

Ancillary Service Provision from Distributed Energy Resources

PhD candidate: Mana Farrokhseresht

M.Farrokhseresht@tue.nl

TU / **e**

Technische Universiteit
Eindhoven
University of Technology

Where innovation starts

Motivation

Challenges

Significant integration of distributed energy resources (DER) in the distribution grid:

- Increases the uncertainty in the electrical system,
- Introduces new challenges to the DSO to operate the grid,
- Makes it difficult to maintain stability, reliability and supply /demand balance.

Solutions

- Increase the flexibility of the system by:
 - Reinforcing the grid → can be effective but is an expensive solution
 - Extracting the potential flexibility of DERs → less capital intensive but difficult to implement

Example

- Procuring ancillary services from DERs to mitigate grid problems (energy balance, over/under voltage, reverse flow, etc.) by exchanging energy locally over the distribution grid.
- Such approach may ultimately results in losses reduction and congestion management in the distribution grid.

Research objective

Research Hypothesis:

*“DERs can improve the operation of electricity grid by providing **Ancillary Services (AS)**”*

Research Objective:

Propose a simulation tool that enables ancillary services from DERs and ensures a stable and efficient operation of active (smart) grids and local energy markets

- We seek a short-term planning and operation methodology that provides an optimal energy balance in distribution grids with a high share of DERs.
- The planning and operation methodology to be developed, is based on a market framework which is constructed and next evaluated on actual Dutch grid and market data.
- The proposed methodology will be used to analyze all potential trade-offs in system costs and grid performance to aid DER-owners and DSOs in attaining mutual benefits.

**AS: Ancillary service means a service necessary for the operation of a transmission or distribution system (ENTSO-E).*





Research Question

What is an optimal design of a control-based market mechanism both at the local and at the system level that leads to economic efficiency and allows for :

- Integrating distributed energy resources in power systems and
- Meeting the requirements for various services such as ancillary services, local trading and balancing functionality, integration of RES and active distribution systems.