



EU SUSTAINABLE ENERGY WEEK



BRIDGE Initiative

BATTERIES' ROLE IN ENERGY TRANSITION

Session#19

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Energy



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NETfficient

Storage for Life

AYESA Advanced Technologies:
Santiago Blanco / Fernando Usero

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NETfficient 1st video clip

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Smart energy storage
on Borkum island in
the North Sea &
Flexibility in
Distributed Energy
Resources
management and their
access to energy
markets



Through use cases such as homes, public buildings, and street lightning, NETFFICIENT follows a strong market orientation that reflects the various energy demand scenarios.



THE PROJECT

NETfficient:

Energy and economic efficiency for today's smart communities through integrated multi storage technologies

H2020 Grant: 8,99M€; Tot. Budget: 11,4M€

Team composed of 13 renowned research organizations, large enterprises, SMEs and municipalities out of 7 EU Member States



Engineering.
Information.
Imagination.



WILLIAMS



swerea|IVF



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Growth in energy assets behind-the-meter (such a photovoltaic panels – PVs and storage) – Challenges for energy sector

- ⚡ **Lack of control and real time visibility** over the distributed energy resources
- ⚡ **Many different generation and storage technologies** at end customer level
- ⚡ **Wide geographic distribution** and consequent maintenance costs
- ⚡ **Massive number of resources to be controlled** (potentially thousands), so **are not valid**
- ⚡ **Lack of ability to participate in electricity markets** with distributed energy resources

NETFFICIENT Objectives

- ✦ Develop and test, in a **real environment**, use cases of energy storage systems with high replicability
- ✦ Develop a central **Energy Monitoring System** to be used by the energy companies to manage the energy of their associates' storage devices.
- ✦ To look for **different business strategies** to allow an easier deployment of energy storage technologies in the electricity market.
- ✦ To **advance state-of-the-art storage** solutions.

Storage is an enabler for providing flexibility using behind-the-meter assets

TESTING STORAGE



USE CASES



1. Storage at Medium Voltage Station

Balancing out peaks of the energy demand and availability of renewable energy.



2. Homes: 40 homes fully equipped with PVs, together with smart meters and energy storages to self-consume solar energy and to benefit from energy markets



3. Public buildings:

Solar energy generation on building's rooftops, energy provisioning by locally stored renewable energy.



4. Public Lighting:

The energy supplied by the sun during the day will be used for lighting during the night.



5. Heating/Cooling of Aquarium Water:

Solar energy generation maintain the temperature of the aquarium as desired using thermal energy storage.

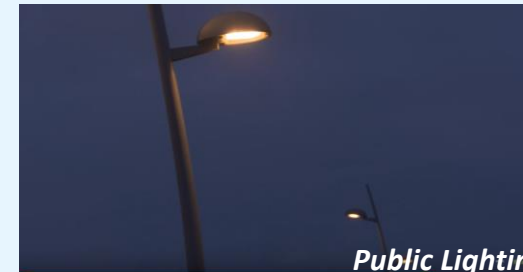
European Commission



Medium voltage station construction



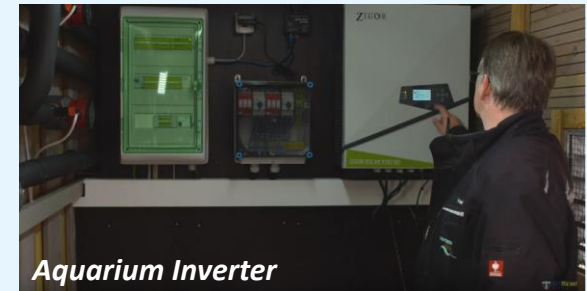
Tourist information center:



Public Lighting



House Solar panels



Aquarium Inverter

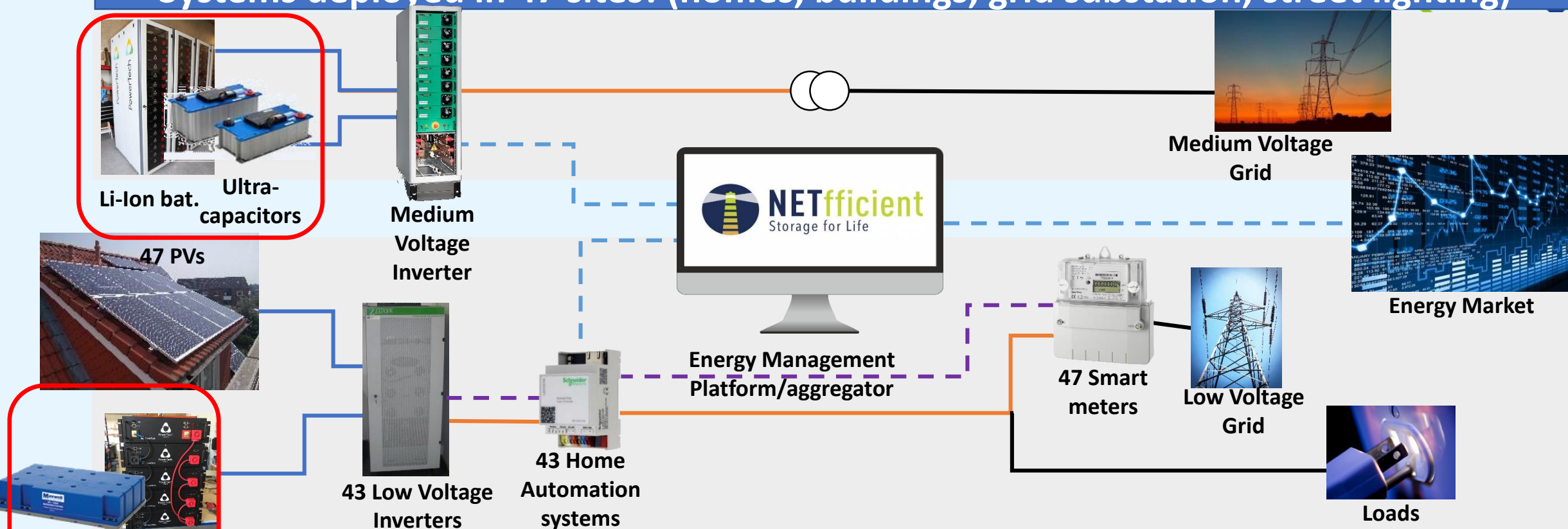
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Systems deployed in 47 sites! (homes, buildings, grid substation, street lighting)



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Li-Ion batteries at low voltage level

- ❖ **Involved Partners:** French company *PowerTech Systems*
- ❖ **Number of Devices:** 36
- ❖ **Battery Size:** *Energy 5 kWh ; Power 5 kW*
- ❖ **Battery Technology:** Li-Ion = *LiFePO4 (Lithium Iron Phosphate)*
- ❖ **Innovation achieved during the project:**
 - *Development of fully scalable system (from 2.5kWh to 1024kWh, up to 1000V DC)*
 - *Modular system for easy deployment and maintenance*
 - *Battery Management System Matrix : high modularity and scalability, which is unique for current storage market*



"Power Tech Systems"
Batteries

Low and Medium Voltage Hybrid Energy Storage System

❖ **Involved Partners:** Zigor: Inverter, ultracaps, Supercap & DC/DC Inverter; Powertech: Li-Ion Battery; Fraunhofer ISE: DC/AC Inverter & energy management system.

❖ **Number of Devices: 7**

❖ **Battery Size used at low voltage level (4 houses, 2 public buildings)**

Batteries: Energy 5 kWh ; Power 5 kW in combin. with Ultracaps (accept and deliver charge much faster than batteries, and tolerate many more cycles):

Homes – 5kW x 30 sec = 41 Wh

Public buildings: 2kW x 45sec = 250Wh

❖ **Battery Size used at Medium Voltage Level (MV substation)**

Li-Ion Batteries: 500 kWh 1000 kW in combin. with
Ultracap: 7 kWh 1000 kW



Supercaps for
Buildings



Medium Voltage Batteries



Low and Medium Voltage Hybrid Energy Storage System: Innovations achieved during the project:

- Low voltage Integration of PVs (dual maximum power point tracking), battery, ultracapacitors and inverter in a single device
- DC-coupled ultracapacitor storage for peak demand used in combination with batteries means:
 - ✓ Batteries can be smaller in physical size
 - ✓ Battery life is not shortened because it does not have to cope with peak demand



Experience with integration of 2nd life Electric Vehicle batteries at low voltage level (homes)

- ❖ **Involved Partners:** WAE
- ❖ **Battery Size:** Energy 24 kWh ; Power 2,5 kW
- ❖ **Battery technology:** Second life application using Nissan EV batteries
- ❖ **Number of Devices:** 2
- ❖ **The system monitors power generation & consumption by measuring:**
 - Power demand from the home/business (load)
 - Power produced by solar panels
 - Available capacity of the battery
- ❖ **This information generated can then be communicated via**
 - Internet connection to embedded PC
 - Remote Telematics system for GPS tracking and data collection

EV batteries, which are no longer powerfull enough for cars, can have a «new life» for storing energy at home or elsewhere!



Williams 2nd life Battery



Thank you for your attention!



Fernando Usero Fuentes
AYESA Advanced Technologies

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Distributed Energy Resource Management System



Distributed energy
resources



Distribution
Management
System

Integration & Management



Asset management



Distributed energy resource &
Smart meter Integration



Distribution
Management System
Integration

Monitorization & control



Alarms



Scheduler



Monitoriz.



Control

Algorithms y Analytics



Analytics



Forecasting

Market



Strategy &
Automated
bidding



DER Owner



Market

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Services and Systems

	Homes & Build. Aggr. Li	Homes & Build. Aggr. HESS	Homes Alone-Li	Homes Alone- HESS	Homes Alone-2 nd life EV bat	Home Alone- Hydrogen	Street Lighting	MV HESS	Aquarium
Self-consumption of locally produced energy			✓			✓			
Optimize local renewable energy use	✓						✓		
Sell energy back to the grid	✓								✓
Limit feed in power and load power	✓								
Extend Battery Lifetime/Power smoothing		✓		✓					
Enhanced Self-cons. of locally produced energy					✓				
Thermal energy storage									✓
Primary & Instantaneous reserve								✓	
Peak shaving								✓	
Participate in energy markets	✓	✓	✓	✓			✓	✓	



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