

SNOOPI

Smart Network Control with Coordinated PV Infeed



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Project Team



Project Team:

- Energynautics GmbH, Germany
 - Developing simulation models and regulation algorithms
 - Project management
- KTH Royal Institute of Technology, Sweden
 - Developing voltage regulation algorithms
- EWR Netz GmbH, Germany
 - Providing grid and metering data
 - Purchasing battery systems from Fronius



Project Supporter:

- Fronius International GmbH, Austria
 - Assisting with communications



Energynautics: Areas of Activity



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Energynautics: Company Structure



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Clients



Project Background (I)

Project-Timetable

- Start: 01.10.2015
- Final Report: 30.09.2018

Motivation

- High amount of photovoltaics increase voltage instabilities in the distribution grid
- Voltage problems should not limit amount of installed PV plants
- Find a solution to install more PV in the low voltage grid while avoiding voltage instabilities and overloadings

Project Background (II)

Solution

- Battery Systems
 - EWR will purchase battery systems from Fronius that will be integrated into the low voltage grid
 - These battery systems will help keeping the voltage in its limits controlling the battery system inverter
- Voltage Regulation Tool
 - This tool will know the current voltage state and the grid topology
 - The regulation mechanism will interact with the battery systems and other controllable devices such as tap-changers in substations



Inverter by Fronius

Project Background (III)

Tasks

- Build simulation models of network areas including battery systems and PV infeed
- Collect high resolution voltage data with Phasor Measurement Units (PMUs) in selected field areas
- Develop and test reactive power regulation algorithm for battery systems in simulation models and field test areas

Project Phases



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Phase 1

- Identification of possible Field Test Areas
- Developing Simulation Models

Phase 2

- Developing Voltage Regulation Tool
- Field Test Plan

Phase 3

- Successful Tests of Regulation Tool in Simulation Model

Phase 4

- Successful Tests of Regulation Tool in Laboratory

Phase 5

- Selection of Field Test Areas
- Installation of Battery Systems

Phase 6

- Successful Tests of Regulation Tool in Field Test Areas

Time Chart



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	2015	2016				2017				2018		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Phase 1	Simulation Model											
Phase 2			Tool Development									
Phase 3				Tests in Simulation Model								
Phase 4					Lab-Tests							
Phase 5						Batteries						
Phase 6							Field Tests					

MV / LV Data from EWR

- Analysis
- Preselection of Grids by means of metered and analysed data

Simulation model

- PowerFactory model of MV-Feeder towards selected LV grid (including LV grid)

Preliminary Simulation

- Detect “Hot-Spots” for significant PMU installation location

Metering

- Installation of PMUs

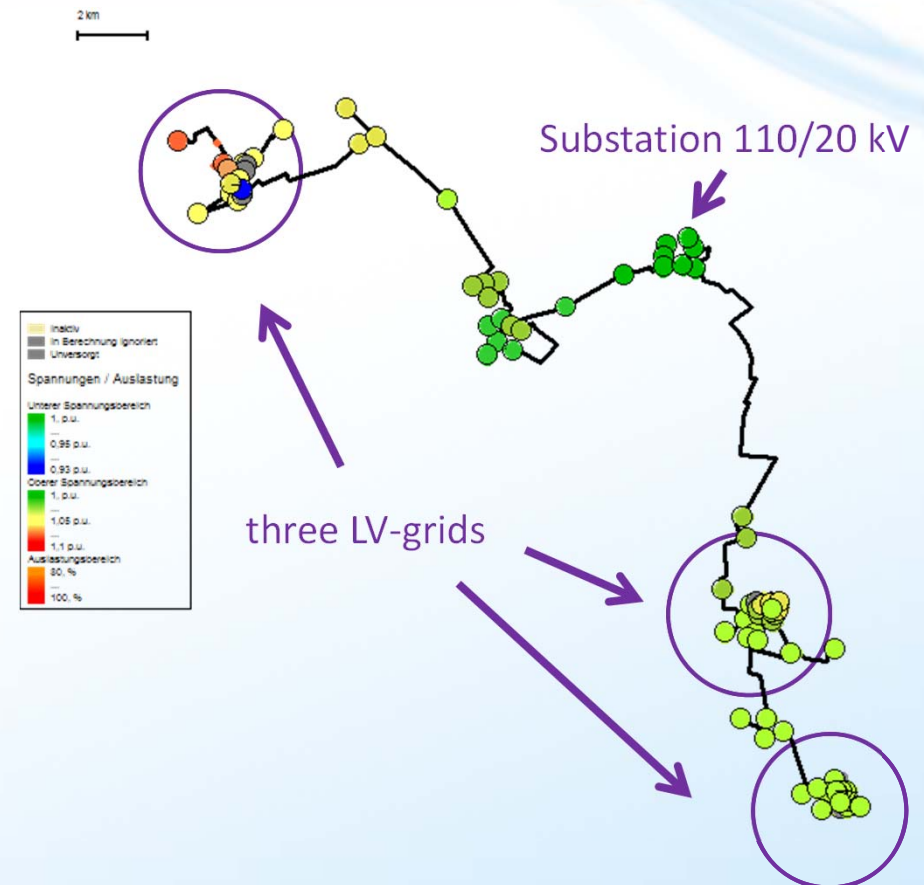
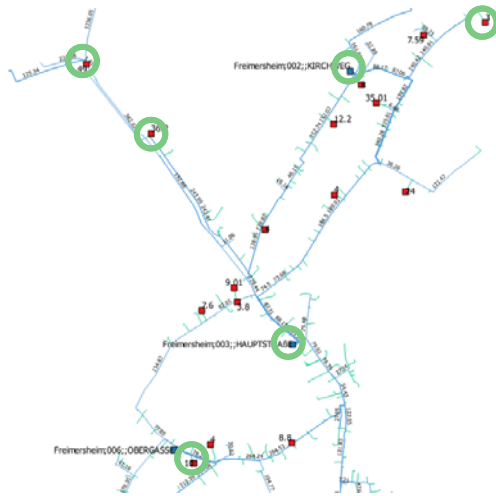


figure: simulation model of selected EWR MV/LV grid



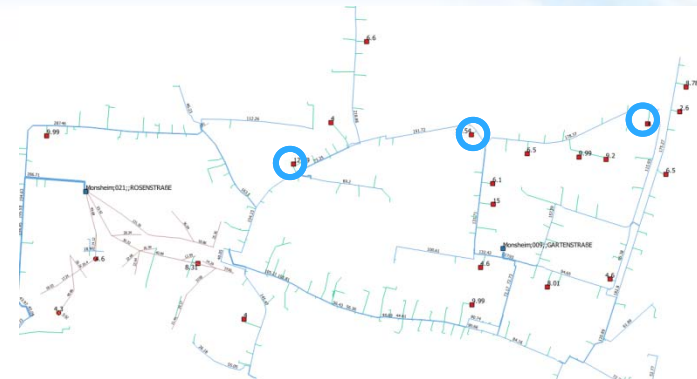
Three preselected LV Grids (EWR Grid)



Long feeder with high PV at the end (farm)

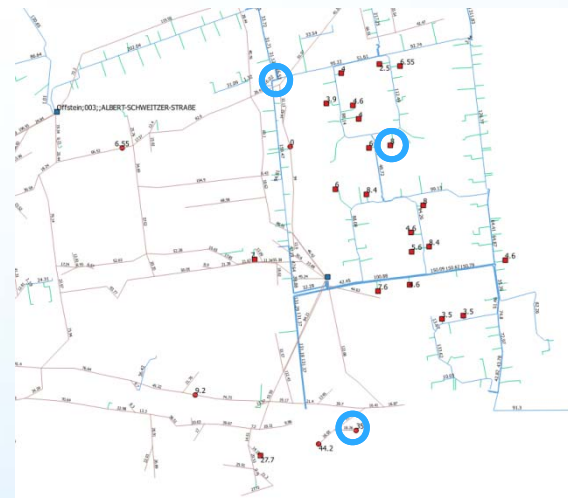
PV: 109.6 kW | load: 101.8 kW

- PV plant
- Metering EWR
- Metering Energynautics (PMUs)



Large amount of medium-sized PV plants

PV: 143.6 kW | load: 187.7 kW



Large amount of small PV plants

PV: 276.4 kW | load: 169.9 kW

j1

Vorsicht mit den Namen in den Bildern?

jdschmidt; 21.01.2016

Next Steps

- Validation of LV grid model
- Installation of Phasor-Measurement-Units at 4 locations
- Developing voltage regulation algorithms

Expected Results

- Battery systems path the way for more PV integration
- Placement of battery systems has high influence



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THANK YOU FOR YOUR ATTENTION!