CINELDI

Centre for intelligent electricity distribution
- to empower the future Smart Grid

Norwegian Centre for Environment-friendly Energy Research

Innovation type:
Software tool

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

Illustrations

Screenshot from GitHub

Example of application: CINELDI security of supply case for the CINELDI MV reference system

Open-source code for reliability of supply analysis in distribution grids

RelDist.jl, an open-source Julia code for reliability analysis of radially operated distribution grids that takes into account backup feeders, self-healing functionality, batteries in the grid and non-firm grid connection agreements.

Challenge

New methods for reliability analysis are needed to estimate how reliability of supply is affected by new measures such as flexibility resources and flexible use of the grid topology. Methods based on Monte Carlo simulations can be used to capture new measures in a detailed manner but are very computationally expensive for realistic cases.

Solution

RelDist.jl is an open-source code package for distribution grid reliability analysis. It is a Julia code implementation of the analytical RELRAD methodology for reliability analysis of radially operated distribution grids that has been extended to account for self-healing functionality (flexible use of grid reconfiguration in operation), the grid reserve capacity of backup feeders, and flexibility resources (reserves in the form of batteries and loads with non-firm grid connection agreements). The code can be used to calculate several reliability indices on an end-user or distribution system level: expected frequency and duration of interruptions, unavailability, expected energy not supplied, and expected interruption costs (i.e., costs of energy not supplied). Since it is based on an analytical method (RELRAD) and implemented in Julia code, the reliability analysis code is very fast.
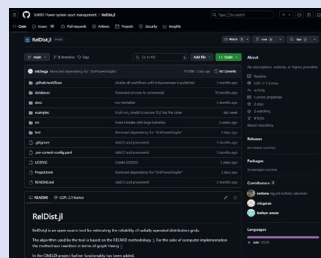
Potential

In the common case study on security of electricity supply carried out in CINELDI, the code has been used to demonstrate the potential of new measures to manage reliability of supply. The open-source code can be used freely under a GNU LGPL license, or the methodology can be reimplemented in commercial software tools. It is therefore considered to have significant innovation potential also in the short term.
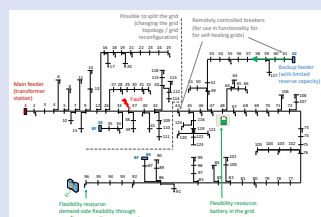
Reference in CINELDI

The code has been made available to the public on GitHub through the following link:
https://github.com/SINTEF-Power-system-asset-management/RelDist.jl