Innovation type:
Computer model

TRL: 3-5

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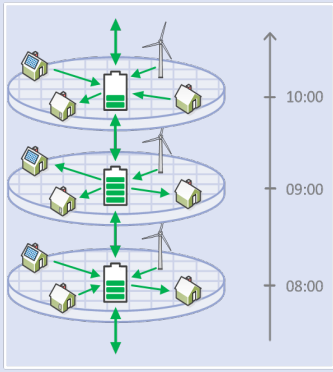
Target group:

Actor/ purpose	x
DSO, TSO	x
Technology provider	x
Member organisation	
Market operator	x
Research/ Consultancy	x
Teaching	x



The storage dispatch in one time step depends on the future vaule of stored energy

Energy Storage and RES Representation in Multi-Period Optimal Power Flow

The objective of this work has been to make sure that energy storage and renewables are taken into account in a realistic way in power flow analysis.

Challenge

The optimal operation of a distribution system with energy storage can be formulated as a multi-period optimal power flow (MPOPF). The challenge is to decide when to charge and discharge the storage, taking into account grid constraints and wind and PV uncertainties.

Solution

The method for storage valuation is inspired by optimization principles from hydropower scheduling ("water value method"). Including the energy storage model in MPOPF, together with stochastic wind and PV. The model has been successfully tested on test grids inspired by Norwegian conditions.

Potential

Relevant for DSOs facing new challenges in planning and operation of their grid, such as:

1. Increasing amounts of prosumers with PV and batteries. The grid operators must be able to predict their net load profile, and also give right price or control signals for activating use of flexibility for grid services.
2. Increasing amounts of medium-scaled distributed generation, such as smaller wind farms and solar PV farms. These can be located in areas where the grid is weak. Energy storage can be an alternative to grid reinforcements.

The method can be further extended to value energy storage in other forms than pure electricity storage, such as room heating, hot water tanks and electric vehicle charging.

Reference in CINELDI

- I. B. Sperstad, M. Korpås, Energy storage scheduling in distribution systems considering wind and photovoltaic generation uncertainties, Energies 12(7), 2019.