

Dynamic virtual power plant: a new concept for grid integration of renewable energy sources

B. Marinescu; O. Gomis Bellmunt; F. Dörfler; H. Schulte; L. Sigrist

Abstract-

The concept of Virtual Power Plant (VPP) has arisen over a decade ago from the relatively low competitiveness of the back then emerging non-dispatchable RES. A set of smaller generators imitates the behavior of large synchronous generators. So far, static aspects such as generation or slow dynamics have been of interest, as it is the case for the zonal secondary frequency control scheme in Spain, which can be viewed as a VPP. However, considering dynamic aspects is of high importance, especially to further increase the current penetration level of Renewable Energy Sources (RES). Indeed, one should deal with the full participation of RES in grid ancillary services. This means not only to get some positive impact on grid voltage and frequency dynamics but to bring concepts which allow integrating RES to existing secondary regulation schemes on the same level as classic synchronous generators. For that, we propose here a new concept called Dynamic VPP (DVPP) which fully integrates the dynamic aspects at all levels: locally (for each RES generator), globally (for grid ancillary services and interaction with other close-by elements of the grid) and economically (for internal optimal dispatch and participation in electricity markets). A DVPP is a set of dispatchable and non-dispatchable RES along with a set of common control and operation procedures. The latter procedures include the choice of dispatchable and non-dispatchable RES constituting the DVPP, the control of DVPP generators for local objectives and participation of the DVPP as a single unit in ancillary services (especially in case of loss of natural resources - e.g., wind, sun - on a part of the DVPP), the limitation of the risk of adversely interaction with close-by elements and the feasibility in both current power systems scenarios and future ones with large share of RES. This new DVPP framework and approaches developed for its implementation allows ensuring optimal operation of a mixed portfolio of dispatch...

Index Terms- Grid ancillary services, grid integration, renewables, virtual power plant.

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to IEEE Access, you can download the paper from the journal website:

[Access to the Journal website](#)

Citation:

Marinescu, B.; Gomis-Bellmunt, O.; Dörfler, F.; Schulte, H.; Sigrist, L. "Dynamic virtual power plant: a new concept for grid integration of renewable energy sources", IEEE Access, vol.10, pp.104980-104995, .