Study Committee C2

Power System Operation and Control

10916

Year-ahead operational planning in an evolving system through Multi-Situation Methods

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RTE

Motivation

- Ever increasing volume of RES generation connected to DSOs and lower transmission voltage levels
- Power flows on the intermediate voltage levels are now bidirectional, more volatile and new patterns keep emerging
- Practice and experience are no longer sufficient for year-ahead operational planning

Discussion

- Three methods were considered to generate network situations
  - Monte-Carlo: inputs are sampled randomly from probability distributions
  - Projective MS: network snapshots are updated to generate forecasted situations
  - Constructive MS: inputs are derived from weather scenarios complemented with market simulations
- Steps 2 and 3 are automated through OPF algorithms

Method/Approach

1. Generate a large number of forecasted network situations
2. Perform a security assessment (N-1 / N-k)
3. Assess the consequences taking into account the likelihood of occurrence of the situation

Discussion

- Each method has its drawbacks
  - Monte-Carlo Method : No correlation between inputs leads to unrealistic network situations
  - Projective MS: snapshots have to be corrected (outages, remedial actions, grid structure and characteristics) with each corrected introducing inaccuracy
  - Constructive MS: operators have less confidence in potential weather scenarios than actual historical data
- Overall, the constructive MS method appears to be the most promising one, especially as it allows to explore more weather scenarios

First results

- Allows to identify the factors influencing congestion allowing them to be monitored
- Allows to identify the periods of least impact of a scheduled outage
- MS Methods remain at a prototype stage with ongoing work on the topic

Challenges to overcome

- Improving automation and train operators to use new tools
- Developing data visualization and devise decision-making criteria
- Ensuring robust and accurate results to gain trust in the approach

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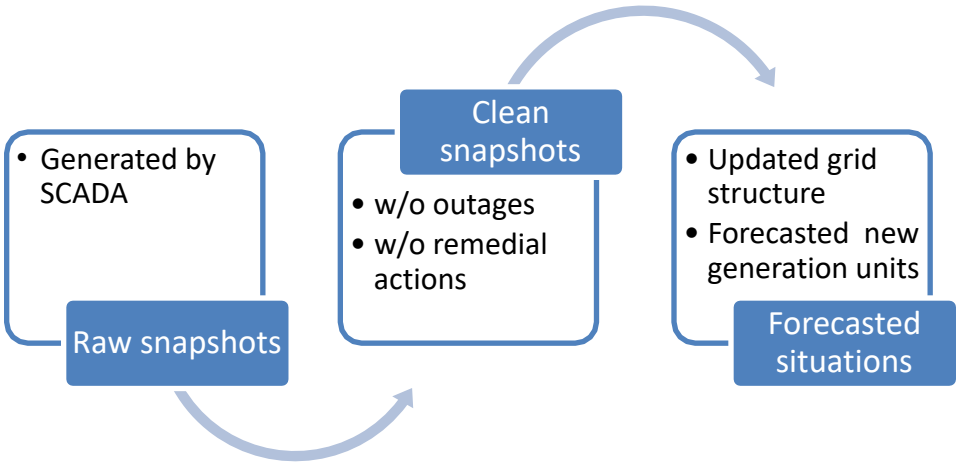
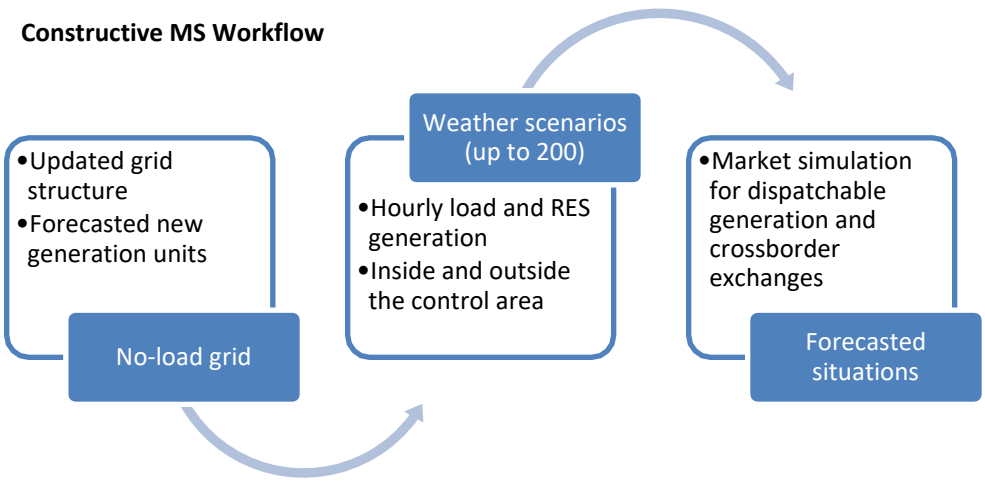
Projective MS Workflow



Constructive MS Workflow



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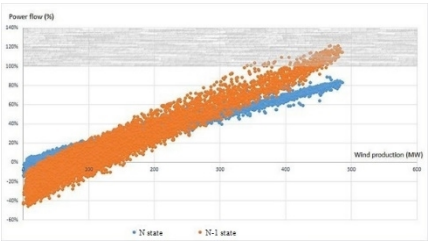
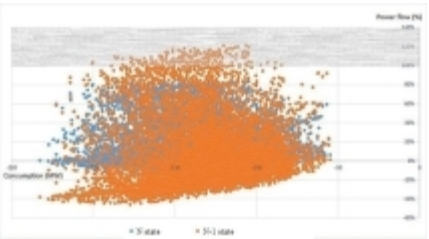
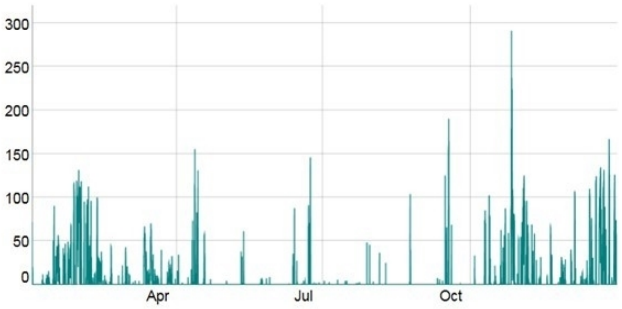
continued

Example of results: identification of influencing factors



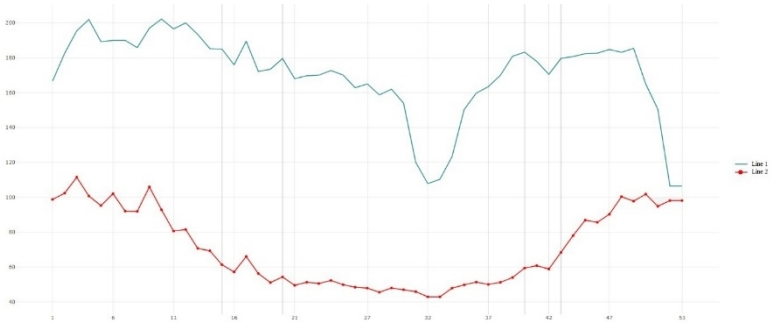


Example of results: decision making with a single influencing factor



Frequency of occurrence of security limits violation

Example of results : decision making with several influencing factors



weekly averaged aggregated impact for different outages