Plan Overview

A Data Management Plan created using DMPTool

DMP ID: https://doi.org/10.48321/D18P6M

Title: Multi-level optimization applied to distribution systems planning including non-utility-owned distributed energy resources

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Template: Digital Curation Centre

Project abstract:

Distribution systems are being restructured, modified, and adapted to operate in the smart grid environment, allowing the integration of distributed energy resources such as distributed renewable generation, energy storage systems, electric vehicle charging stations, and so on. These technologies provide several operational and environmental benefits to distribution networks, but they also present several challenges that must be addressed carefully in order to avoid system operational issues, which can vary depending on the location, size, and type of distributed energy resource installed. Furthermore, the installation of these resources in the network allows the emergence of new agents in the energy market, which may have different objectives and/or conflict with the concessionaire's objectives, making proper planning of the size and location of these resources difficult. As a result, utilities require specialized tools to assist them in making decisions in the face of these new challenges. The current research project proposes to use bi-level optimization to address the problem of distribution system planning that includes distributed energy resources that are not owned by the utility. The bi-level optimization allows to hierarchically model problems involving multiple agents and finds a balanced solution that optimizes each agent's objectives. Thus, the objectives of the utility will be considered at the upper level, while the objectives of the owners of distributed energy resources will be considered at the lower level. To represent the planning problem, mathematical optimization models will be developed to be solved using commercial solvers, as well as variable neighborhood search metaheuristics. Furthermore, the formulation of the problem will be expanded to account for the uncertainties associated with the planning problem. The proposed methods will be used to solve systems with varying degrees of complexity from the literature, and the results will be compared to existing methods.

Start date: 01-01-2023

End date: 12-31-2024

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Copyright information:

Multi-level optimization applied to distribution systems planning including non-utility-owned distributed energy resources

1. Data of test systems (distribution networks, renewable distributed energy resources, cost and parameters of expansion alternatives).
2. Result of analyzed case studies (cost values, electrical variables, operation settings for batteries and distributed energy resources).

The data for the test systems will be based on IEEE test networks and microgrids from specialized literature.

Algorithms for the generation of stochastic parameters such as fault duration and occurrence, demand, solar irradiation, will be developed to produce operation scenarios.

The generated information will be stored as text and CSV files .

The files with the data will be available along with a README file explaining the several fields.

There are no ethical issues related to the research.

Although there is no restriction on the data, the source must be referenced when used for research purposes.

Repositories such ResearchGate and GitHub will be used to share the data once it is produced and before the submission of papers to journals. Submitted versions of manuscripts will be deposited in ResearchGate, while data of case studies and programming codes will be uploaded to GitHub.

There are no risk securities since the data is public.

All the data will have long-term (test systems and results of simulations) and will be shared before the submission of papers to journals.

The data will be shared, using ResearchGate, in a permanent way before the submission of papers to journals or at the end of the research.

The data will be shared via a repository (manuscript with ResearchGate and codes and data with GitHub).

There are no restrictions on the sharing since the information of the test systems will be adapted from standard IEEE test systems.

John Fredy Franco will be responsible for the data management.

There is no need for additional specialized software or hardware. The institution (UNESP) provides the computational/information infrastructure for data management.

The repositories are free, so there will not be any kind of fees.
