

Challenges of renewable energies in islanded systems

SC C1 Power system development and economics

Question 1.2.3 Paper 11030 describes studies of the special problems of island system in integrating renewable generation. How have other island systems addressed the challenges of renewable generation?

Agustín Díaz García. SPAIN

red eléctrica

The challenge of renewable integration in islanded systems

System adequacy studies must combine with steady state and dynamic studies

Must-run synchronous units (normally fossil fuels) to ensure a safe operation

-Frequency stability:

○Inertia

○Reserve (to cover N-1 and renewable resource variation)

-Voltage control (steady and transient)

-Transient stability

Improved technical requirements of inverter based renewables makes must-run synchronous units needs decrease → improvement of renewable integration (less curtailment):

- upwards/downwards reserves
- ramp limitations
- voltage control
- fast injection of reactive power
- fault ride through
- inertia emulation
- grid forming capabilities

Different strategies to island decarbonization

Balearic Islands

- Increase interconnection capacity to mainland Spain (second HVDC 2x400 MW)
- Batteries (90 MW in Ibiza + 50 MW in Menorca) to provide emergency control in case of a link trip (fully integrated asset in the system)
- Synchronous condensers (2x100 MVA) to improve system robustness and inertia

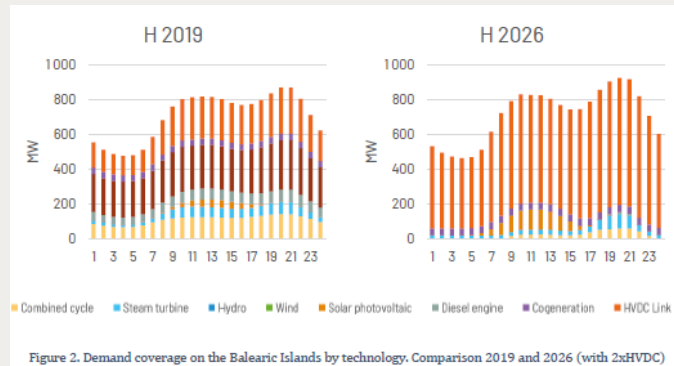


Figure 2. Demand coverage on the Balearic Islands by technology. Comparison 2019 and 2026 (with 2xHVDC)

El Hierro

- Operation of hydro power plant in coordination with wind farm in order to integrate the most amount of renewables.
 - Record of 24 full days 100% renewable
- Group Discussion Meeting

Canary Islands

- Need to provide flexibility and system strength
- Secure system voltage, frequency and transient stability by means of
- Batteries, hydro pump storage and synchronous condensers
- Interconnect islands by means of AC subsea cables

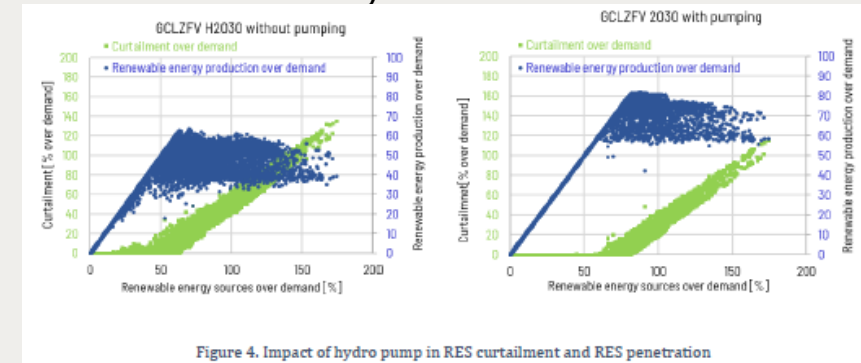


Figure 4. Impact of hydro pump in RES curtailment and RES penetration

