



**Polskie Sieci Elektroenergetyczne S.A.**

**Polish-Japanese partnership in the field of On-line Special Protection Scheme  
for Next Generation Power Grid**

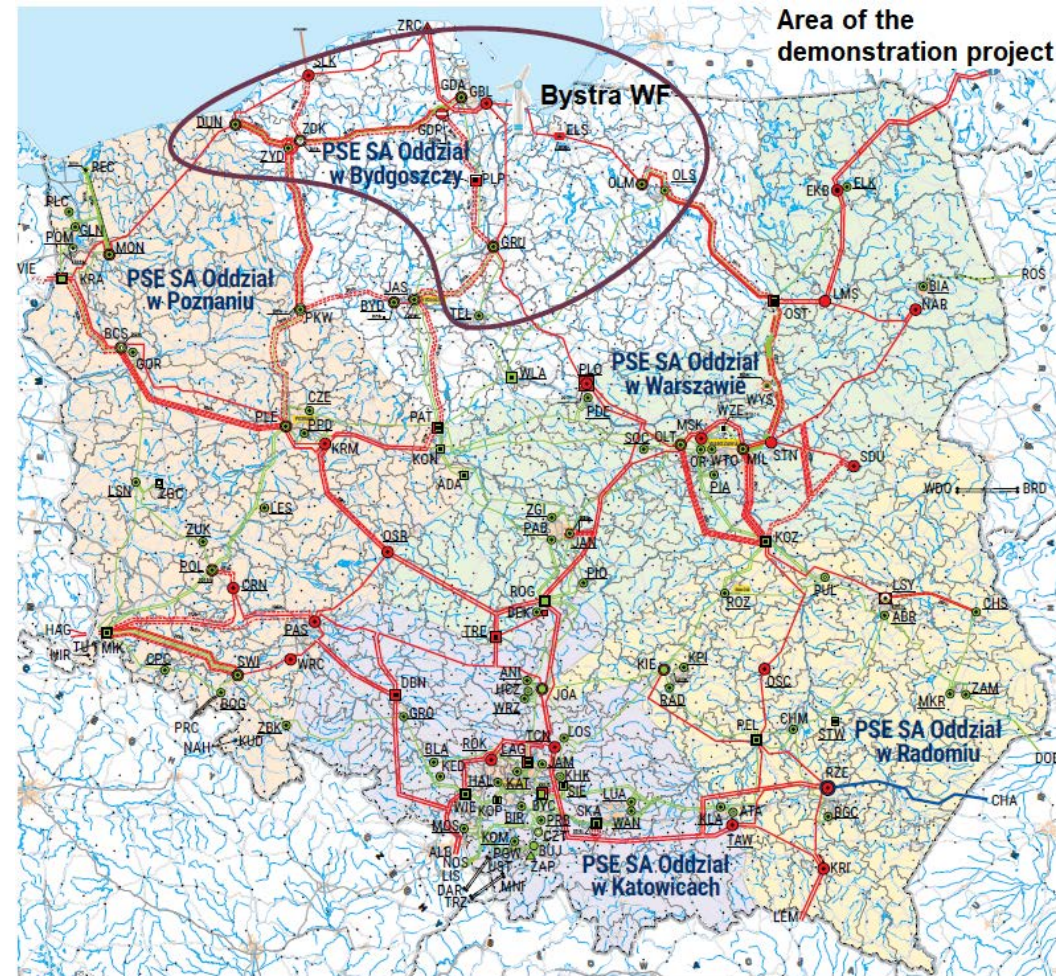
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Katowice | 12th December 2018





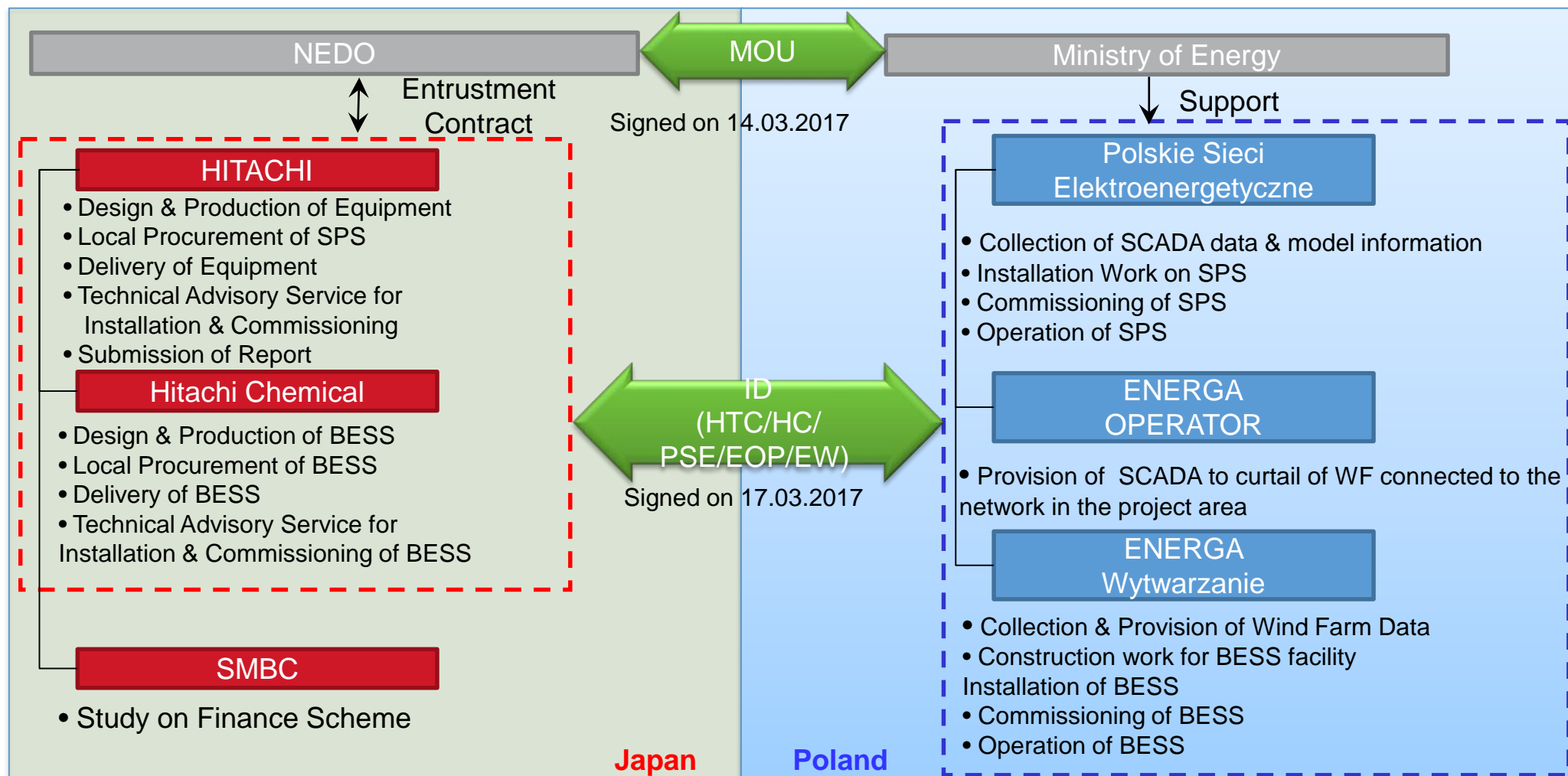
### Basic information about the NEDO project

- **Scope of the project:**
  - System Protection Scheme (SPS) implementation
  - Battery Energy Storage System (BESS) implementation
- **Beginning of the project: 17th March 2017**
- **Planned end of the project: September 2020**
- **Total power of wind farms: 1 800 MW**





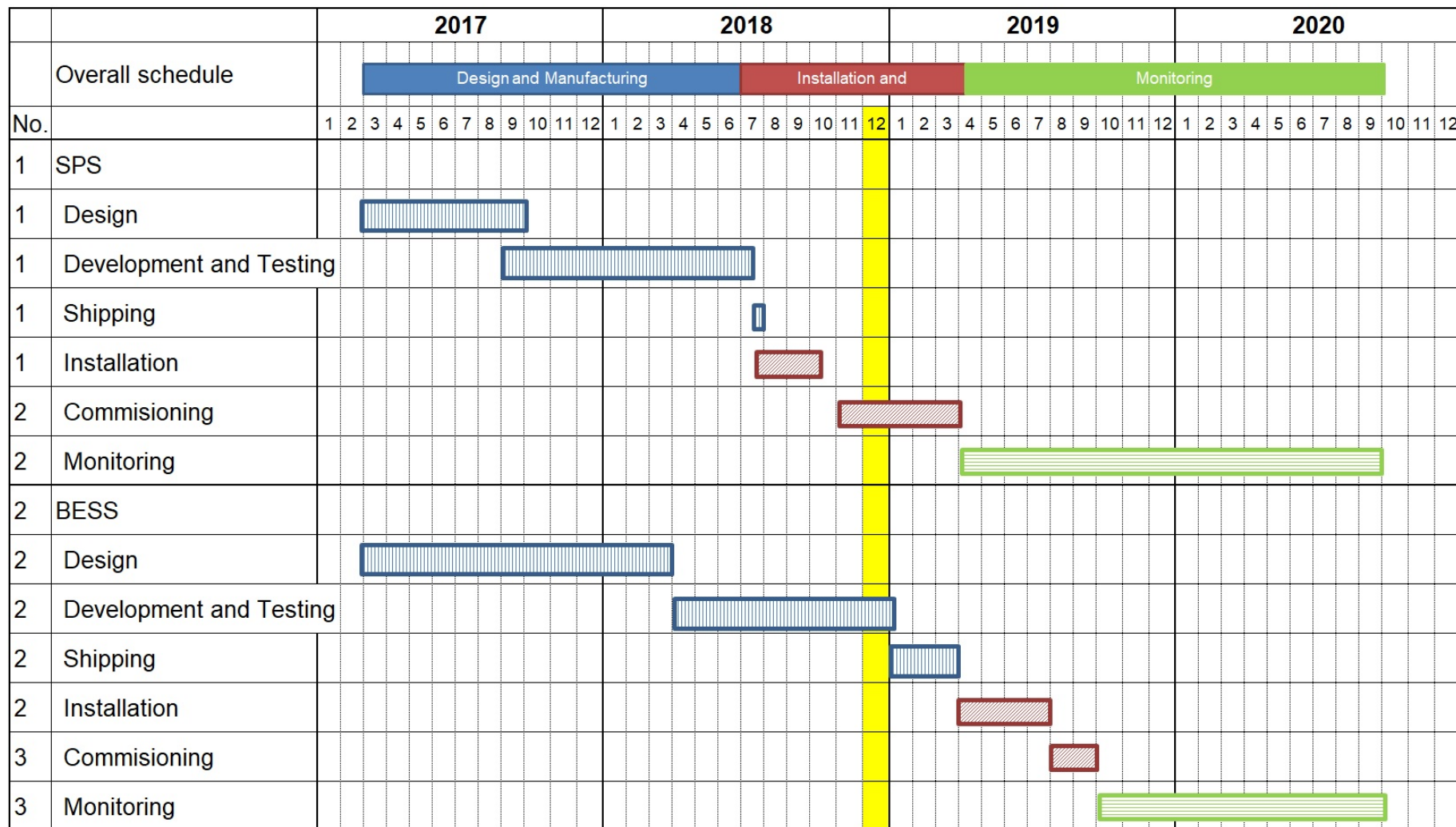
### The structure of the NEDO project





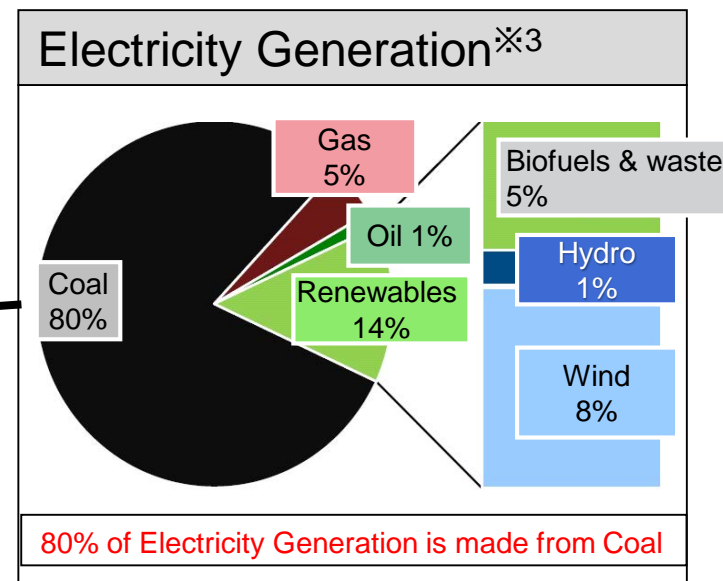


## Overall project schedule





## Background (1): Overview in Poland



Installation of renewable sources is necessary to meet EU Directives, RE ratio target in EU: 32% (2030)

Increasing the Share of Wind Generation

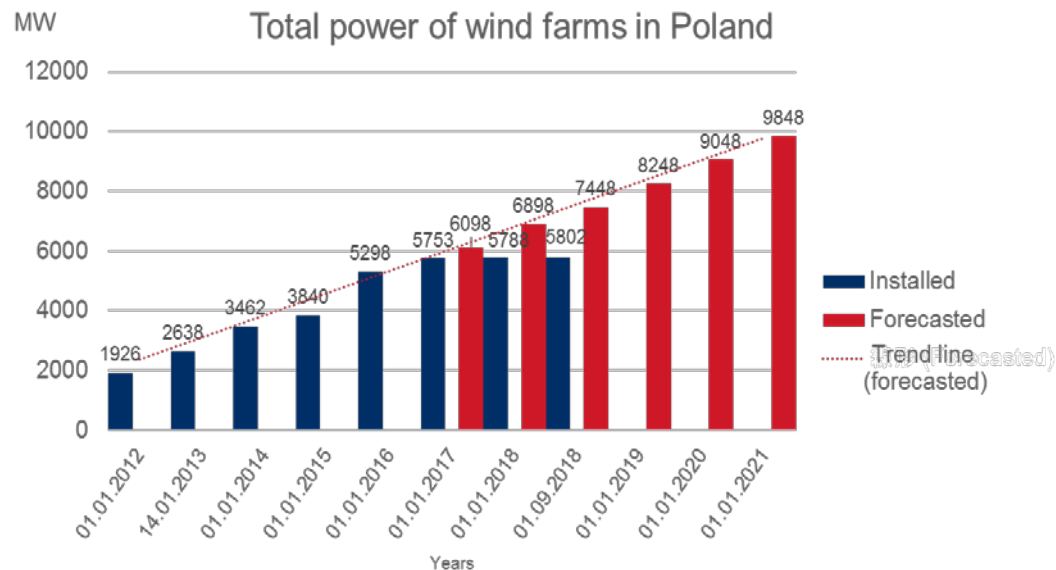
※1 IEA "Natural Gas Information"

※2,3 IEA "2017Poland - Energy System Overview"





## Background (2): Analysis before the start of the NEDO project



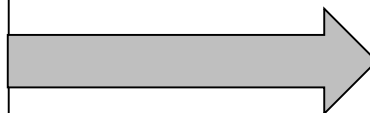
Source : PSE (2018)

The SPS system as a tool for:

- Getting more flexibility
- Fast and optimal elimination of overloads

### Projection of Wind Farms Installation in Poland

Amount of WF  
5,802MW  
(As of Sep. 2018)



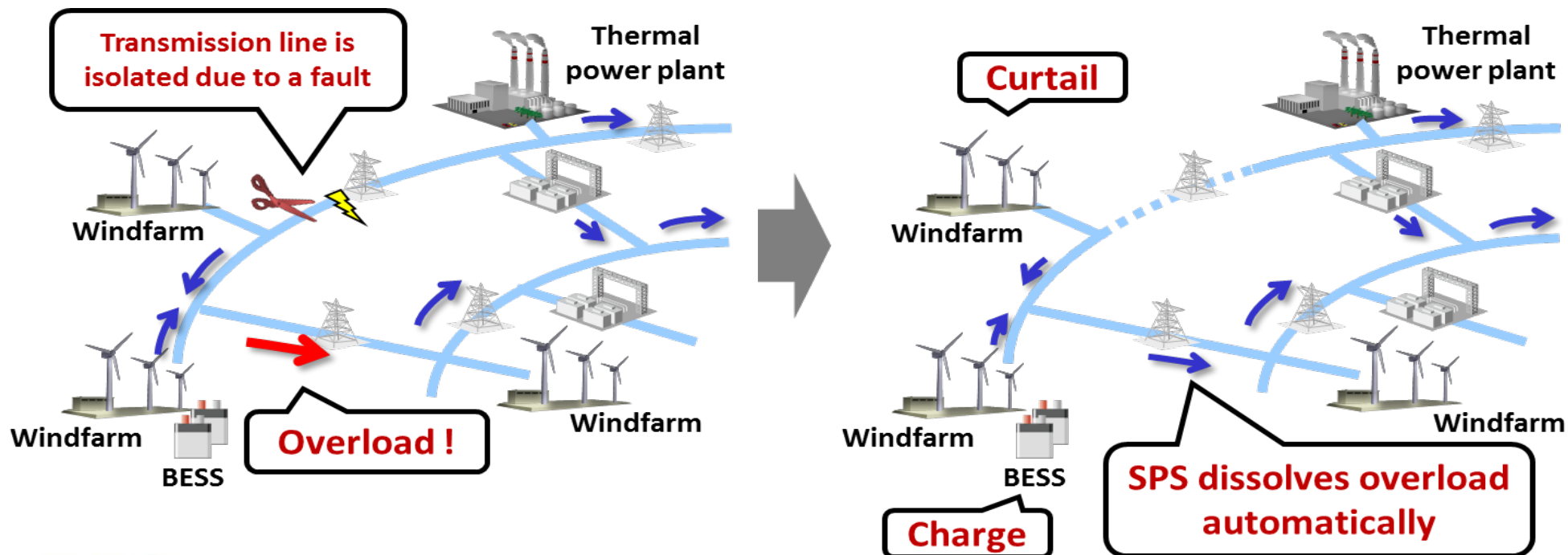
Amount of WF  
9,848MW  
(As of 2021)  
(PSE Forecast)





### Planned functionalities of SPS and BESS system (1)

- Automatic elimination of overloadings by SPS system,
- Generating remedial measures in the form of hints (DSS - Decision Support System) by SPS system,

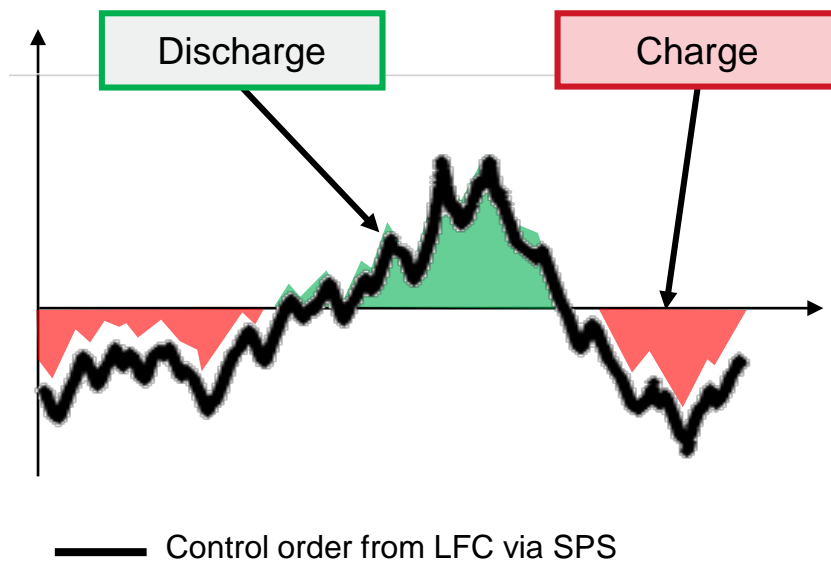




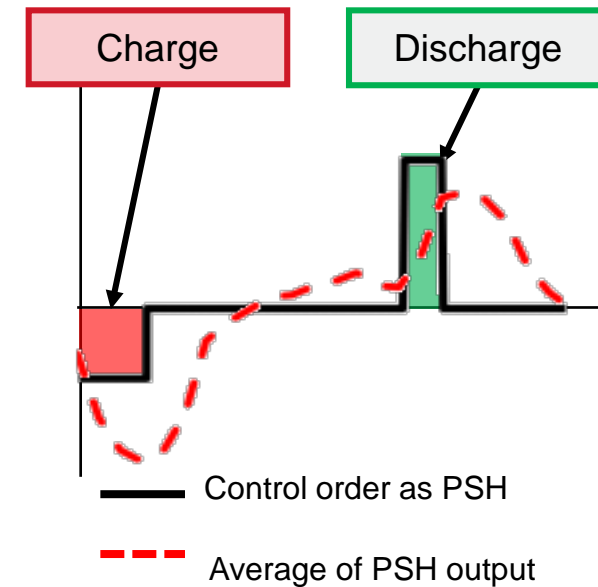
## Planned functionalities of SPS and BESS system (2)

- Frequency Restoration Reserve (FRR)
- Replacement reserve

FRR services



Ancillary services similar to PSH



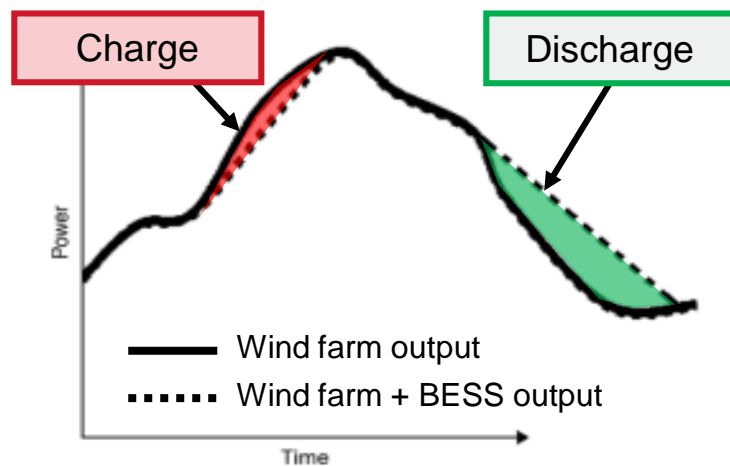




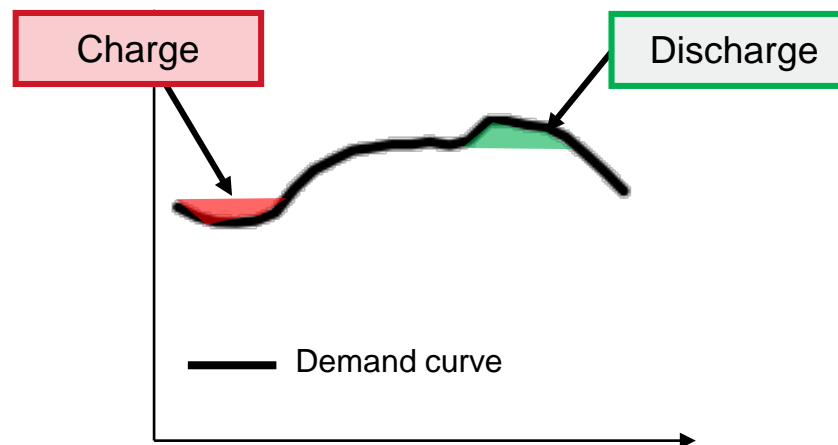
### Planned functionalities of SPS and BESS system (3)

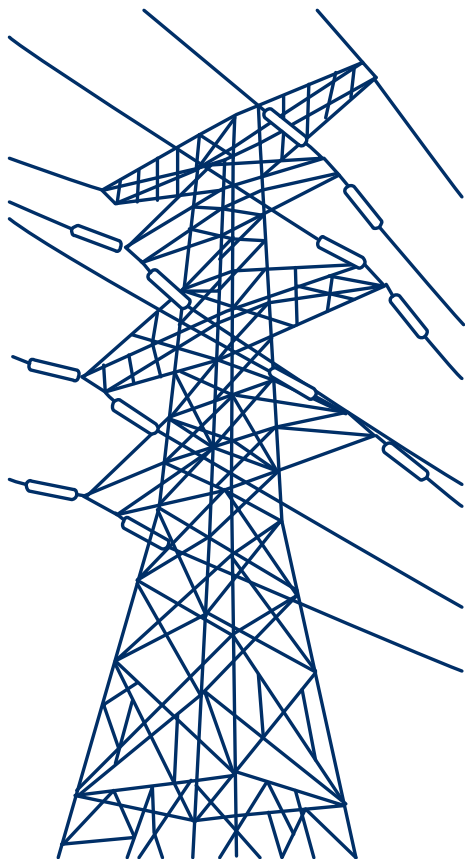
- Curtailment of short-term fluctuations of Bystra wind farm output (BESS functionality),
- Price arbitrage.

Curtailment of short-term fluctuations



Price arbitrage





### What do we expect from the implementation of the SPS and BESS system ?

- Gathering experience,
- Simple extension of the SPS and BESS system,
- Increasing the margin of network security,
- Fast and optimal elimination of overloads,
- Hints for dispatchers,
- Getting more flexibilities,
- Integration of BESS with wind farm
- Business model for BESS in Polish energy market conditions.





**Thank you for your attention !**





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