

Scalability and replicability analysis in smart grid demonstration projects: lessons learned and future needs

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Abstract-

This paper compares various approaches to the scalability and replicability analysis (SRA) of smart grid pilot projects, highlighting the need for a comprehensive SRA methodology as called for by the European Commission and International Energy Agency. This study addresses the need for a standardized SRA methodology and explores how three EU-funded projects—Platone, EUniversal, and IElectrix—adapted the general guidelines developed by the BRIDGE initiative. These guidelines provide recommendations for developing a comprehensive large-scale deployment analysis. The results show that while the guidelines are usable and flexible, project-specific conditions and data availability limitations—particularly in regulatory and technical analysis—can pose challenges. Some key recommendations to overcome these and facilitate future applications are identified. These include defining SRA methodologies and securing data-sharing agreements early. The lack of standardized approaches for presenting SRA results hampers cross-project comparison. Thus, creating an open-use case repository and updating the BRIDGE guidelines with more detailed examples, benchmarks, and reference networks is recommended. Additionally, linking SRA with cost–benefit analysis (CBA) is suggested in order to evaluate the commercial viability of smart grid solutions. The paper concludes that while the BRIDGE guidelines have proven to be fit for purpose, further developments are needed to facilitate their practical application in real-world projects.

Index Terms- scalability and replicability analysis; smart grid projects; congestion management; distribution grid flexibility

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