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flexitranstore

An Integrated Platform for Increased FLEXibility in smart TRANSmision grids with
STORage Entities and large penetration of Renewable Energy Sources



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D10.4 Constructed and operational control platform for the ADN and WPP demonstrator, and documentation			
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Executive summary

1.1 Scope of deliverable

The project "An Integrated Platform for Increased FLEXibility in smart TRANSMission grids with STORage Entities and large penetration of Renewable Energy Sources" is defined with the aim of facilitating the contribution of renewable energy in providing electricity for Europe and to increase the flow of energy all over the continent.

This report presents the deliverable D10.4 in WP10, "Constructed and operational control platform for the active distribution node (ADN) and the WPP demonstrator, and documentation", which presents the implementation and programming of the concepts, methods, formulations, and simulations already described in previous Deliverables, D4.2 and D4.3.

This report is focused on programming the hardware of the hierarchical control structure and demonstrating practically how these controllers are functioning and how they are communicated to each other.

1.2 Concept and methodology

This report describes the construction and programming of the active substation control platform. This control platform is aimed to increase the flexibility and also to improve the stability in the power system around the active substation. In particular, this report presents the detailed development and deployment of the three-levels control hierarchical structure and the associated communication networks. Additionally, the experimental results obtained from the hardware-in-the-loop (HIL) testing lab developed in WP10 at LUA facility is also provided to validate the performance of the controllers as well as the effects of communication delays and failures.

1.3 Key activities

In Task 10.4 the HIL-Lab SCADA has already been selected and its specifications have been already defined. The specifications of the demonstrators SCADA should be defined for WP5 and WP6. Signal, parameters and commands are defined at the lab level. Procedures and state machines, as well as experiments to be defined in collaboration with operators.

1.4 Key results/Main findings

Main result of this task is the detailed description of the construction and programming of the hierarchical control platform used in the active distribution node (WP5's demonstrator) and the wind power plant substation (WP6's demonstrator). It includes details of implementation and coding for the 1st-level controller, the 2nd-level controller, and the 3rd level controller, along with their associated services.

1.5 Conclusions

In this report, we presented the specifications, data packet, and detailed implementation of the communication network that allows the interaction between controllers and measurement devices. We showed that various protocols are used to constitute such a communication network.

We also explained the configuration and programming of the 1st-level controller, including control algorithms and communication links.

The configuration and programming for the 2nd-level controller are also explained in depth that involves the implementation of the state machine, control task, and communications.

The configuration of the software packages utilized for implementing the 3rd-level controller and the connections with each other are explained and demonstrated. Finally, a time based executive working mode is provided where the scheduling for the desired service can be performed without the interference of the user for a specified time period.