An European urban transition project towards more sustainable cities through innovative solutions, in the fields of mobility, energy and digital.

Smart City

Global project

Coordination: Cartif
European grant: 18 M€
30 partners, 6 countries
Period: Dec. 2016 - Sept. 2022
Demonstrators: Nantes, Hamburg, Helsinki

@mySMARTLife_EU
https://mysmartlife.eu/

Hamburg demonstrator site

Coordination: Borough of Hamburg-Bergedorf
European grant: 5,25 M€
14 partners

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Energy

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ACTION OVERVIEW

HAW HAMBURG | CC4E

Large Scale Wind Turbines

This action is supervised by the University of Applied Science Hamburg (HAW). A full report (D 3.4), written in English in November 2019, is available at https://mysmartlife.eu/publications-media/public-deliverables/.

OBJECTIVES

› Broaden the understanding of specific issues relating to wind power production and plant operation
› Gathering knowledge for improved grid integration and electricity storage

IMPLEMENTATION

CHALLENGE

To achieve the climate goals, electricity production through renewable energies is necessary. In addition to the use of solar radiation through photovoltaic systems, wind energy is converted into electricity with the help of wind turbines.
The Curslack wind farm was commissioned near the project area in October 2018. Four of the wind turbines have a nominal capacity of 2.4 MW and one of 3 MW, so that the wind farm can provide 12.6 MW at nominal conditions. In addition, a battery storage system with a capacity of 792 kWh was installed at the wind farm. The storage was used to test various possible applications in terms of grid efficiency and marketing opportunities for fluctuating generation from renewable energies.
The realisation is a joint project of Vattenfall, Nordex Energy GmbH and the Competence Center for Renewable Energy and Energy Efficiency (CC4E) of the HAW and is part of the project “SINTEG NEW 4.0”.

PROGRESS

GPS rovers, which are used to determine the orientation of the nacelle, were installed on all wind turbines.
LiDAR (Light detection and ranging) systems were installed on two of the turbines to measure the horizontal wind speed. A SCADA (Supervisory control and data acquisition) system was set up and a stable data connection was created between the wind farm and the TEC (Turbine Exhaust Case).
Since the middle of January 2019, regular tests with the batteries have been made. To evaluate the operation of the batteries, a test was carried out on 08.08.2019. Among other things, the active power of all batteries before the low-voltage main distribution board and the state of charge (SoC) of a battery were measured. The interlock of grey electricity has been installed since the beginning of the use of the batteries, so that no grey electricity is drawn or upgraded. The charging release is controlled by a hysteresis between two limit values, which are based on the generation data of the wind farm and the measured values at the transformer station. Since January 2020, the control system has been modified so that the batteries can be discharged for the wind farm self-supply.

LESSONS LEARNT

- During the longer use of the batteries, it became clear that there is an increased need for a quick adjustment of the battery control. Therefore, a controller was implemented in November 2019. With this controller, data can be retrieved from the battery storage and previously calculated set values can be transferred to the battery. The data is stored in a database and displayed with a visualisation tool.
- By using the stored energy for the wind farm's own consumption, costs can theoretically be saved. The battery control system for optimal self-consumption coverage and primary control power provision still has to be designed.

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