SmartNet

Smart TSO-DSO interaction schemes, market architectures and ICT Solutions for the integration of ancillary services from demand side management and distributed generation

Task 4.2 Scenarios
Simulation model input datasets

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Content

- Creation of scenario datasets
- Overview of scenario datasets
  - Italy
  - Denmark
  - Spain

2030 scenarios – high level description

Italy ("scenario 4")
- ENTSO-E Vision 3
- Demand response partly used (50%)
- Poor cross-border capacity

Denmark ("scenario 3")
- (ENTSO-E Vision 4)
- Energinet.dk projections
- Demand response fully used
- Good cross-border capacity

Spain ("scenario 2")
- ENTSO-E Vision 1
- EU Reference scenario
- No demand response
- Poor interconnectors

Main differences in the three scenarios:

- Different electrical networks
- Different generation mix
- Different penetration of flexible devices

Scenario dataset creation procedure

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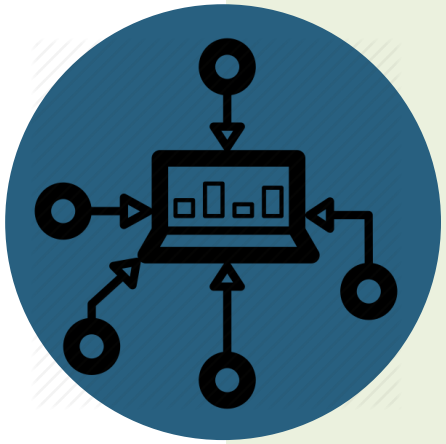


data collection

electrical network

generators device parameters

statistics power profiles

data processing

consistent dataset in the correct format in line with 2030 projections

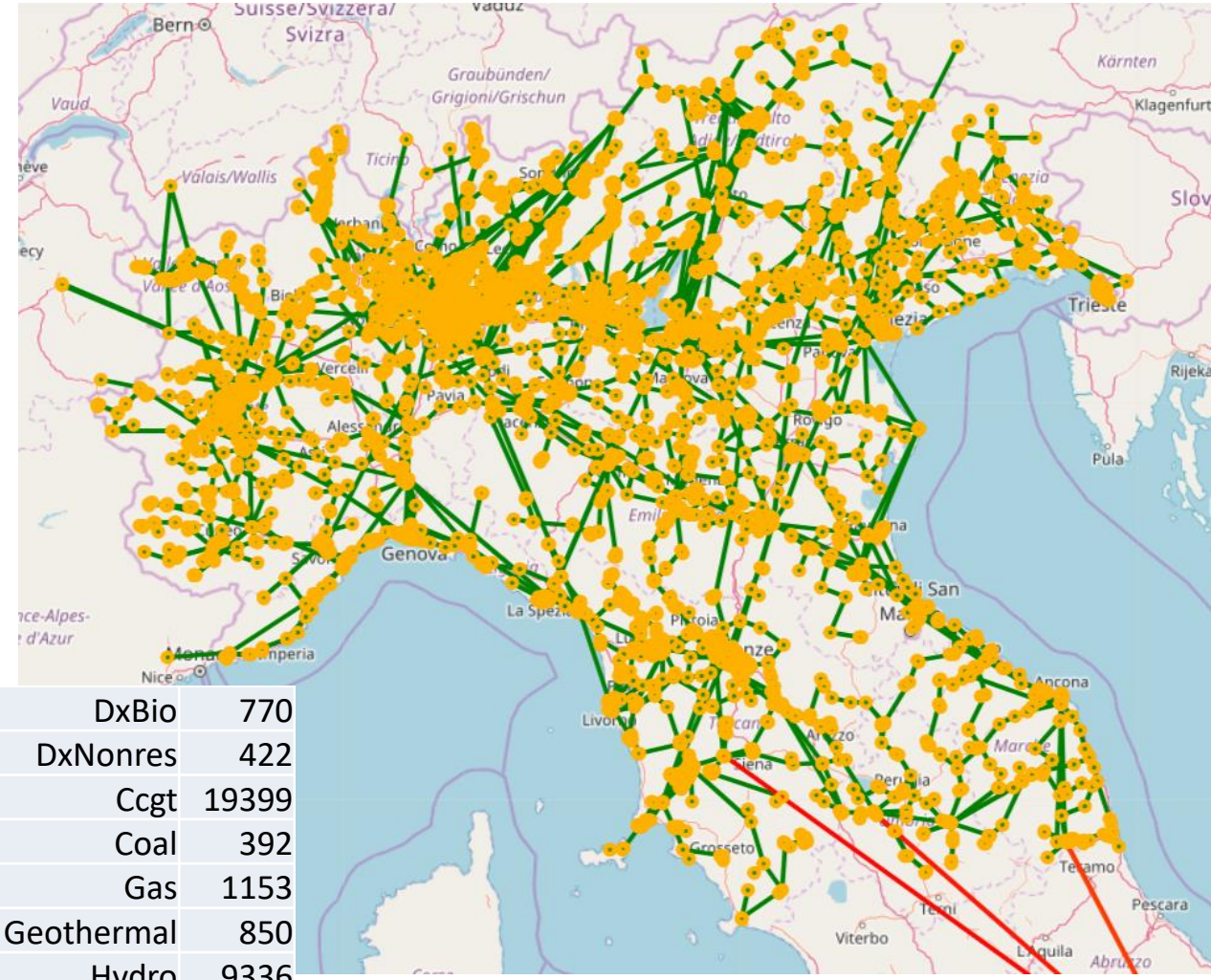
Overview of datasets - Number of devices and network elements

Category	IT 503	DK 401	ES 301	Comment
Pv	655323 (5746)	203502 (2568)	59943 (1951)	Large and small
Wind	31	3472 (375)	1053 (192)	Wind farms/turbine
Chp	1531	3	922	Combined heat and power
Hyd	1833	0	555	Run-or-river hydro
Con	1774	67	596	Conventional (fuel) generator
Sto	212717 (69909)	139335 (43716)	200033 (60134)	Storage: Electric cars and pumped hydro
Wet	1236325	3206570	1847500	Domestic wet appliances
Tcl	68481	74688	124539	Thermostatic: Domestic heat pumps
Sel	33783	3383	43501	Sheddable load: Street-lights
Nodes	3648 2410	144 3388	1493 2799	Transmission network Distribution network
Edges	4230 2410	199 3387	2231 2755	Transmission network Distribution network
Distr. grids	638	66	397	Primary substations

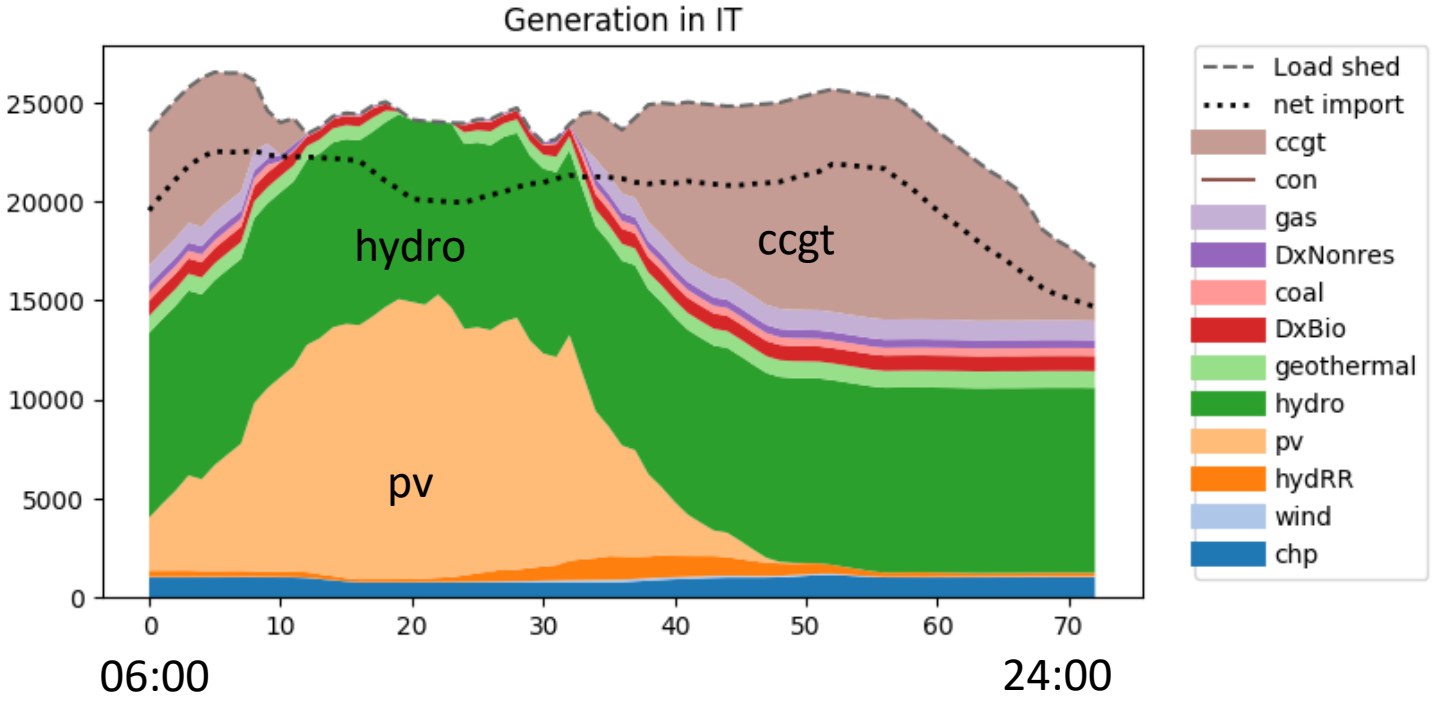
Numbers in bracket are after lumping together devices on same node

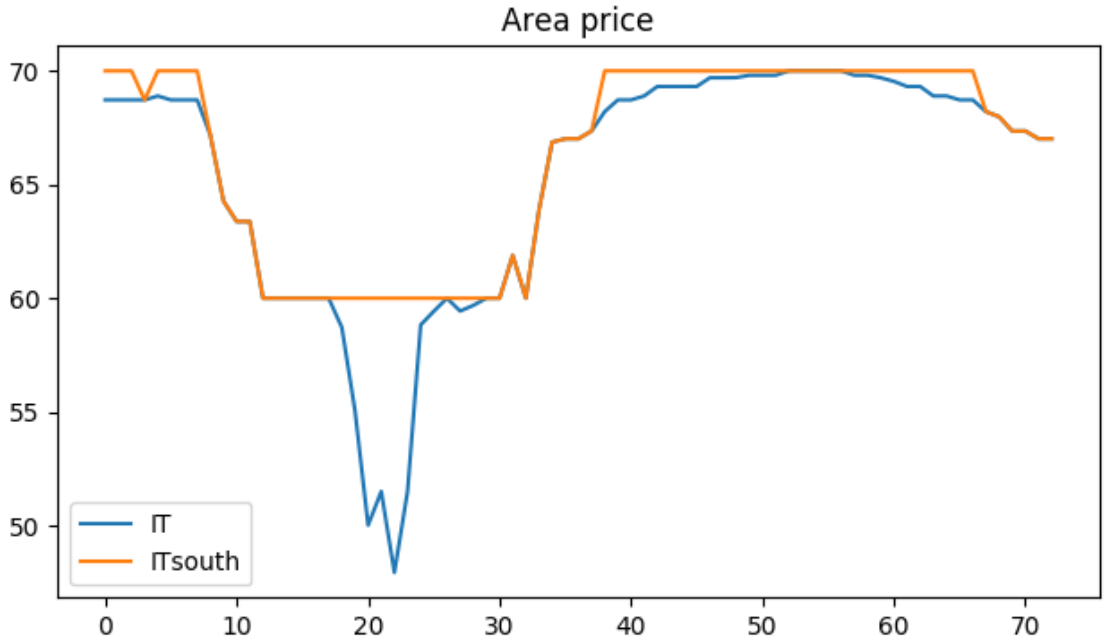
Scenario dataset summary – Italy

	Number of devices	Power capacity (MW)	Mean power (MW)	Capacity factor
Chp	1531	4485.5	932.7	0.21
Con	1774	32321.8	16955.2	0.52
Hyd	1833	2670.0	470.4	0.18
Pv	655323	21302.1	5151.3	0.24
Sel	33783	-168.9	-53.1	0.31
Sto	212717	-6482.1	-84.7	0.01
Tcl	68481	-260.8	-48.7	0.19
Wet	1236325	-1315.4	-41.0	0.03
Wind	31	340.1	53.4	0.16



DxBio	770
DxNonres	422
Ccgt	19399
Coal	392
Gas	1153
Geothermal	850
Hydro	9336



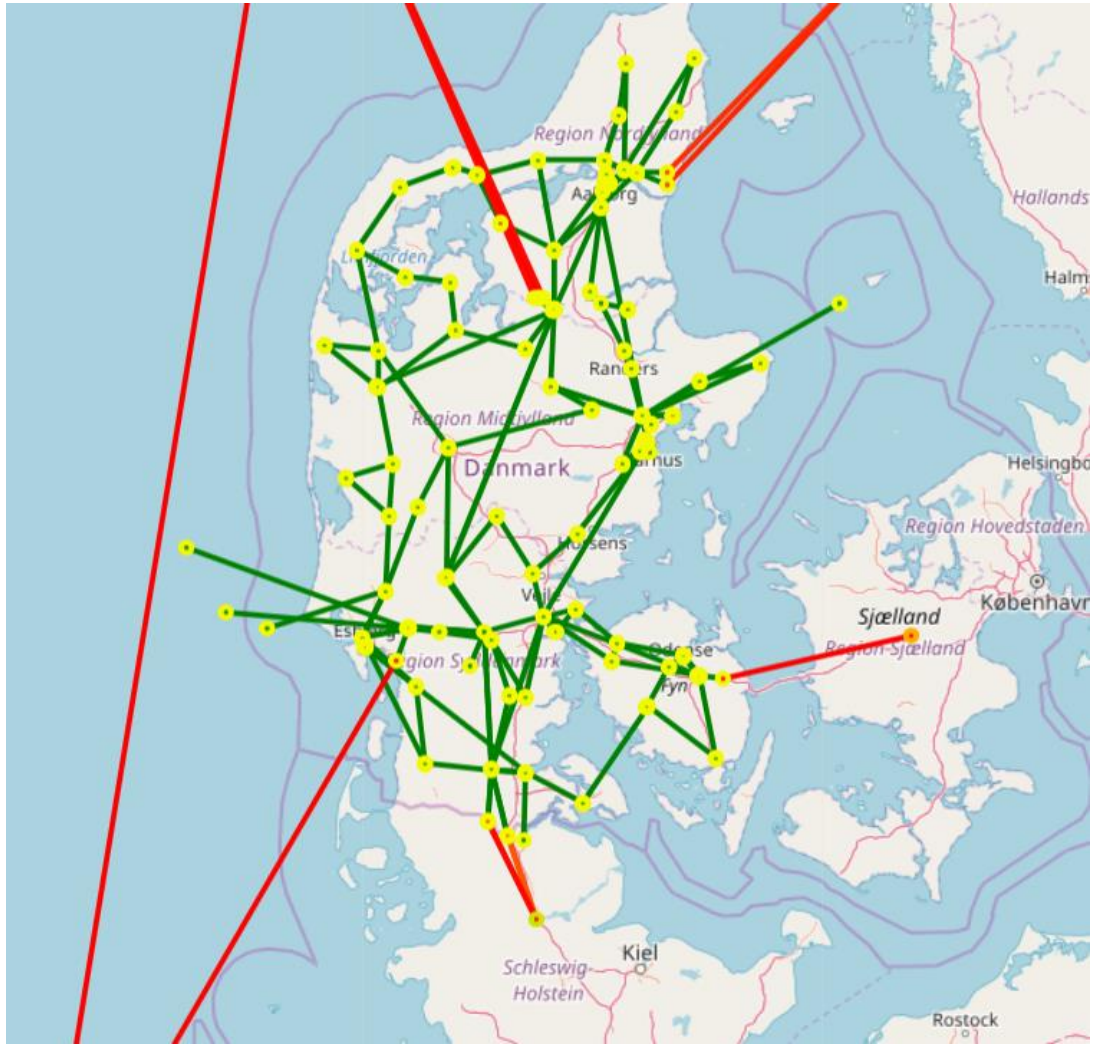


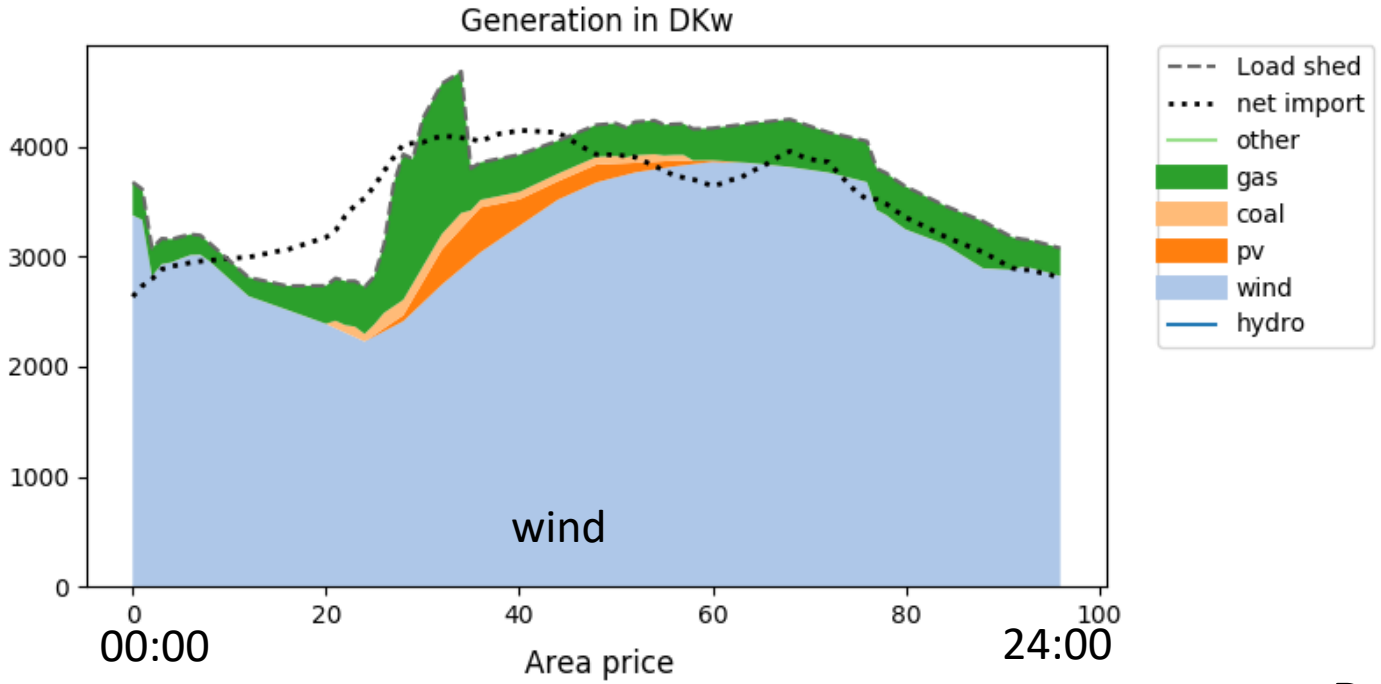
Previous market result = baseline in SmartNet market

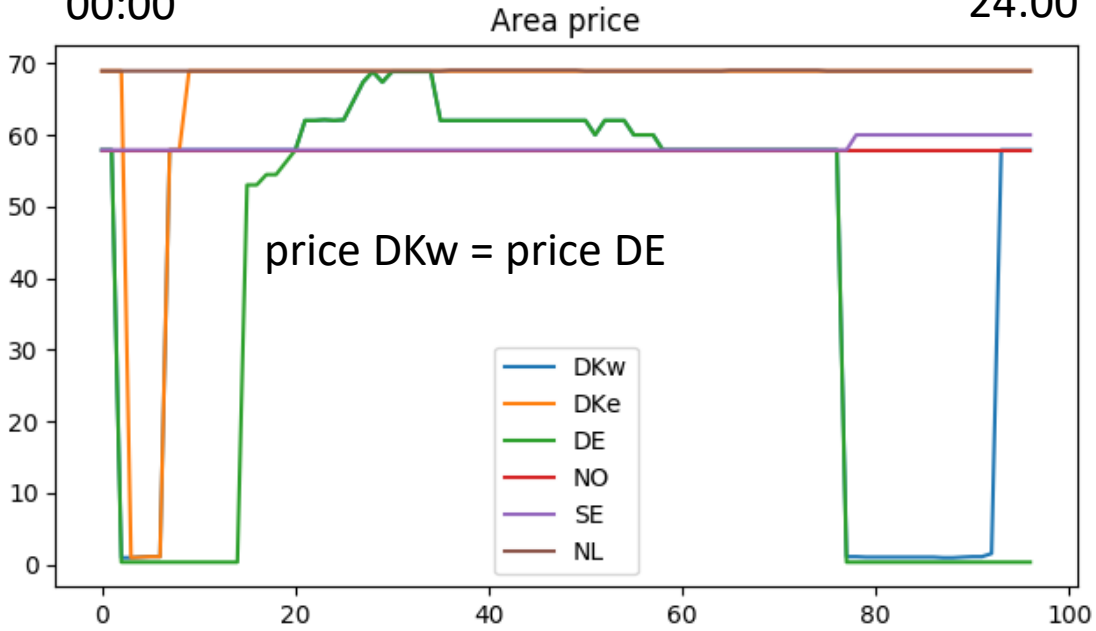
Italy
1 May
Medium sunny, medium windy

Scenario dataset summary – Denmark

	Number of devices	Power capacity (MW)	Mean power (MW)	Capacity factor
Chp	3	1232.0	297.9	0.24
Con	67	1828.7	136.8	0.07
Hyd				
Pv	203502	1946.6	62.4	0.03
Sel	3383	-16.9	-8.3	0.49
Sto	139335	-949.1	-75.7	0.08
Tcl	74688	-479.4	-268.4	0.56
Wet	894790	-952.1	-22.9	0.02
Wind	3472	6497.0	2988.4	0.46







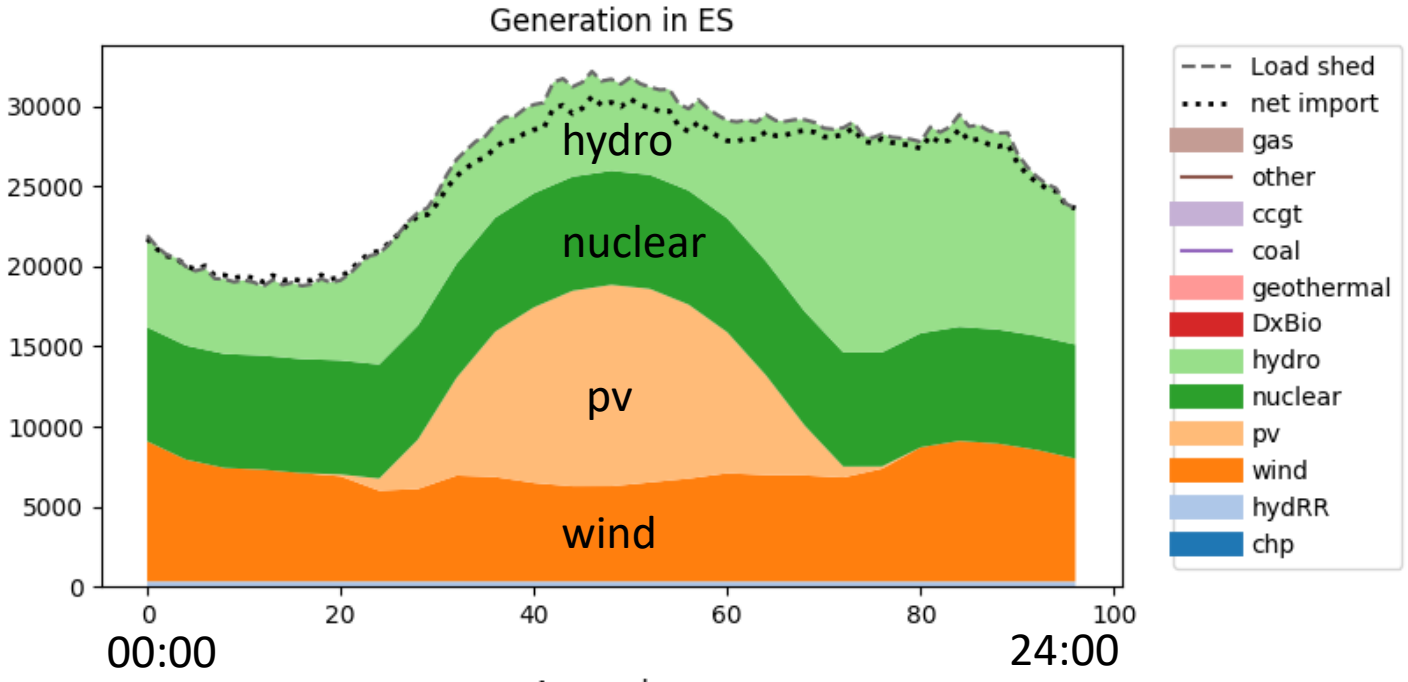
Previous market result = baseline in SmartNet market

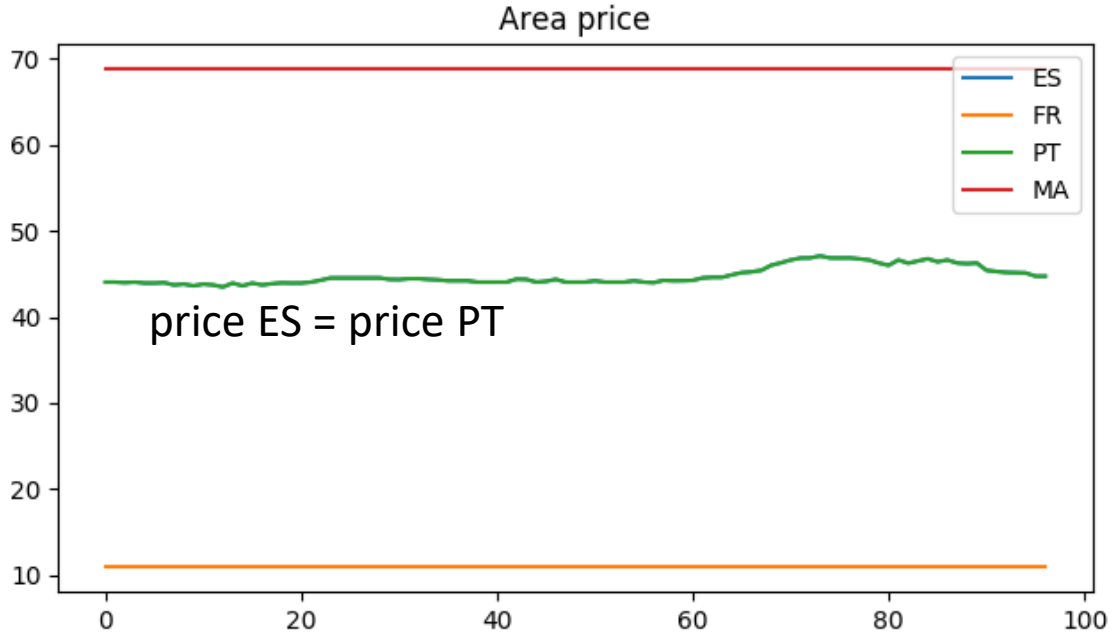
Denmark
9 Nov
Little sun, windy

Scenario dataset summary – Spain

	Number of devices	Power capacity (MW)	Mean power (MW)	Capacity factor
Chp	922	6819.0	19.8	0.00
Con	596	50513.9	14991.6	0.30
Hyd	555	1222.6	301.4	0.25
Pv	59943	16800.0	3947.5	0.23
Sel	43501	-217.5	-106.4	0.49
Sto	200033	-9372.8	-108.6	0.01
Tcl	124539	-356.8	-50.0	0.14
Wet	1847500	-1965.7	-46.6	0.02
Wind	1053	35750.0	6506.2	0.18

DxBio	936
ccgt	13501
Gas	11447
Geothermal	5
Hydro	17505
Nuclear	7120

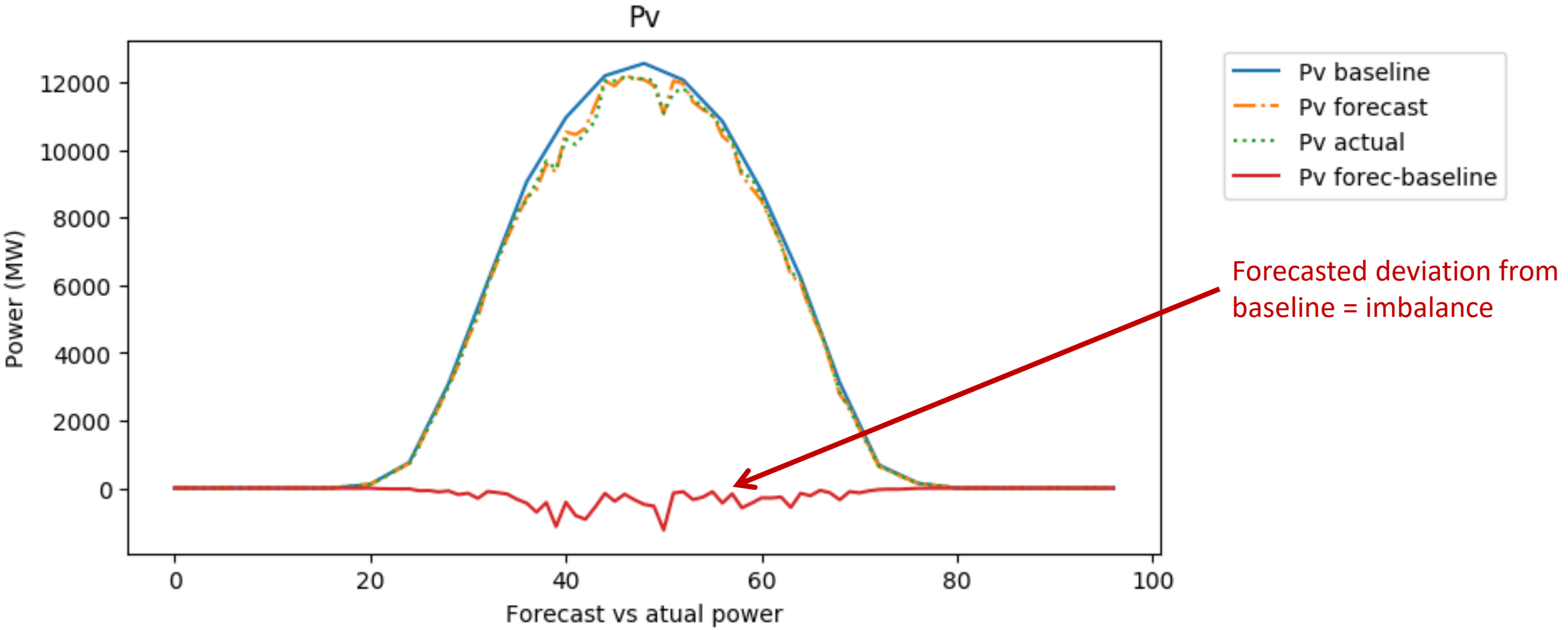




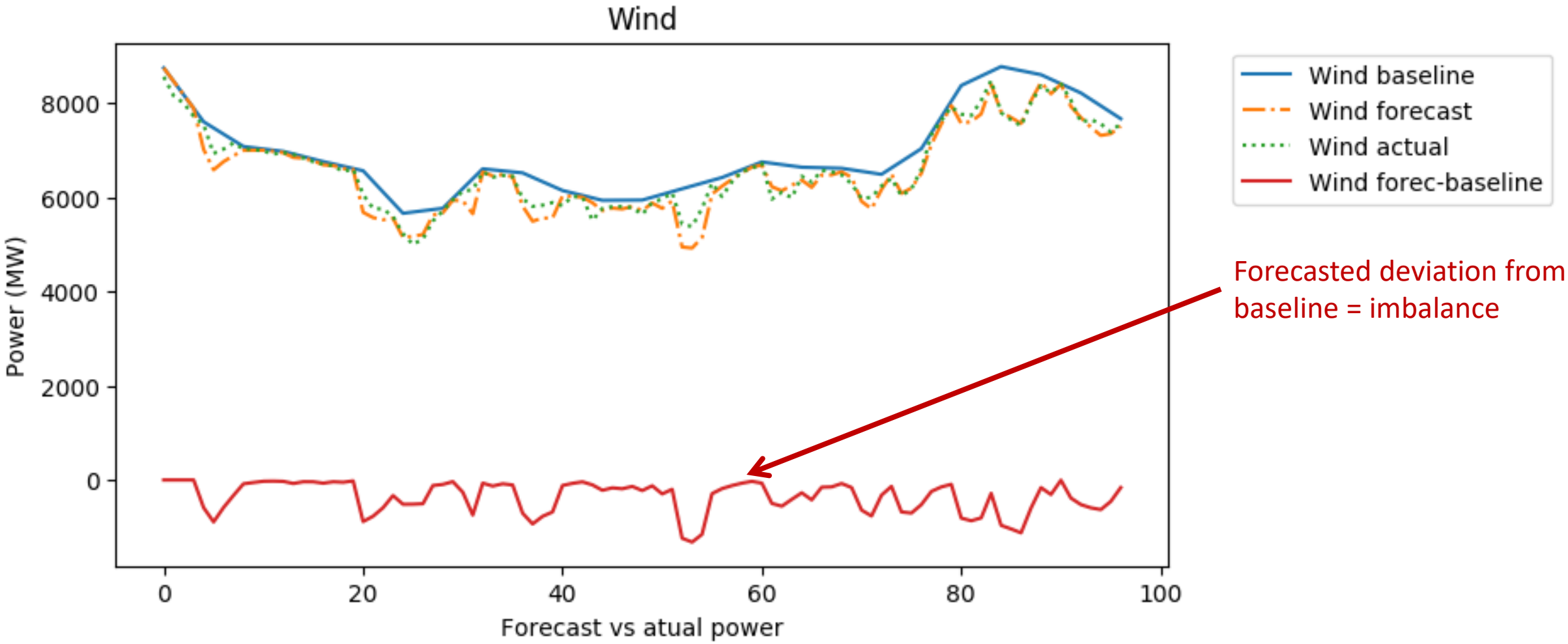
Previous market result = baseline in SmartNet market

Spain
4 June
Sunny, modest wind

Forecast error – PV



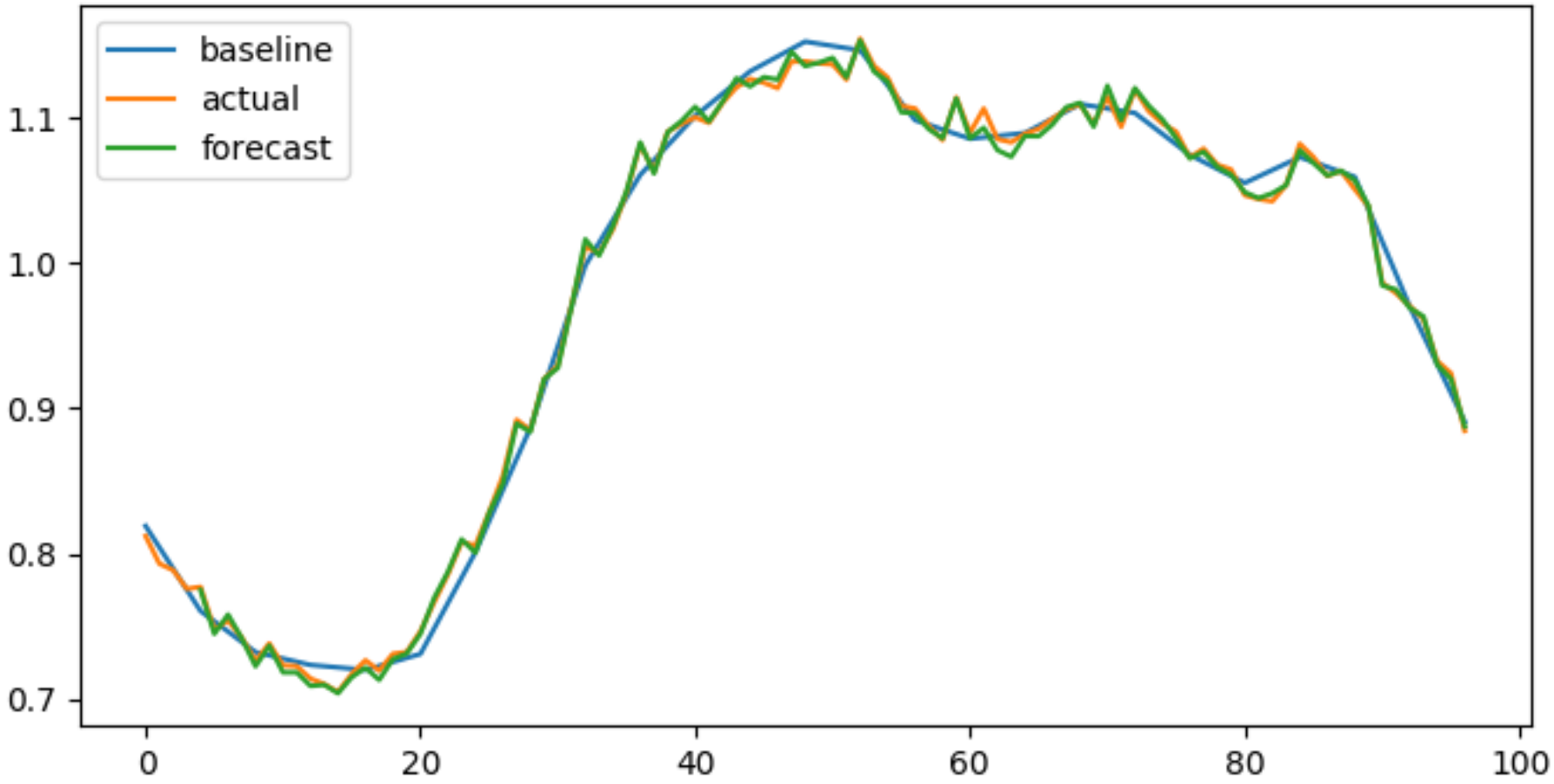
Forecast error – Wind



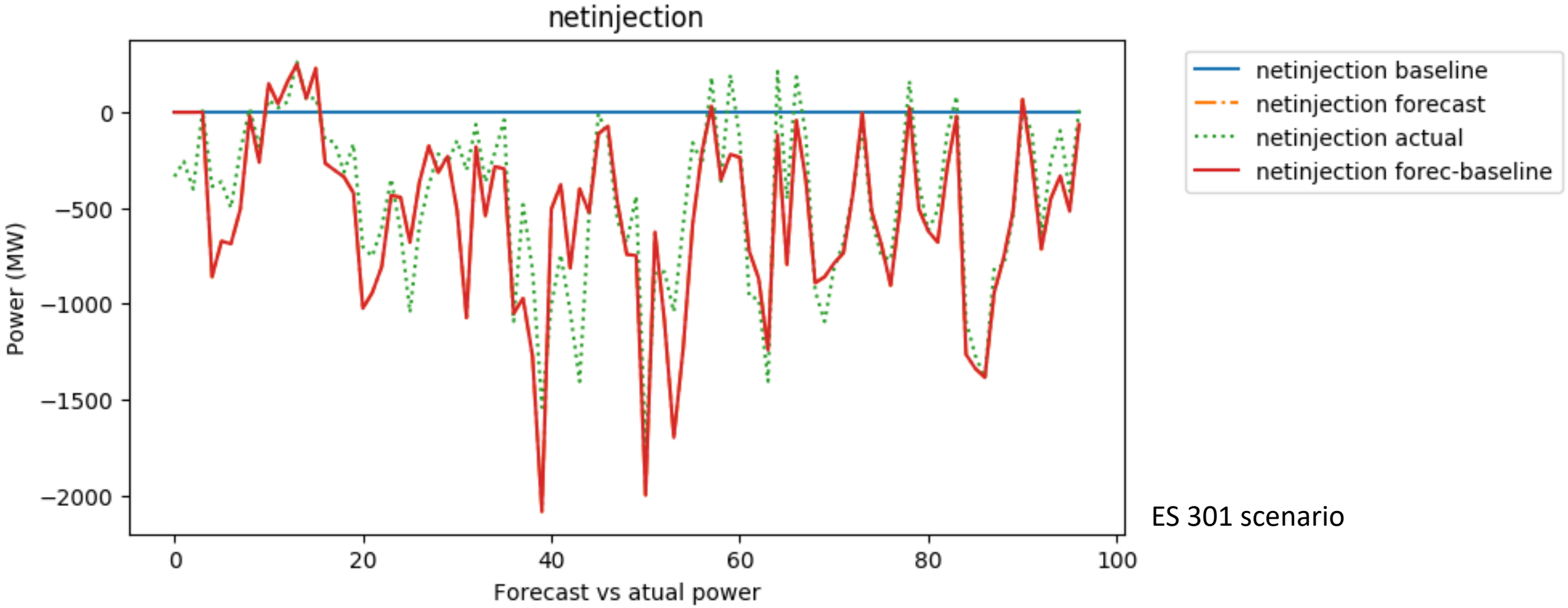
Forecasted deviation from baseline = imbalance

Forecast error – Load

Load profile ES



Forecasted imbalance – to be re-balanced by SmartNet market



ES 301 scenario

Simulations run for representative dates

- IT
  - **1 May (medium sun, medium wind)**
  - 15 July (sunny, windy)
  - 6 Dec (little sun, little wind)
- DK
  - **9 Nov (windy, little sun)**
  - 5 Jun (sunny, little wind)
  - 11 Apr (windy in the afternoon, quite sunny)
- ES
  - **4 June (sunny, not so windy)**
  - 4 Oct (increasing wind, medium sunny)
  - 17 Sept (decreasing wind, sunny)

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