ELECTRA REX

A Researcher Exchange Programme for Smart Grids

European Liaison on Electricity Committed Towards long-term Research Activity Integrated Research Programme

MODELLING AND ANALYSIS OF THE EXTERNAL BEHAVIOUR OF A CELL IMPLEMENTING THE ELECTRA PROPOSED CONTROL

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The two main objectives of the activity were the implementation of a power systems model suitable for the ELECTRA use cases validation and investigation of specific aspects such as the behaviour of cells under the control concepts developed in ELECTRA.

For the first objective a simplified approach, in which DER are represented by equivalent current sources, was used. The target power system model used in the analysis was the CIGRE MV grid, based on Task Force C6.04.02, also adopted by the ELECTRA consortium as a reference system. In order to achieve optimal performance in terms of computational and time requirements the model was developed using purely Matlab/Simulink. Through the exchange the model was improved and validated by making some crucial assumptions, such as absence of inertia in all small-scale generators. In addition, based on the requirements posed by the research questions of the project consortium regarding the validation of stand-alone and combined use cases, the model was processed in order to represent a number of three cells at MV and one at HV level. As a result, the main achievement of the activity with regard to the implementation is a model suitable for simulating any stand-alone or combination of use cases while, the model can also be used for developing use case functions. Last but not least, the model can be used by the host organisation in order to assess the implementation of specific tests on their experimental microgrid.

Concerning the second objective the activity focused on the implementation of specific use cases, either in a simplified form (i.e. BRC) or by implementing the detailed aspects of it such as the adaptive FCC. Specifically, the latter function was implemented and tested in the short as well as long run by implementing 24-hour profiles for loads and RES production. Overall, the test results showed that the adaptive FCC control performs as planned by detecting the instantaneous imbalance state of cells correctly, reducing the total usage of FCC reserves and without compromising the overall system stability.

Exchange location-RSE premises

ACKNOWLEDGMENT

The research leading to these results has received funding from the European Union Seventh Framework Programme ([FP7/2007-2013] under grant agreement n°609687 (ELECTRA project), as part of the ELECTRA REX Researcher Exchange Programme.