A Communication Architecture for Power Routing in the Smart Grid

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Abstract

One of the main benefits of the smart grid will be the introduction of Distributed Energy Resources (DERs) into the electricity grid at large scale. These DERs will be able to supply areas with electricity when isolated from the main power grid due to failure conditions or system/equipment failures. Although the integration of DER into the power grid makes the energy supply more reliable and reduces its cost, it creates new issues for distributed network operators (DNOs). While in traditional power grid the electricity usually flows from the central power stations to the consumers, in a modern power grid incremented with DER, the electricity follows in two directions as these new sources of energy are introduced at lower voltages. To introduce DER technology, DNOs will be faced with the challenge of making their distribution power networks more flexible and dynamic. Whilst in the past distribution networks were considered as static with no major control operation or re-configuration requirements, in the smart grid, distribution networks will be in constant change according the direction and amount of power flow. Power routing is an emerging concept that aims at making distribution networks more flexible and dynamic which will help address the technical challenges related to DER. Power routing is predicated on the information availability and coordination which requires a robust and scalable communication. In this paper we propose layered communication architecture that facilitates the implementation of power routing in distribution networks.