



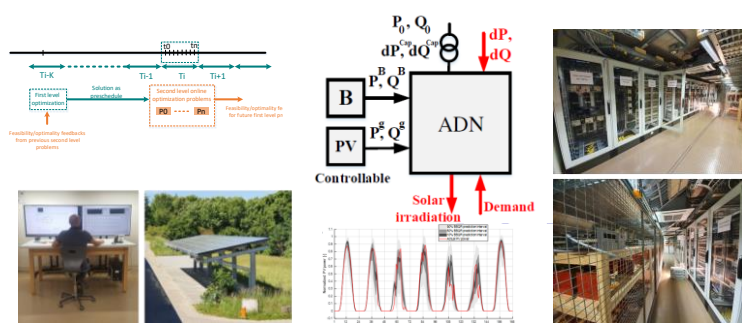
# DiGriFlex

## DiGriFlex

### Real-Time Distribution Grid Control and Flexibility Provision under Uncertainties

“ An innovative solution for integration of small-scale intermittent renewable energy sources into distribution power grids.

In this project, we propose and validate effective forecasting and optimal control algorithms to ensure efficient and secure operation of low voltage distribution grids, as well as flexibility provision from distribution grids toward upstream grids, under uncertainties. A two-levels rolling optimization framework to ensure optimal and secure operation of distribution grids under uncertainties will be developed and experimentally validated. The first level deals with pre-scheduling of controllable resources in a time ahead basis, whereas the second level deals with real time online scheduling of all the controllable resources. Moreover, an appropriate forecasting system will be developed to provide day-ahead and near real-time forecast of uncertain parameters, in accordance with the optimization framework. Finally, we validate the proposed methodology and demonstrate its effectiveness under realistic uncertainty sources (e.g., PV power generation), for a low voltage distribution grid.



#### Project Duration

01.09.2019 - 31.08.2021

#### Project Budget

Total Budget: € 434,830.-  
Funding: € 295,700.-

#### Project Coordinator

HEIG-VD (Switzerland)

#### Project Partners

- HEIG-VD/IESE (Switzerland)
- HEIA-FR (Switzerland)
- UNF II DIETI (Italy)
- UNP DI (Italy)
- EPFL (Switzerland)
- DEPsys SA (Switzerland)

#### Project Website

<http://iese.heig-vd.ch/projets/digriflex>

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ERA-Net Smart Energy Systems



This project has received funding in the framework of the joint programming initiative ERA-Net Smart Energy Systems. The initiative has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements no. 646039 and no. 755970.

#### ERA-Net Smart Energy Systems Joint Call 2018

This project has been awarded funding within the ERA-Net SES Joint Call 2018 for transnational research, development and demonstration projects. EUR 33.4 Mio of funding have been granted to 23 projects from 16 regions and countries.

## Main Objectives

The first objective of this research project is to develop effective forecasting and optimal control methods to ensure efficient and secure operation of distribution grids, as well as flexibility and ancillary service provision from local low voltage distribution grids to the upstream medium/high voltage grids, under uncertainties. The source of uncertainties varies from stochastic distributed power generation (e.g., solar power generation) and demand uncertainties to system model uncertainties (e.g., uncertain parameters of overhead lines and cables). Secure operation deals with satisfaction of technical constraints of distribution grids such as nodal voltage limits, power flow limits of lines/cables, and technical constraints of grid connected resources such as distributed generation and battery storage capacity limits. Efficient and optimal operation deals with both of the technical and economic objectives of local distribution operators such as minimization of voltage deviations and lines losses, maximization of ancillary service provision to upstream medium and high voltage grids, and minimization of real-time imbalances with respect to predefined schedules.

The second objective of the project is to implement the above forecasting and optimal control methods in a test case low voltage distribution grid, and demonstrate the effectiveness of the developed methods for different grid operation scenarios.

## Expected Main Results

- A two-level optimization framework including prescheduling and online controlling of resources in a distribution grids with respect to uncertain parameters.
- A forecasting system that suits the day-ahead and the real-time forecasting.
- Validation tests in fully reconfigurable distribution grid lab environment.
- Assessment of potential ancillary service provision from distribution grids with respect to market and regulation frameworks.

## Joint Programming for Flourishing Innovation from Local and Regional Trials towards a Transnational Knowledge Community

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