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Towards Dynamic and Adaptive Distribution Network Tariffs

Panagiotis Andrianesis, Vasileios Cheimonidis, Alexandre Manzo de Zuniga
Mines Paris - PSL, Sophia Antipolis, France

Extended Abstract

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Abstract Summary

The estimation of Distribution Locational Marginal Costs (DLMCs), i.e., the marginal costs for serving real and reactive power demand at a certain time and location, can serve as a means for efficient coordination of distributed energy resources in active distribution networks. DLMC computation can benefit from the computation of voltage and current sensitivities with respect to nodal real and reactive net demand, yet detailed network models are often unavailable in practice. We derive a parameterized formulation of these sensitivities that explicitly captures their dependence on net demand, based on a radial distribution network model (LinDistFlow). Building on this formulation, we propose an optimization based approach that learns network parameters and bias terms from measurement data or high fidelity power flow outputs. Numerical results on standard test feeders, and on an actual distribution feeder demonstrate the effectiveness of our data-driven approach and its potential to support dynamic and adaptive distribution network tariffs.

Presenting Author Biography

Panagiotis Andrianesis is an Associate Professor at Mines Paris, PSL University, France. He is a Graduate of the Hellenic Army Academy, holding a B.Sc. degree in economics (National and Kapodistrian University of Athens), a Diploma in electrical and computer engineering (National Technical University of Athens), M.Sc. and Ph.D. degrees (University of Thessaly). He has held positions at Boston University (Research Associate Professor), Technical University of Denmark (Assistant Professor), ECCO International (Research Associate). His research interests include power system analysis, optimization and economics. He is the recipient of the 2010 IEEE APS Pre-Doctoral Research Award and the 2024 ERC Starting Grant.