Innovation type:
Methods and tools

TRL: 6

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Target group:

Actor/ purpose	x
DSO, TSO	x
Technology provider	x
Member organisation	
Market operator	
Research/ Consultancy	X
Teaching	X

The network and component structure of the tool including a simple dependency relation between them.

Simulation tool for reliability assessment of modern distribution systems - RELSAD

A tool is developed for assessing reliability of distribution systems considering the active participation of distributed generation, flexible resources, and ICT components.

Challenge

With increased penetration of renewable energy resources, flexible resources, and ICT components in the distribution system, the power system will experience a changed behavior. The traditional reliability assessment methodology does not fully comprehend the increased complexity in the system and does not account for the structural and time dependencies brought by, for example, renewable energy resources and ICT in the system. With the increased penetration of renewable energy sources with power that vary over time, analyzing the power system under varying conditions is important for the reliability of the system.
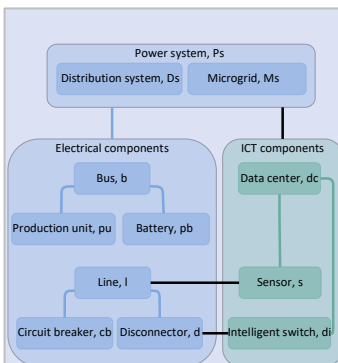
Solution

- A Monte Carlo based tool package supporting user-chosen increment steps is developed in Python for calculating reliability in distribution systems.
- Implementation of active components such as distributed generation, batteries, microgrids, and electrical vehicles with the possibilities for vehicle-to-grid services is included.
- The different layers of cyber-physical systems are modelled (power and ICT), as well as dependencies between them.
- The extensive reliability analysis foundation, implementing important and new reliability indices, aims to give a complete picture of the reliability for both networks and components in the system.

Potential

- The tool represents a foundation for calculating and evaluating the reliability of modern distribution systems.
- Supports reliability analysis of cyber-physical distribution systems with active generation units.

Reference in CINELDI

S.F. Myhre, O.B. Fosso, P.E. Heegaard, O. Gjerde: "RELSAD: A Python package for reliability assessment of modern distribution systems", Journal of Open Source Software (JOSS) , 2022.