

**RED**  
**ELÉCTRICA**  
DE ESPAÑA

*Grupo Red Eléctrica*

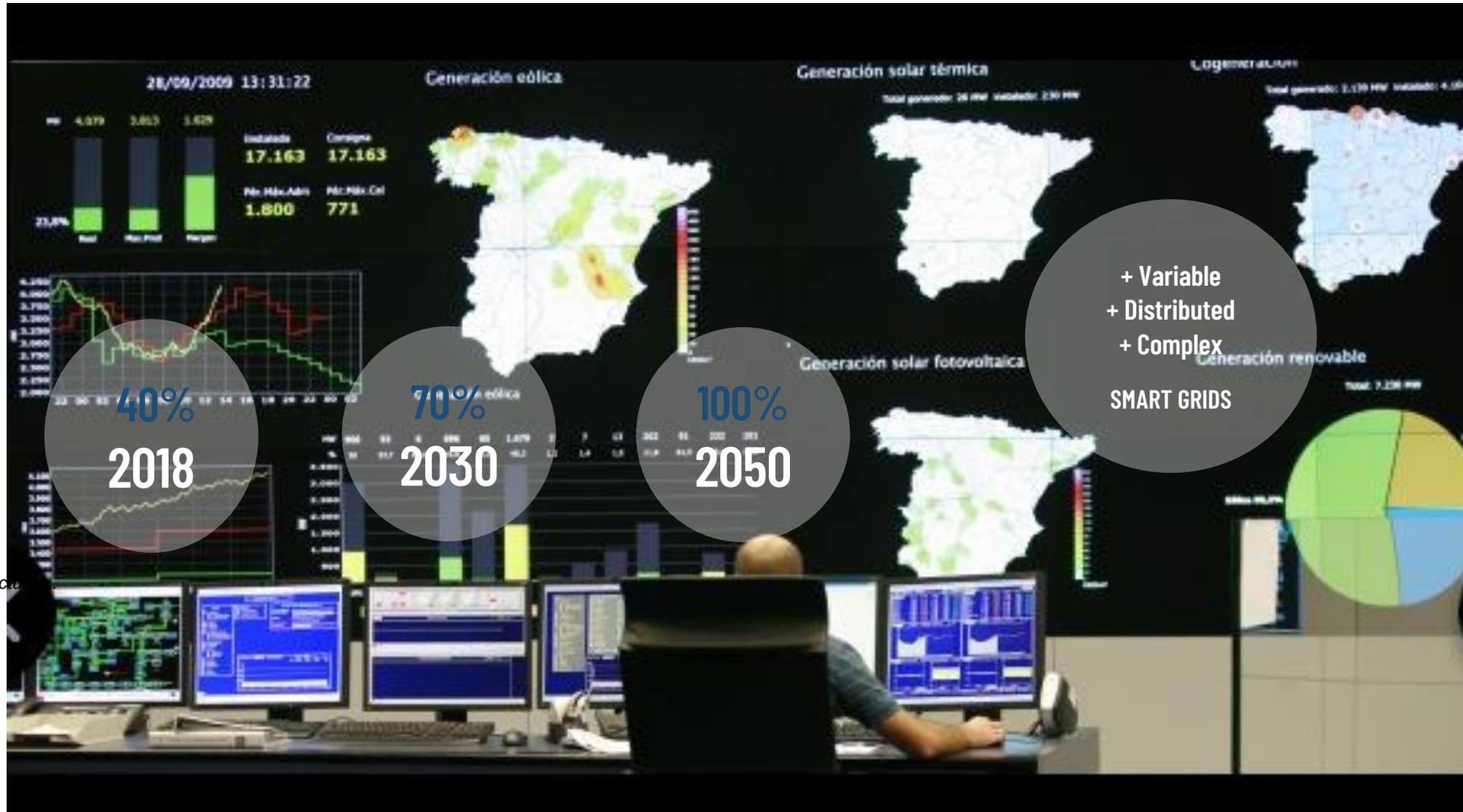
**Solutions to support RES  
integration**

**Storage Red Electrica experiences**

**Susana Bañares – Head of Demand Response and Smart Grid Department**

2019, October 29<sup>th</sup>

# Energy transition: New challenges



# Storage as a tool for the energy transition

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**1 Flexibility**  
Compensate  
variability

**2 Demand  
management**  
Shaping our  
demand curve

**3 Security**  
More reliability  
and quality

# REE experiences



**ALMACENA Project (Ion-Li)**  
Sevilla



**Fly wheel**  
Lanzarote



**Gorona del viento (Hydro pumping)**  
El Hierro



**Chira-Soria (Hydro pumping)**  
Gran Canarias



**OSMOSE Project (Hybrid)**  
Lanzarote + Fuerteventura



**ALISIOS Project (Ion-Li)**  
Tenerife



# ALMACENA Project

ALMACENA is an innovation project led by REE. ALMACENA Project consists of a 1MW, 3MWh Li-Ion grid battery system connected to the Spanish Transmission Grid in Carmona Substation (Sevilla) with the target to analyze challenges and features of electrochemical storage systems connected to the grid.

## Technology

1 MW Power converter with 1 MW, 3 MWh Li-Ion modular battery

## Location

Carmona 220/400 kV substation (Sevilla).

## Functionalities

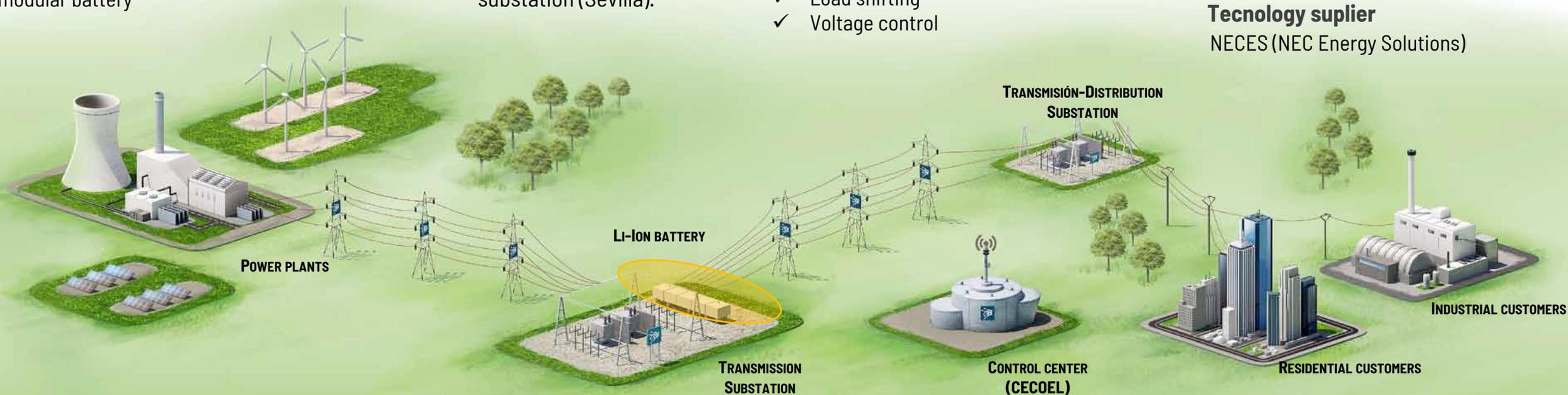
- ✓ Power-frequency control
- ✓ Load shifting
- ✓ Voltage control

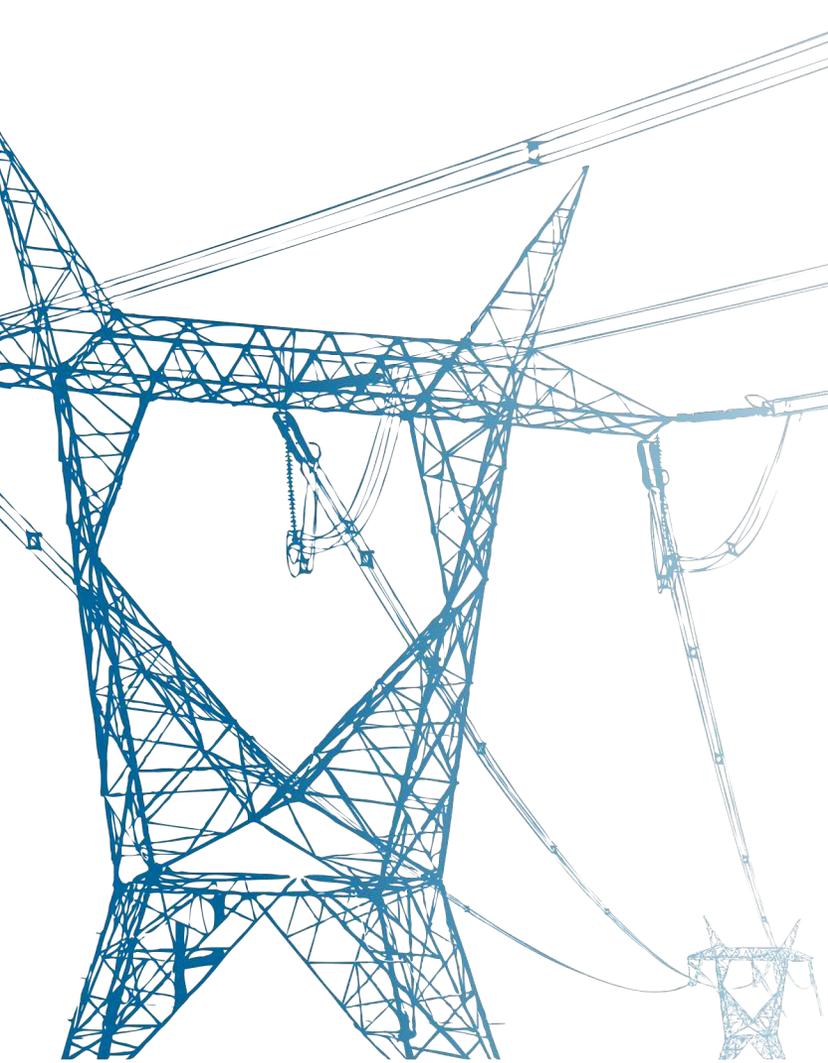
## Comissioning

By the end of 2013.

## Tecnology supplier

NECES (NEC Energy Solutions)





## REE experience in isolated systems

# Canary Islands

Isolated systems are quite difficult to manage in some inbalancing situations that can affect to electricity supply



**Current fossil fuels based generation but high potential for Wind and Photovoltaic**

System Operation challenges:

- ✓ Frequency stability
- ✓ Primary resource variability
- ✓ Reduction in system inertia
- ✓ Surplus of renewable production

**High scale storage is part of the solution**

1

**Isolated systems, weak and no meshed**

Systems difficult to interconnect because of Atlantic waters deep

2

**Size of systems**

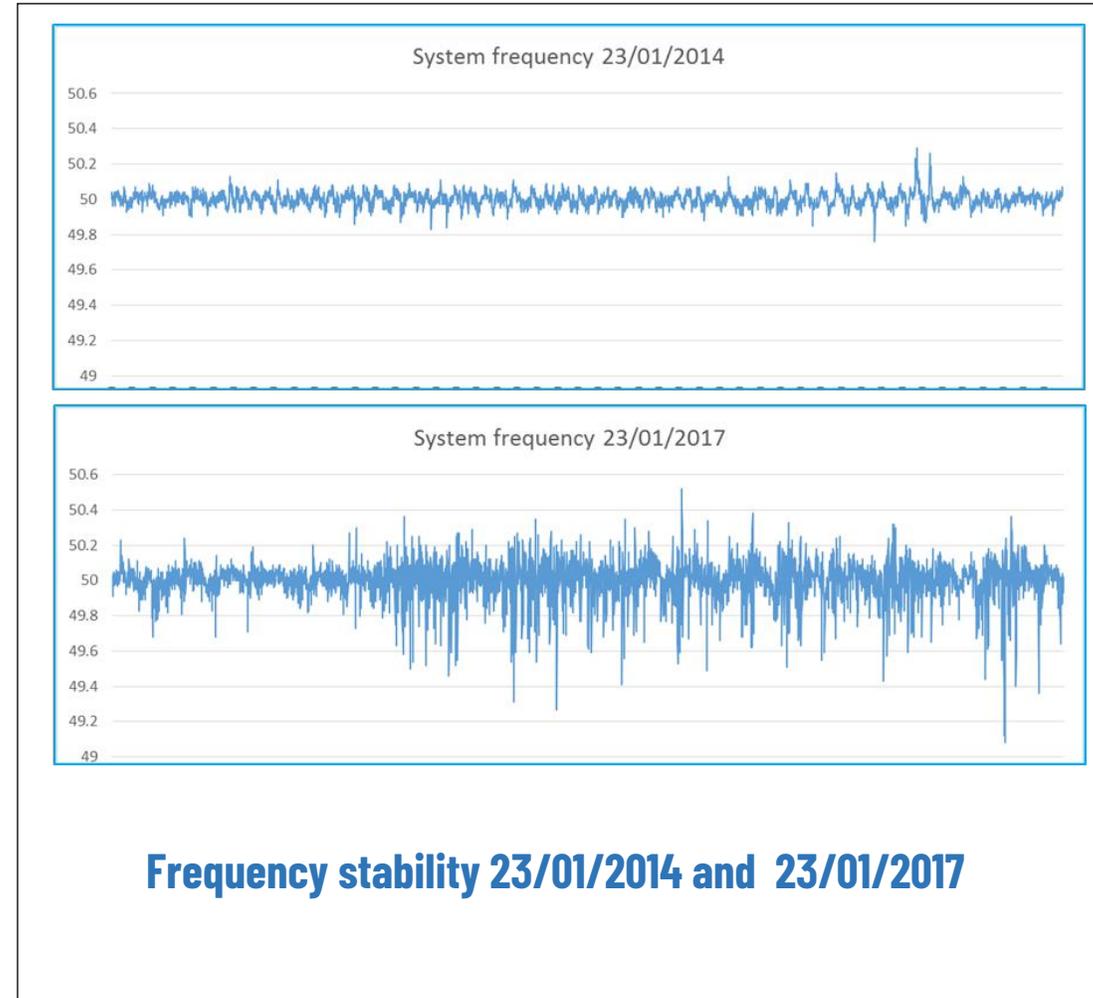
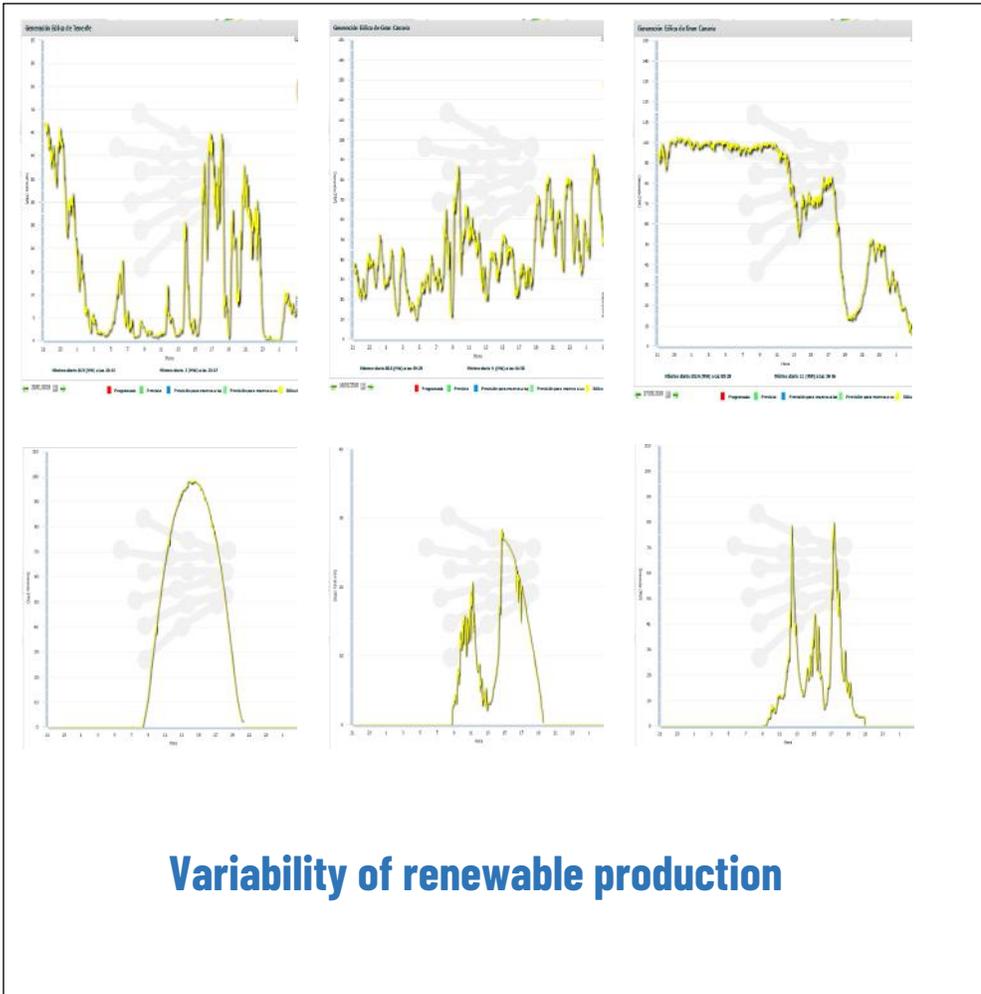
Very vulnerable small systems to unbalancing between production and demand

3

**Lack of inertia**

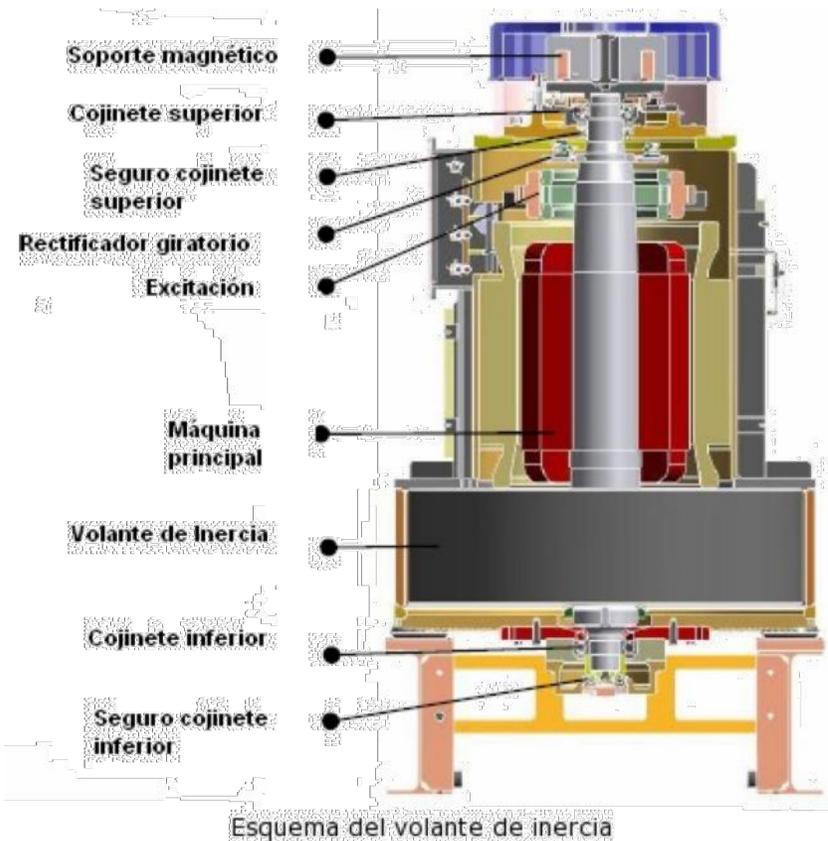
More difficult to solve unbalancing situations and to integrate renewables

# Real impact today



# Flywheel in Lanzarote

Lanzarote Flywheel is a pioneer project that works as frequency and voltage stabilizer in Fuerteventura-Lanzarote system.



**SE Mácher 66 kV**

Location

**1'65 MW-0,005 MWh**

Power-Energy

**Benefits**

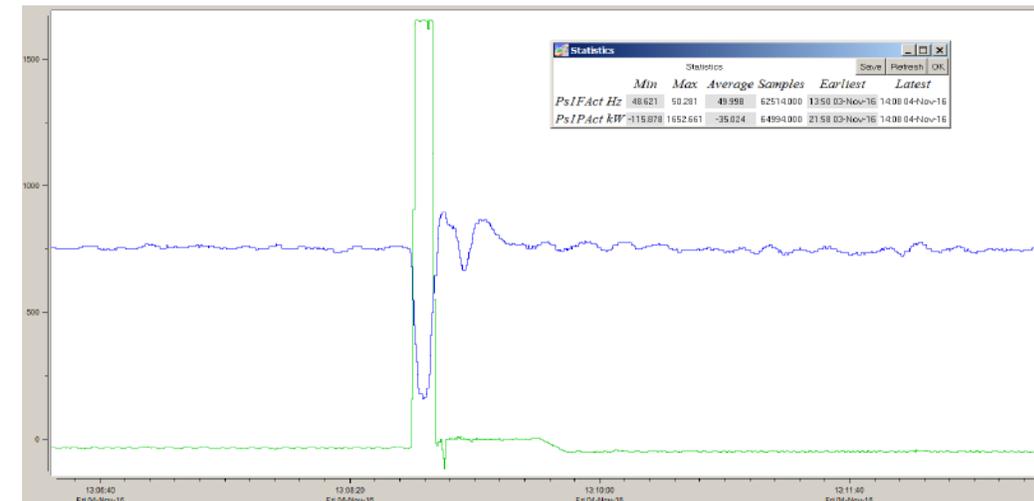
Improving in system stability

**High speed response**

**1,5 M€**

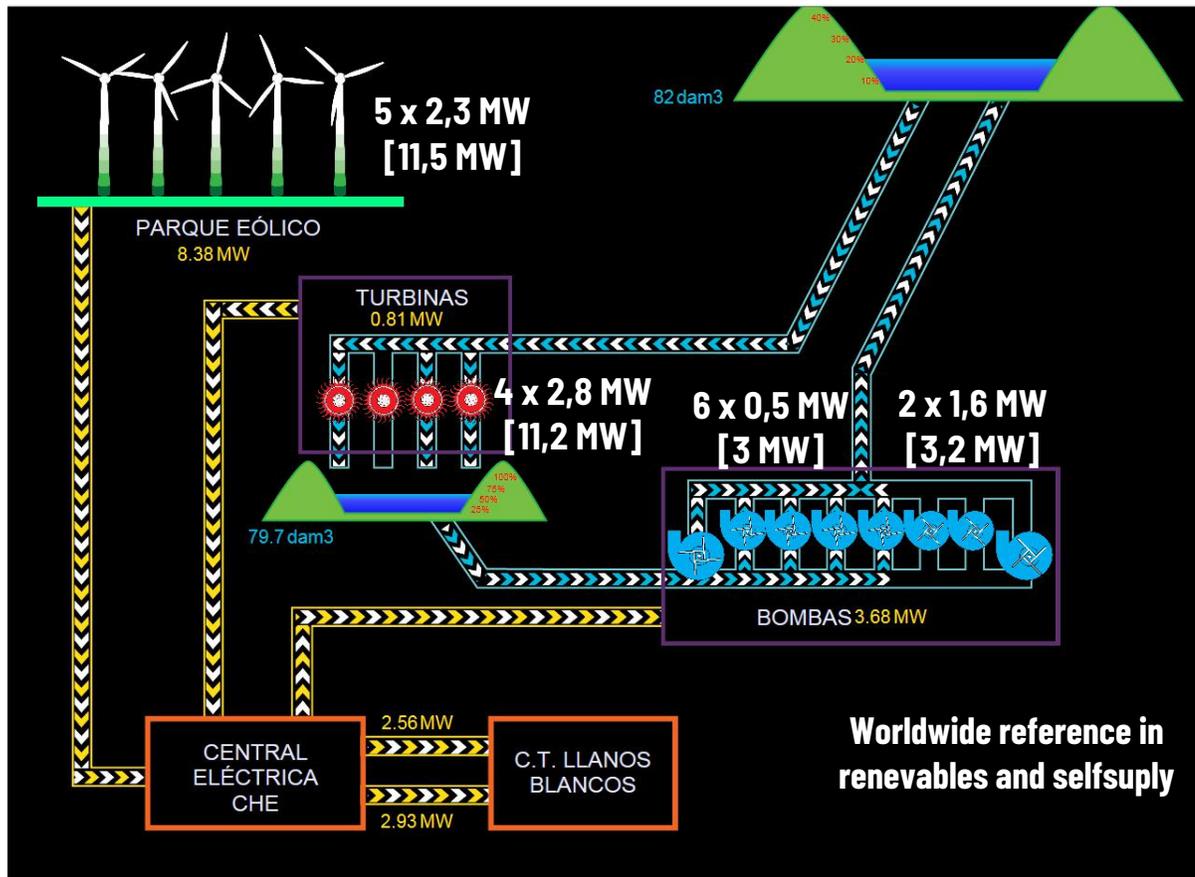
Cost

**Comissioning: 2014**



# Gorona del Viento, hydro pumping plant in El Hierro island

A 100% renewable island because of wind and water



Working since 2014

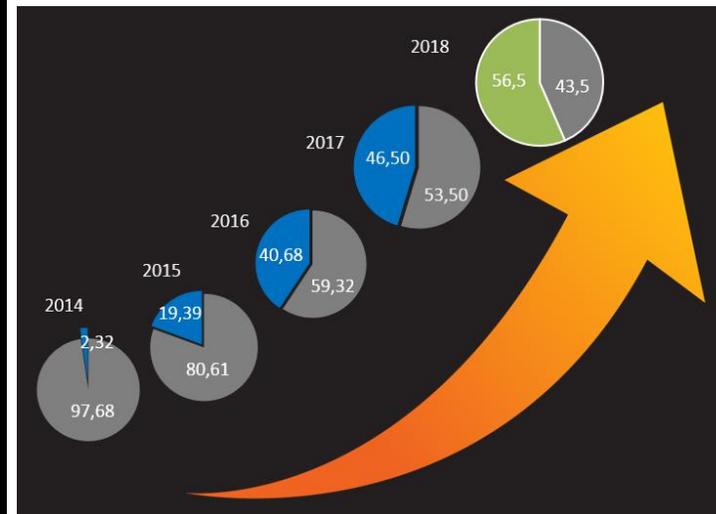
**11,4 MW-240 MWh**  
Power-Energy

**Storage capacity:**  
**2 days of total island demand**

**97%**  
of total demand from renewables  
(2019 July)

**>5,400**  
Hours with 100% renewable supply thanks to Gorona del Viento (2019)

**80,000**  
tCO<sub>2</sub> avoided since 2015



# Chira-Soria Project in Gran Canaria

Chira-Soria reversible hydro pumping plant is a key infrastructure towards new Canary Renewable Energy Model

## Benefits

Better supply guarantee  
Better system security  
Better renewable integration

## Permitting - Detail engineering

Project status

**200 MW-3200 MWh**

Power-Energy

**18 horas**

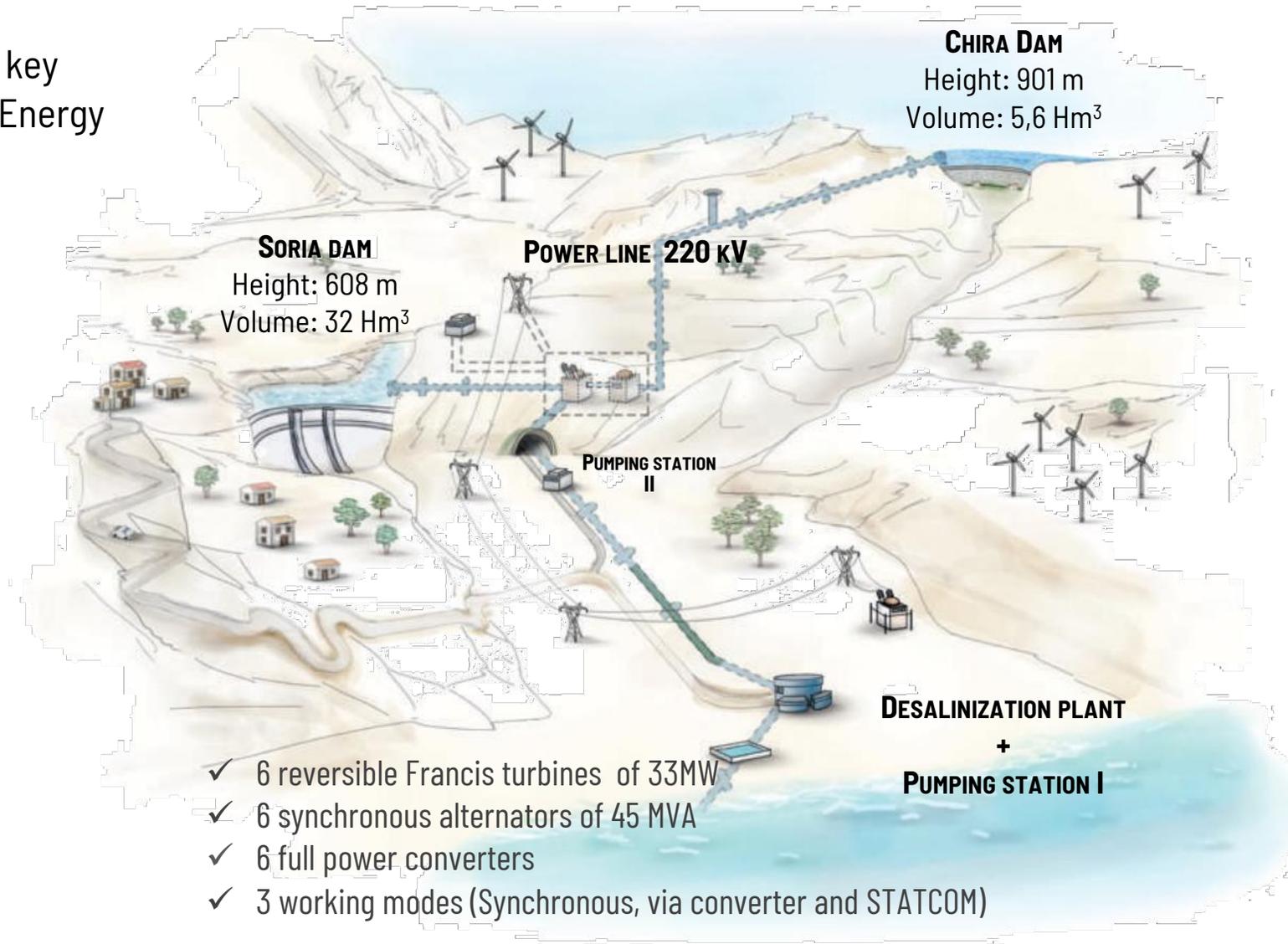
Full charge capacity

**2025**

Forecast comissioning

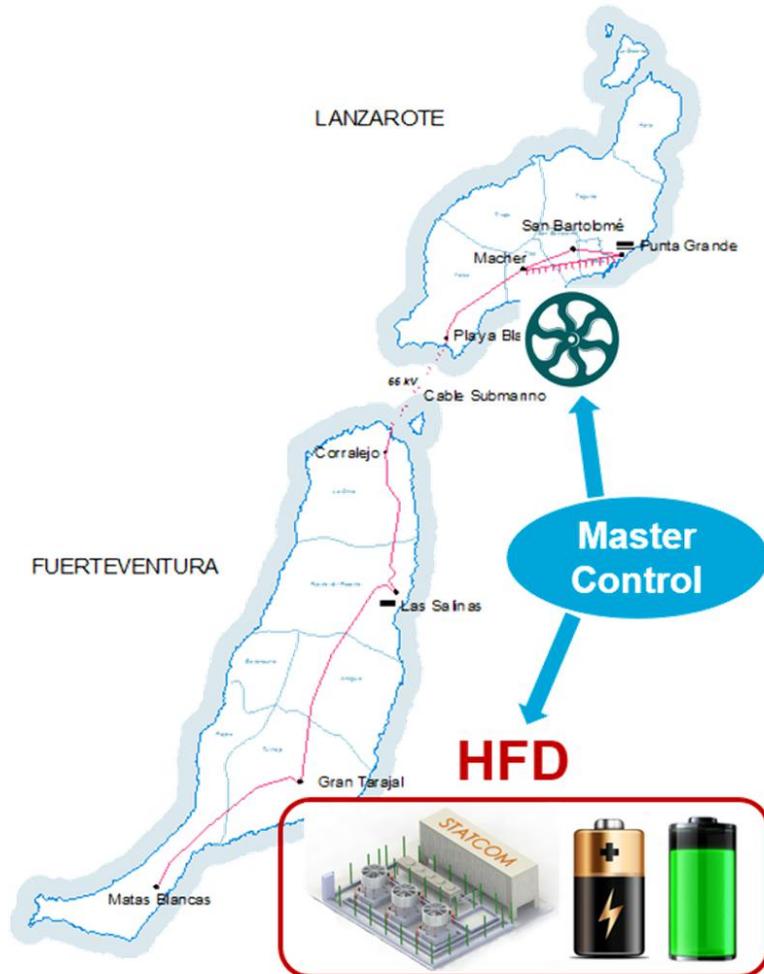
**390 M€**

Cost



# OSMOSE Project in Lanzarote-Fuerteventura

A European Project with the main goal of renewable integration by a multi technology storage solution



**1,6 MW-0,005 MWh**

Flywheel

**3 MW-0,75 MWh**

Batteries

**25 MVar**

STATCOM

**10 MW-0,015 MWh**

ULTRA-Capacitor

**2018-2020**

Project status

**~ 60 people**

Working team

**28 M€**

Budget

**33 partners  
from 9  
countries**

Partnership

**Laboratory**

Lab Analysis in phase I.  
Phase II under definition

**CENER agreement**

First testin in CENER premises

# ALISIOS Project in Tenerife

ALISIOS main target is to evaluate technical feasibility and impact of a power intensive storage system in Tenerife.

## Benefits

Better supply guarantee  
Better system security  
Better renewable integration

**Full specification and RFI  
ended**

Project status

## Li-Ion battery

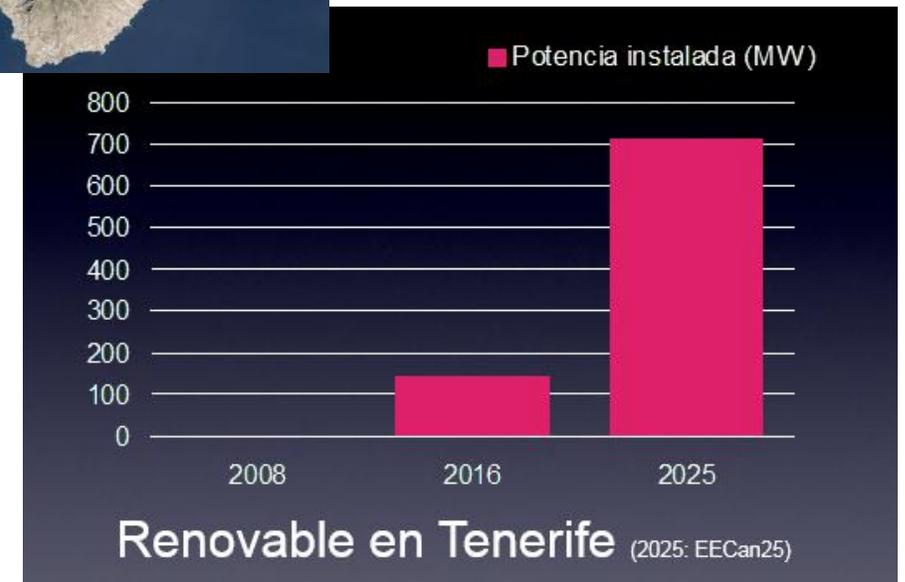
Current proposal

**25 MW-6,5 MWh**

Power-Energy

**17 M€**

Estimated Cost



# Conclusions

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- Spanish Electric System is facing the challenge of Energy Transition and TSO role is a key element for these goals.
- Storage is essential for Energy Transition, since will allow to manage electric system and to ingrate renewables, replacing conventional power plants providing these services.
- Red Electrica is facing this challenge, exploring different storage technologies, and with pioneer projects like Chira-Soria or 100% renewable El Hierro island.
- Storage, combined with other coming flexibility tools and Transmission Grid development will be enablers of Energy Transition.



**RED**  
**ELÉCTRICA**  
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*Comprometidos con la energía inteligente*

**Thank you very much!**

[www.ree.es](http://www.ree.es)