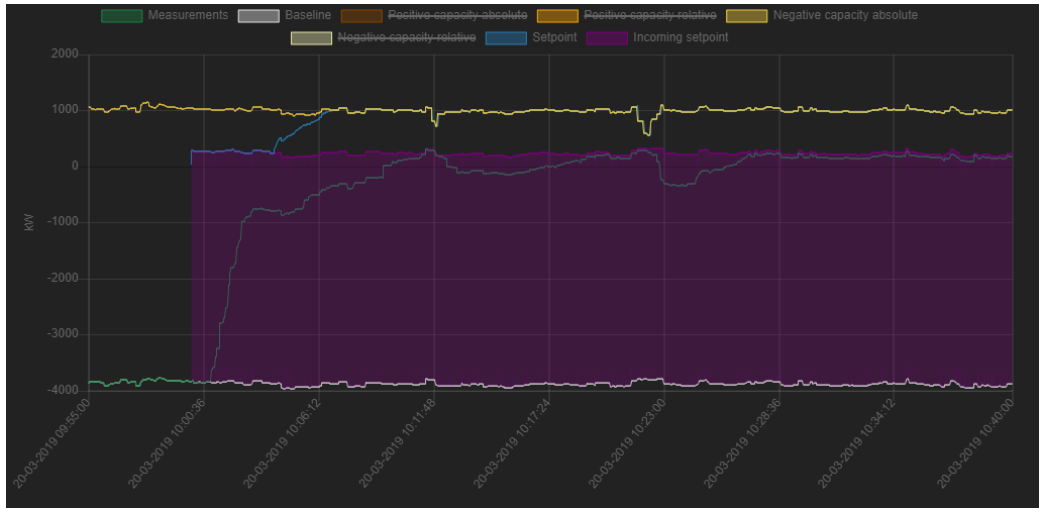
Steps:

1. Receive setpoint from local TSO (real-time)
2. Creating internal real-time merit order list (considering: availability, price, … of DR&DGs)
3. De-aggregate incoming setpoint signal (from TSO) to meet the internal merit order list and distribute individual signals (setpoints) to the DR&DG
4. Monitor any deviations of the activated DR&DG and reduce deviations by closed-loop controller
5. Report pool performance data to the TSO for validation purposes





Reducing DR/DG set-point



Increasing DR/DG set-point

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