INTERPLAN

INTEgrated opeRation PLANning tool towards the pan-European network

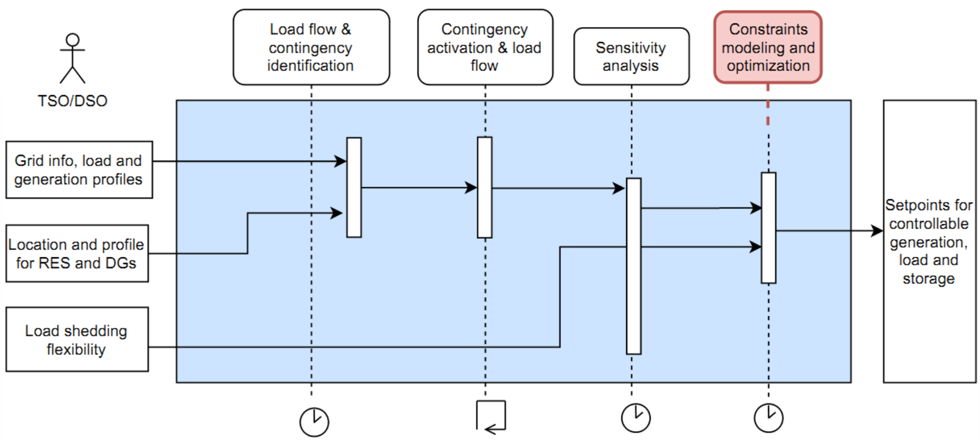
Transforming Grid Operation Planning

Use Case 7: **Optimal Energy Interruption Management**

Objective: Minimize the cost associated with generator re-dispatch and load interruption for satisfying operational constraints in the post-contingency operational state of the grid.

Network operation planning criteria: Resolving the network constraint violations after a contingency, maximizing DG/DRES contribution to ancillary services and optimal schedule for interruptible loads based on the energy tariffs.

Use case solution: This algorithm resolves the network constraint violations (line congestion, voltage limits) after a contingency by solving an optimization problem in which the active and reactive power of participating generators is re-dispatched and a schedule for energy interruption for loads is obtained with the aim of minimizing the cost of energy interruption and generators re-dispatch.



Operation challenge:

- Optimal Energy Interruption Management in Post-Contingency

Actors:

- TSO
- DSO

Controllable units:

- Dispatchable generators
- Interruptible loads

Description

Step1: A TSO/DSO prepares the grid information (network model), load, generation forecasts and identify a list of credible contingencies.
Step2: For each contingency, load flow is evaluated, and sensitivity analysis is performed. It helps to identify the influence of dispatchable generators and interrupt-able loads on critical lines and buses. This information is used to define the penalty cost terms that assigns less penalty costs to the terminals whose control action can influence more the grid constraint violation. This cost is additional to the cost of generator redispatch and load interruption based on energy tariffs.
Step3: The optimization problem is solved to yield generator & load set-points. This schedule is evaluated for each contingency and can be used offline to prepare network resources. The software can also be used during operation.

Use case developer: Sohail Khan (sohail.khan@ait.ac.at), Sawsan Henein (sawsan.henein@ait.ac.at)

Project duration
1 November 2017 - 31 January 2021

Contact
interplan-project.eu

Giorgio Graditi (Project Coordinator)
giorgio.graditi@enea.it

contact@interplan-project.eu

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 773708

INTERPLAN

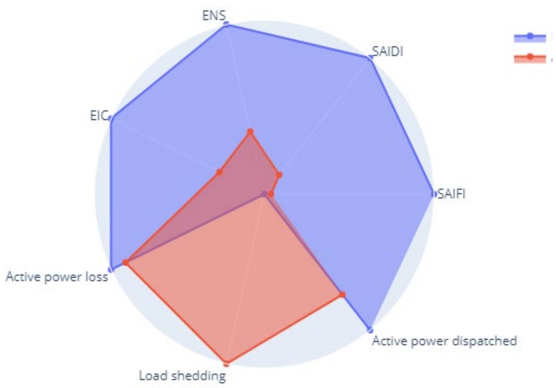
INTEgrated opeRation PLANning tool towards the pan-European network

Transforming Grid Operation Planning

The key results of implementing use case 7 control functions:

Comparative analysis of multiple KPIs for each contingency before and after applying control strategy for radial grid:

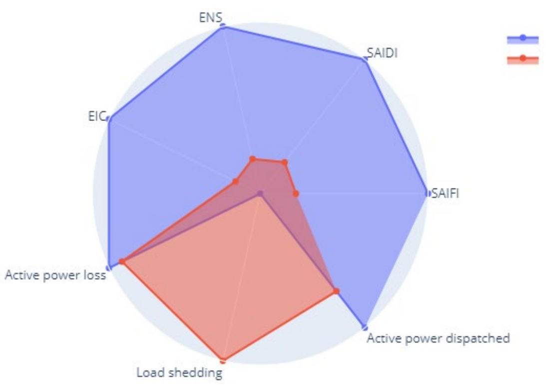
- This diagram presents the comparative analysis of multiple KPIs before (blue curve) and after (red curve) activation of control functions in radial configuration.



- It can be noticed that reliability indices have reported considerable improvement at the expense of the load shedding and increased dispatch of active power from DGs. The KPIs are averaged over all contingencies and normalized along each axis separately.

Comparative analysis of multiple KPIs for each contingency before and after applying control strategy for meshed configuration:

- This diagram presents the comparative analysis of multiple KPIs before (blue curve) and after (red curve) activation of control functions in meshed configuration.



- It can be noticed that reliability indices have reported considerable improvement at the expense of the load shedding and increased dispatch of active power from DGs. The KPIs are averaged over all contingencies and normalized along each axis separately.

Use case developer: Sohail Khan (sohail.khan@ait.ac.at), Sawsan Henein (sawsan.henein@ait.ac.at)

INTERPLAN Tool Use Case 7:

Optimal Energy Interruption Management

Project duration

1 November 2017 - 31 January 2021

Contact

interplan-project.eu

Giorgio Graditi (Project Coordinator)
giorgio.graditi@enea.it

contact@interplan-project.eu

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 773708