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Sustainable Data Evolution Technology (SDET) for Power Grid Optimization

Henry Huang, Pacific Northwest National Laboratory (PNNL)

Partners: National Rural Electric Cooperative Association (NRECA), GE Grid Solutions, PJM Interconnection, AVISTA Utilities, California Independent System Operator (CAISO)

CRITICAL NEED

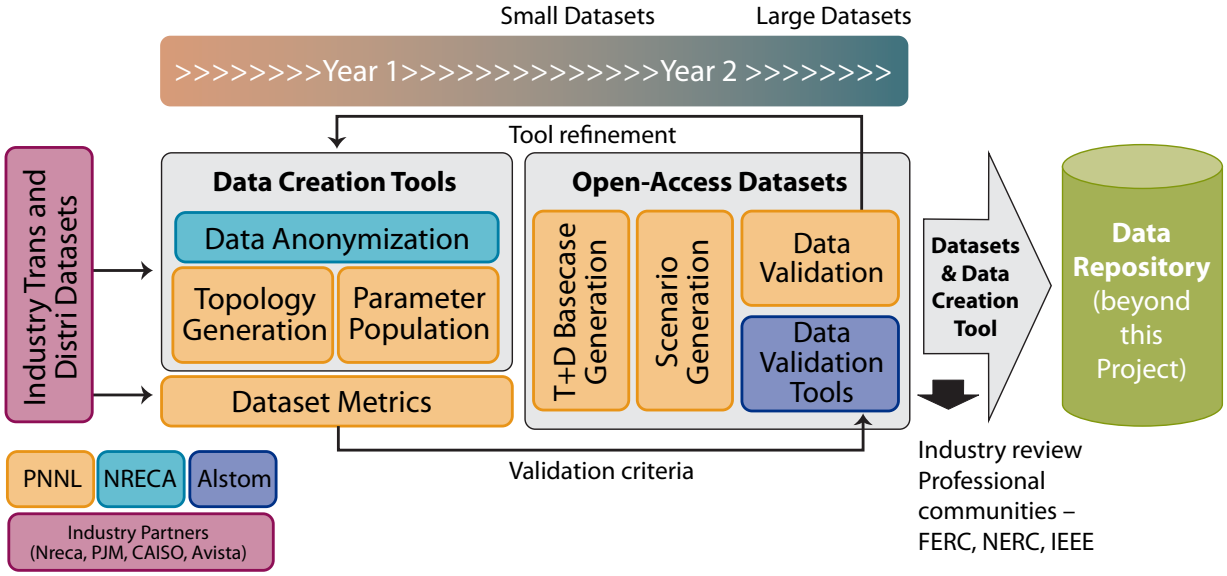
The power grid has become increasingly complex over time. Demand for electricity keeps changing, and the grid now requires more efficient optimization methods for short-term operation, long-term planning, and disaster restoration. Power generation must constantly be adjusted to meet those demands. Optimal power flow is used to make such adjustments.

However, the optimization methods used in today's power grid tools are mostly decades old, and there is a lack of realistic, open-access datasets. This limits the ability of researchers to develop, benchmark and compare new methods and tools for optimizing the operation and planning of the grid, which leads to slow adoption by end-users.

The open-access datasets that do exist are either incomplete, static and not keeping up with grid needs, missing real-world details needed to test for actual applications, or too small. Specifically, test systems are too small to test optimization algorithms for solving large-scale problems within required timeframes. For example, OPF problems need to be solved every five minutes to be consistent with five-minute resolutions of real-time markets.

OUR SOLUTION

Pacific Northwest National Laboratory (PNNL) has partnered with the National Rural Electric Cooperative Association (NRECA), GE Grid Solutions, PJM



Interconnection (PJM), Avista Utilities, and California Independent System Operator (CAISO) to drive innovation and industry adoption for power grid optimization. The six collaborators are working to develop a sustainable data evolution technology (SDET) tool.

The goal of SDET is to create open-access transmission and distribution power grid datasets, as well as data-creation tools that the grid community can use to create new datasets based on user requirements and changing grid complexity.

The SDET technology will deliver large-scale realistic datasets and data-creation tools capable of generating new datasets. The generated datasets and data creation tools will be compatible with, and available through, the GRID DATA program's data repository. The objective is for this to be a sustained effort within and beyond the ARPA-E GRID DATA program so that the datasets can evolve over time and meet the current and future needs for power grid optimization.

SDET technology is expected to fundamentally enhance the development, assessment, and adoption of new methods and tools for power grid optimization and other applications, which in turn would significantly improve the reliability, resiliency, and efficiency of the power grid.

APPROACH

The SDET approach will derive features and metrics from many private datasets provided by PNNL's industry partners. The SDET approach will:

1) Derive features and metrics for both transmission and distribution (T&D) systems by analyzing many public and private datasets provided by NRECA, GE Grid Solutions, PJM, CAISO, and Avista

2) Develop data-creation tools and use these tools to generate large-scale open-access realistic datasets that comply with the metrics for both T&D systems

3) Validate the created datasets using industry tools provided by GE Grid Solutions.

For additional information contact:

Henry Huang, Zhenyu.Huang@pnnl.gov

Ruisheng Diao, Ruisheng.Diao@pnnl.gov

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