sweet swiss energy research for the energy transition

PATHFNDR

Alternative fuels

Demonstrating the coordinated operation of the DESL smart grid demonstrator with EMPA Nest

Work package 3
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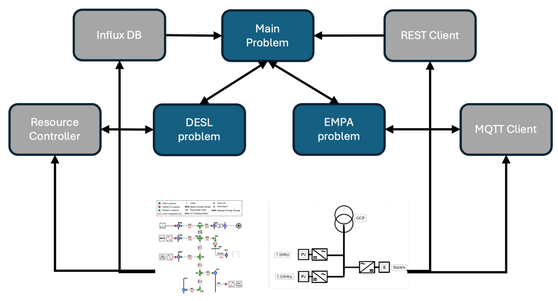
1 Goals: Demonstrating Coordinated Flexibility

- Demonstration of the simultaneous control of both demonstration sites, allowing to validate control algorithms or operation frameworks.
- Experimentally validate the developed scheduling and control algorithms.
- Show the feasibility and benefits of coordinating the operation of multiple distribution grids, with minimal information exchange.

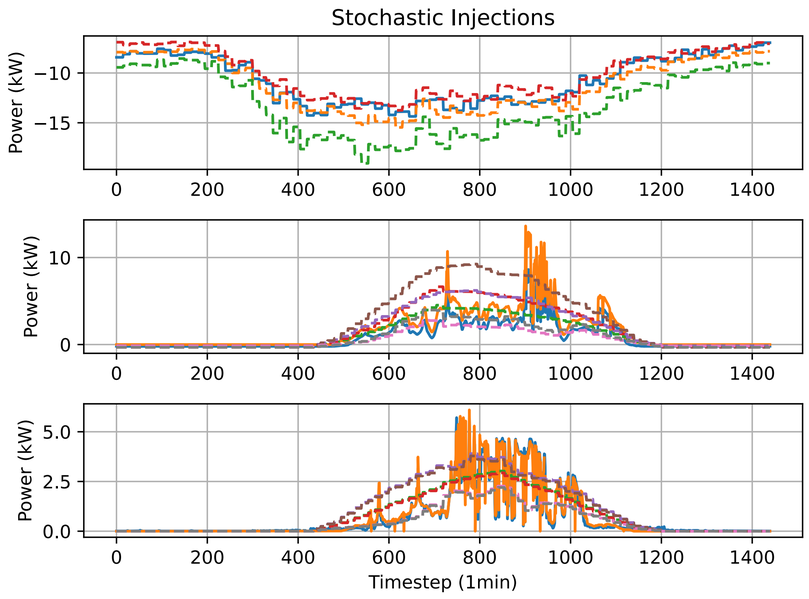
2 A Platform for Method Validation

- Both systems consist of stochastic presumption and controllable distributed energy resources (DERs)
- System states are continuously stored on servers.
- APIs allow to obtain most recent state.
- Optimizer makes informed decisions and sends setpoints to control clients.

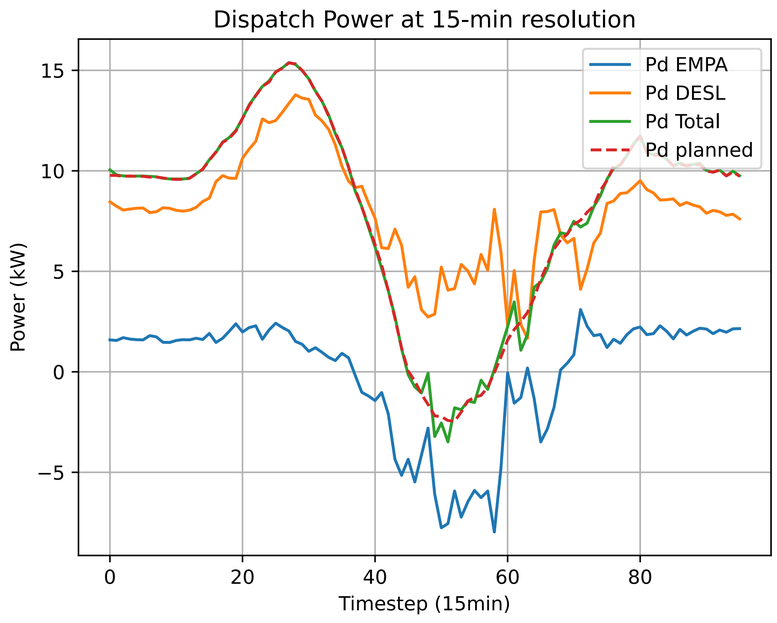


2 Distributed Microgrid Control

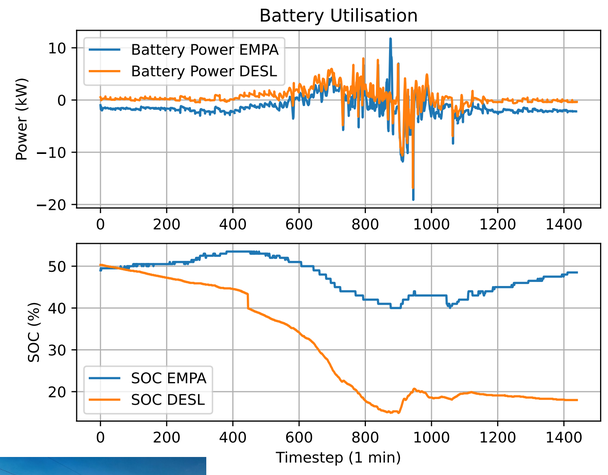
- Alternative direction method of multipliers (ADMM) allows coordination between multiple systems without sharing network topology or resource parameters.
- Day ahead: The different systems coordinate to find the dispatch plan that can be tracked with minimal error.
- Using GHI predictions from DWD consistent scenarios are obtained for multiple locations. A scenario-based optimization approach then allows to account for uncertainty of the prosumption in the day ahead stage.
- Intraday: A distributed multi-layer MPC determines the share of the dispatch plan allocated to each system and distributes the error compensation between the different systems and over the remaining time steps of the dispatching period.

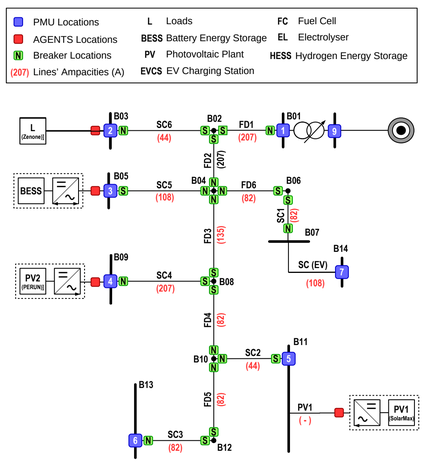


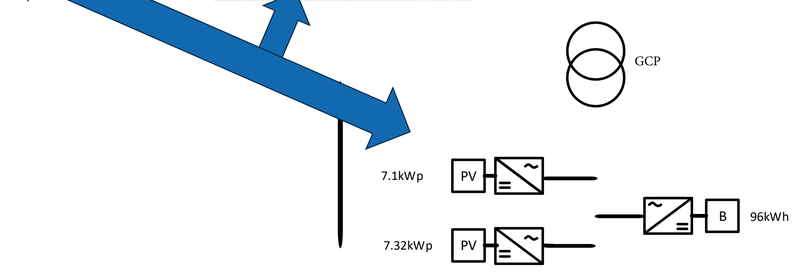
3 Accurate Aggregate Dispatch Tracking through Flexibility Sharing



- Dispatch plan (aggregate 15-min energy exchange) tracked with high fidelity.
- Both batteries contributing even when local variability is low.
- Geographical distribution reduces the volatility of the aggregate presumption.
- Coordination allows to utilize flexibility where it is needed most.







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ACKNOWLEDGMENTS

This work was performed by the PATHFNDR consortium, which is sponsored by the Swiss Federal Office of Energy's SWEET program.