





Ayesa Grandes Cifras



ESA – Áreas de Actividad

QYESQ Engineering Information Imagination



AYESA

Engineering
Information
Imagination

Avesa Smart Life

🐼 Energía

left Movilidad

🐼 Agua

Seguridad

Cloud & IoT

Centro BigData



ect





H2020-LCE6 EU Funded 12,5 M€

NETfficient's Project



2015 to 2018

Coordinator: AYESA

13 partners from 7 European countries

OBJECTIVE: DER aggregation through storage solutions



enges						
Application in Power system age Functionalities	Transmission grid- central storage (national and European level)	Distribution grid storage (city level)	End-user Storage (household level)			
Balancing demand and supply	Seasonal / weekly fluctuations Large geographical unbalances Strong variability of wind and solar (electricity and gas storage need to be integrated)	Daily / hourly variations Peak shaving (electricity and heat/cold storage need to be integrated)	Daily variations (electricity and heat/cold stora need to be integrated)			
Grid Management	Voltage and frequency regulation Complement to classic power plants for peak generation Participate in balancing markets Cross-border trading	Voltage and frequency regulation Substitute existing ancillary services (at lower CO2) Participate in balancing markets	Aggregation of small storage systems providing grid services			
Energy Efficiency	Better efficiency of the global mix, with timeshift of off-peak into peak energy	Demand side management Interactions grid - end user	Local production and consump Behaviour change Increase value of PV and local wind Efficient buildings Integration with district heatin			

cept and approach artCity concept via use cases in 2 Voltage Levels



Medium Voltage Grid Li-lon Ultra-ΜV Storage for Life bat. capacitor Inverter PVs **Energy Market Energy Management** Smart Platform/ Aggregator Low Voltage meters Grid 1.986 43 Home Automation Low Voltage Marca. systems Loads Inverters

36 Li-Ion bat. Ultracapacitors

nonstration



Borkum: a little german island in the northern sea



cept and approach







Smart Energy Storage

Mini-Energy storage: HESS for windgeneration stabilization
Micro-Energy storage: batteries plus

supercapa, second life car batteries,



Communications Controlling SCADA Smart meters Global SmartCity KPIs dashboard

Smart Energy Management

New functionalities to Generation

Smart storage-generation monitoring



Smart Energy Generation

MV wind generationLV photovoltaic generation



Intelligent streetlights
Streetlights control system

Smart Lighting

Smart TIC





Smart Informed Customer

Showroom
Public KPIs dashboard
Movile apps



Smart Building

System

system

•Building Energy Management System •Active demand management

e cases



Peak Shaving:

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



Homes:

Fully equipped with energy generation units, smart meters and energy storages.



Buildings:

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



Public Lighting:

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



Heating/Cooling energy interchange (district/Aquarium Water):

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

e Case 1: peak shaving and ancillary services in the rket through Aggregator





Aggregator management:

- Peak-saving function
- Ancillary services market participation: frequency regulation
- Energy sell in market via aggregation of some energy storage systems



Medium Volto Batteries



Ultracapacitor



Load 1-jan 7000 -KW

MV Substation

case 2: Homes. PV & batteries. id-alone or managed by an Aggregator





40 houses different configurations of aggregated/stand PV + Li-Ion batteries + supercapacitors







5Kwh PV

5Kwh-5Kw Batteries

Stack

Ultracapa

2 hydrogen based Module Fuel Cell storage. Stack





case 3: buildings with PV and batteries





Managed by Aggregator

- 3 buildings with the following distribution: PV + inverter + Li-Ion battery + smart-meter
- 2 buildings with the following distribution: PV + inverter + HESS (Li-Ion battery+supercaps) + smart-meter
- Hydrogen Power Box



Supercaps for Buildings



Inverter

case 4: Street lighting with batteries





- The main elements of the system are
 - 50 lighting points connected to a controlling point. The spoints will change to LED.
 - Generation's System: solar panel
 - Storage's System: Li-Ion battery.
 - Control platform: monitoring of the production, storage consumption of the different lighting units
 - Smart-meter:
- In the control point it will be installed:
 - A PV system of 4 KW: a secured place where to install.
 - A Li-Ion battery of 15 KWh
 - An inverter
 - A smart-meter (GPRS)



case 5: Regulation in Aquarium water



One deposit: To be kept to 14°"

- If the sun is shining (PV-production)
 - If the temperature in the deposit is not ok, the cooling/heating unit will or heat up the deposit water.
 - o If the temperature in the deposit is ok, the PV-production will be fed to t
 - If the aquarium temperature is not ok, the deposit water will be used to temperature in the aquarium ok.
- If the sun is not shining (no PV-production)
 - If the deposit temperature is not ok, the unit will cool down or heat up the using electricity from the grid.
 - If the aquarium temperature is not ok, the deposits will be used to cool of heat up.





ystems





Systems rtgrid: DSO & Aggregator cooperation



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Systems: Ayesa DERMS ributed Energy Resource Management System



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Imaginatio

sa DERMS: typical use case for homes





sa DERMS: machine learning - forecasting





Market Prices Forecaster

(Day Ahead)

- Based on historical data of Day Ahead Market
- Identify trends and applies them to foresee market prices one day ahead



Consumption Forecaster (Customer)

- Forecaster is fed with information from prosumers Smart Meters
- Predicts prosumers next day consumption

Market Forecasting module (MFC)

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Allows DERMA to elaborate most accuracy offers based on DERs to bid on the Day Ahead Energy Market



DERMA DDBB

- Filled with data gathered from the sensors existing in the physical devices
- DDBB contains current state of ever power converter or storage system



PV Generation Forecaster

- Forecast algorithm feed with measures gathered from power converter
- Analyse previous behaviour and applies the acquired knowledge to foresee next day generation

sa DERMS: Markets



gy market	Energy trade	System enabling purchases, through bids to buy; sales, through offers to sell; and short-term trades, generally in the form of financial or obligation swaps		
ncillary ses market	Active Reserve / Frequency Control	Services to balance supply and demand in the event of a sudden and unexpected loss of generation unit or transmission line or an unexpected increase in demand	Frequency containment	e.g. primary control, availabl 5-30 seconds
			Frequency restoration	e.g. secondary control, availa in no more than 5 minutes
			Replacement of reserves	e.g. tertiary control, available usually more than 15 minut
	Restoration Services (Black Start Capability)	Services to go from shutdown to operating condition, and start delivering power without assistance from power system		
	Voltage / Reactive Power Control	Services to maintain a specific voltage level and to generate or absorb reactive power		

sa DERMS: EMP Services Portfolio



lectricity Wholesale Market



sa DERMS: EMP Service Life Cycle

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