

Evaluation methodology for tariff design under escalating penetrations of Distributed Energy Resources

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Abstract-

As the penetration of distributed energy resources (DERs) escalates in distribution networks, new network tariffs are needed to cope with this new situation. These tariffs should allocate network costs to users, promoting an efficient use of the distribution network. This paper proposes a methodology to evaluate and compare network tariff designs. Four design attributes are proposed for this aim: (i) network cost recovery; (ii) deferral of network reinforcements; (iii) efficient consumer response; (iv) recognition of side-effects on consumers. Through an analytical hierarchy process (AHP), the evaluation methodology is applied to compare traditional cost allocation methods, on the basis of 100% energy, 100% demand, and 50% energy-50% demand, with more advanced pricing methods based on distribution locational marginal prices in combination with cost-reflective network charges. Numerical results are obtained through a case study based on the IEEE 34-node test feeder with DER integration. The results illustrate the advantage of advanced pricing methods to promote an efficient integration of DER and demand price-response from consumers.

Index Terms- analytical hierarchy process; distributed energy resources; distribution locational marginal prices; distribution network tariff; peak-coincidence network charges

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