STORY

The STORY continues: The added value storage can bring to flexible and secure energy networks, second year of work

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About STORY

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646426

General project information

- 18 institutions from 8 countries
- Coordinator: VTT
- Technical coordinator: Th!nk E
- Horizon 2020 (LCE-08-2014)
- Start: May 1st, 2015 (Duration: 60 months)
- Budget: 15,8 million Euro

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Project partners

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Objectives

Show the added value of storage in the distribution grid

- To **demonstrate** and evaluate **innovative approaches** for energy storage systems
- To find **solutions**, which are **affordable, secure** and ensure an **increased percentage of self-supply of electricity**
- To accelerate **innovation and business models** for deployment of storage at local level.

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Methodology

- Project demonstrations
  - Technology Readiness Level (TRL) 5 to 7
  - Interoperability
  - ICT
- Validate large scale models
- Understand impact (economic, environmental)
  - At demonstration level
  - At level of grid
- Create framework for viable business cases

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Project demonstrations

Overview

1. Residential building (Oud-Heverlee, Belgium)
2. Roll out of a neighbourhood (Oud-Heverlee, Belgium)
3. Storage in factory (Navarra, Spain)
4. Storage in residential district (Lecale, Northern Ireland)
5. Flexibility and robustness of medium scale storage unit in:
    1. Industrial area (Hagen, Germany and Kranj, Slovenia)
    2. Residential area (Suha, Slovenia)
6. Roll out of private multi-energy grid in industrial area (Olen, Belgium)

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Project demonstrations

1. Demonstration in residential building (Oud-Heverlee, Belgium)

Site contains 5 new and old buildings at the end of the electricity line

- Technologies (new or existing)
  - PV, PV-Thermal, vacuum collectors
  - Natural gas, oil, heat pumps
  - 2 electric vehicles
  - Load shifting
- Storage type (new)
  - Batteries
  - Small and large scale thermal water storage (low and high temperature)
  - Fuel cells
  - ICT at building level (interoperability)

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Project demonstrations

1. Demonstration in residential building (Oud-Heverlee, Belgium)

- Building 1
  - U < 0.1 W/m²K
  - LED
  - Smart 2-zone ventilation: continuous measuring of CO_2, T and humidity
  - Smart house hold appliances
  - KNX home control
  - Shallow geothermal
  - Electric vehicle
  - PV-Thermal and vacuum collectors
  - Hot water tanks / cooling basins
  - 2 batteries

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Project demonstrations

2. Demonstrating the roll out of a neighbourhood (Oud-Heverlee, Belgium)

Additional 7 buildings compose last part of the line with its specific challenges

- Buildings from demo 1 are connected, combined with another 7 buildings -> microgrid
- ICT will integrate operation of thermal storages, heat pumps, fuel cell, PV and batteries and optimize it at the neighborhood scale
- A hardware solution for black-outs will be implemented using the actual grid configuration

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Project demonstrations

3. Demonstration of storage in factory (Navarra, Spain)

Site is located in an industrial zone in Navarra.

- Existing situation
  - Facility produces professional fridge rooms and requires high power peak values (280 kW)
  - Installed 113 kWp PV does not deliver expected cost savings
- Objectives and technologies
  - 50 kW, 200 kWh Li-Ion battery will be added to improve the business case
  - Reduction of peak power
  - Demand side management

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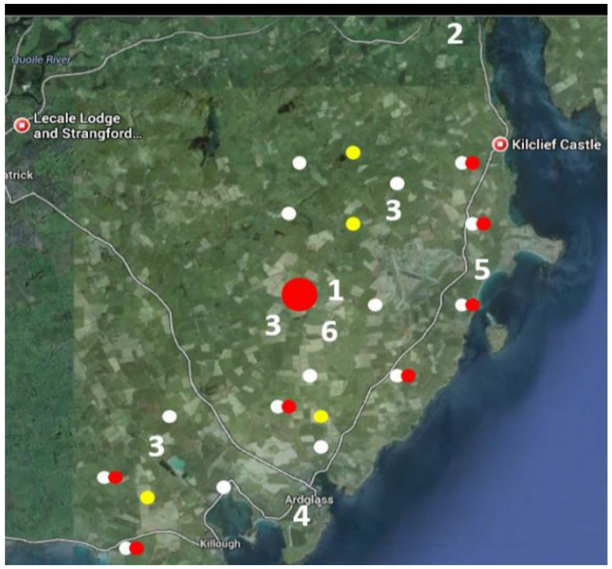
Project demonstrations

4. Demonstration of storage in residential district (Lecale, Northern Ireland)



Site is under development to become a complete self-sufficient, greener, cheaper energy grid for the 300 residential buildings

- Existing situation
  - 250 kW of PV installed
  - 2 x 2,5 MW onshore wind turbines
  - 500 kW anaerobic digestion unit
  - 1.2 MW tidal energy test
- Objectives and technologies
  - Extension with a large scale, medium voltage 250 kW and 2 MWh Compressed Air Energy Storage (CAES)
  - To increase security of supply

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Project demonstrations

5. Flexibility and robustness of medium scale storage unit (Germany/Slovenia)

First site is the Enersys factory, where the battery will be placed near the gas engine CHP unit

- Objectives and technologies
  - Flexible design of medium voltage battery: 800 kW, 660 kWh
  - This battery will be tested at 3 different locations
- First location: Hagen, Germany
  - Gas engine cogeneration (CHP) already installed
  - Test flexibility storage unit for peak shaving potential and support for optimization of CHP operation

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Project demonstrations

5. Flexibility and robustness of medium scale storage unit (Germany/Slovenia)

Second site is a village, where the battery will be installed at the Low Voltage (LV) substation

- Second location: Suha, Slovenia
  - 210 kW of PV already installed
  - Low Voltage (LV) network supplied by 400 kVA transformer
- Objectives
  - Demonstration of flexibility and robustness of the battery
- Demonstration starts in 2017

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Project demonstrations

5. Flexibility and robustness of medium scale storage unit (Germany/Slovenia)

Third site is the headquarters of distribution grid operator Elektro Gorensjka, near the Suha residential substation

- Third location: Kranj, Slovenia
  - 2 x 630 kVA transformer station
  - 35 kW PV
  - 27 kW CHP unit
  - 80 kW diesel generator
  - Cold storage (ice bank)
- Objectives
  - Integrated management of these devices with electric storage unit
  - High degree of self-sufficiency
  - Peak demand & voltage control

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Project demonstrations

6. Roll out of private multi-energy grid in industrial area (Olen, Belgium)

Site is located around a large wood product factory, which has a large amount of wood waste

- Existing situation
  - Old wood-fired boiler
- Objectives and technologies
  - New highly-efficient wood-fired boiler
  - Organic Rankine Cycle (ORC)
  - Large scale thermal energy storage (low and high temperature)
  - Multi-temperature district heating
  - To increase efficiency of ORC
  - To reduce power peaks
  - To increase self-sufficiency

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Result highlights from two first years

- Three demos in full action
- Control strategies
- Control algorithms
- Three-level ICT architecture
- Communication gateways
- Interoperability guidelines
- Common and demo specific KPIs
- Value analysis framework

- Main grid challenges to be addressed by storage solutions
- Large scale scenarios
- Large scale network models
- Large scale network modelling approach
- Business model archetypes
- Understanding of practical barriers for implementation

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Impact creation

- Proposing **policy and regulatory recommendations** that allow implementation of innovative technical solutions and business models for deployment of storage at local level
- Impact created by **involving full value chain of technology providers**: end users, investors, ICT and storage technology providers, as well as the Distribution System Operators (DSO)

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Impact creation

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Impact creation

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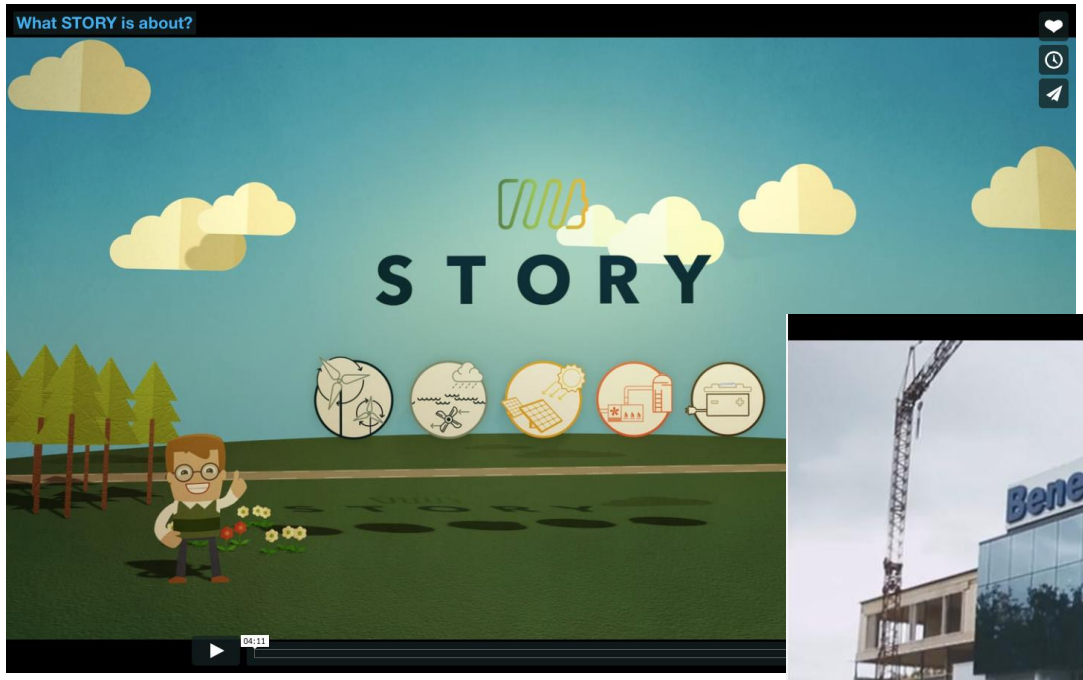

1) What STORY is about

2) Case study Beneens

….and more to come.

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Impact creation

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Project STORY - H2020-LCE-2014-3