

# 31st GC ESC meeting – SPD

SG SPD, Janek Massmann (Co-Convenor)



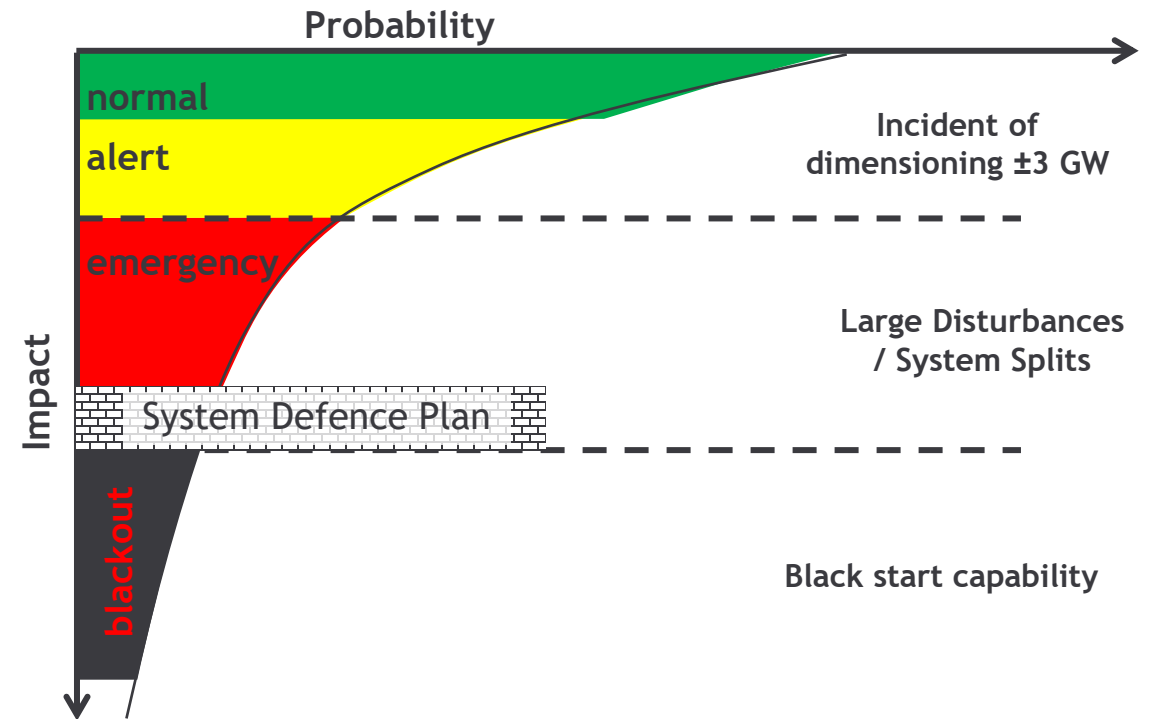
# System states in operation

- **Normal-/Alarm operation**

- Control of incidents of dimensioning with power imbalances of up to 3 GW (load and generation)
- Intact and interconnected European power system
- Control of incidents without supply interruptions
- Considering a correct behavior of grid users (compliance with grid connection requirements), these disturbances can be controlled in the future

- **Emergency operation**

- Control of major disturbances, especially system splits
- Automatic or manual measures from the system defence plan are applied, which may result in regional and temporary supply outages
- System splits have local requirements regarding the applied measures (inertia, system defence plan, regulating reserves)
- Increasing system needs due to raising significant power transports in the transmission system and decommissioning of conventional power plants



# Measures of the system defence plan

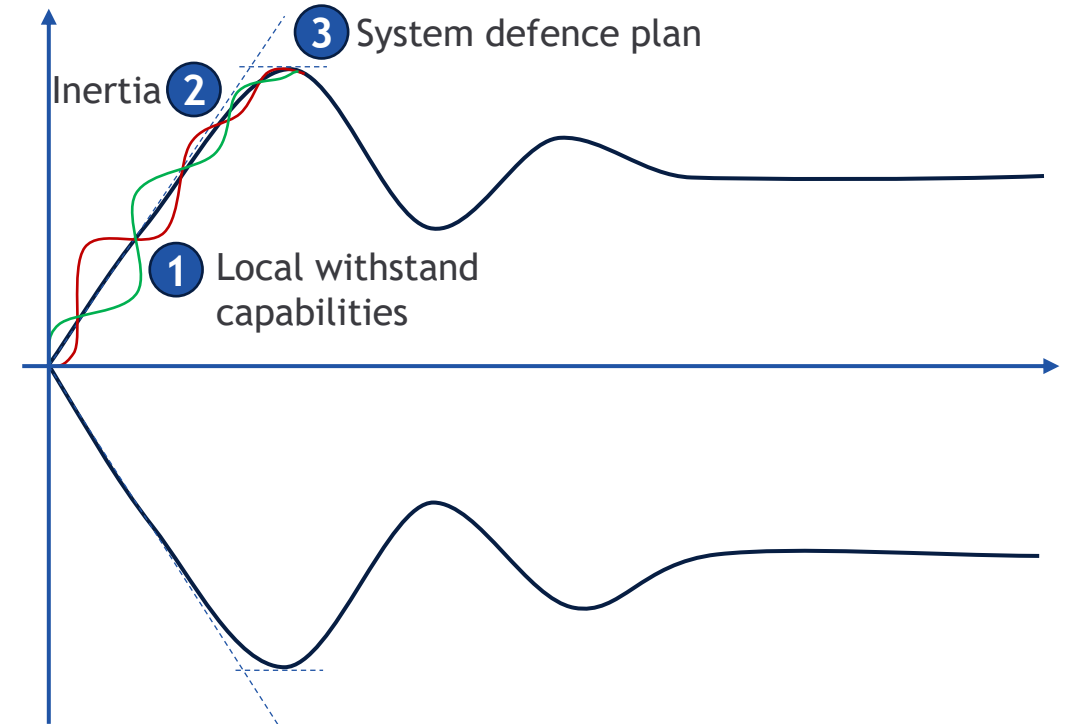
- Frequency stability is ensured by several measures that build up on each other
- Three factors are critical to managing large system disturbances:

1. Local withstand capabilities of units against voltage deviations and local RoCoF

2. Inertia to limit the RoCoF in the centre of inertia

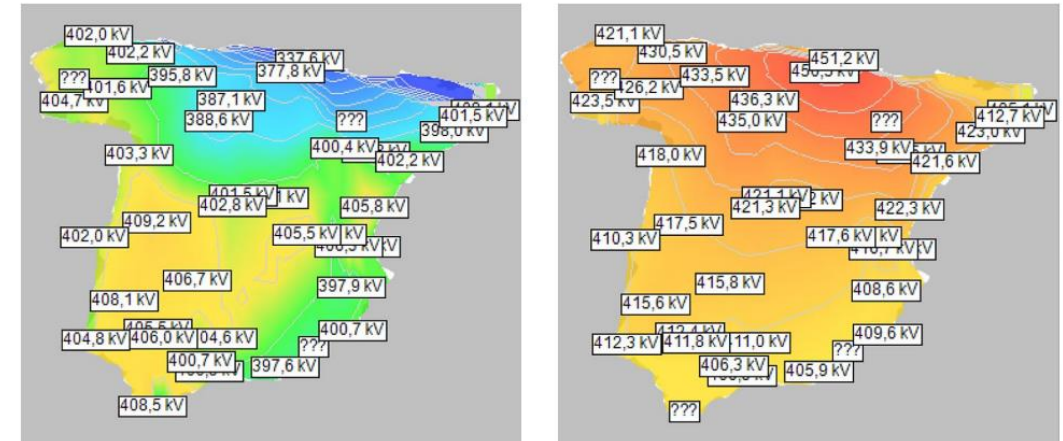
3. Reliable measures of the system defence plan to limit frequency deviations

- All three aspects must be considered at the same time considering the future changes in the system



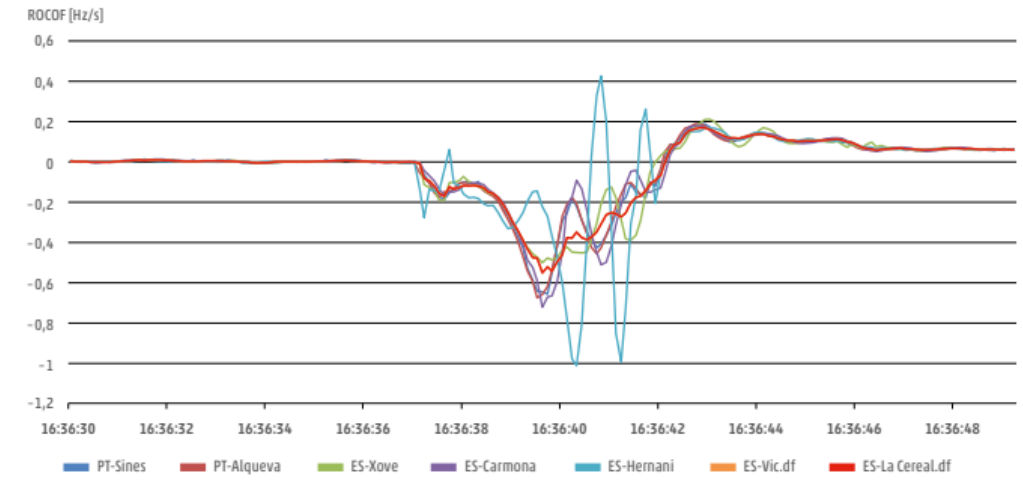
# System split on 24.7.2021

- Power transport of **2400 MW** from north to south
- A fire led to an outage of the "Baixas-Gaudiere" double circuit
- Voltage fluctuations in Spain/Portugal because of the system split led to the disconnection of generation units from the grid (approx. 2700 MW)
- Frequency in Spain/Portugal to 48.7 Hz with a global RoCoF of -0,5- to -0,6 Hz/s. Locally a maximum RoCoF of -1.03 Hz/s was recorded
- Frequency was stabilized by system defence plan measures
  - Shedding of pump hydro storages with 2300 MW
  - Underfrequency load shedding with 4800 MW
  - activation of primary control with 370 MW
- All units must be able to withstand voltage deviations and RoCoF in a defined range to avoid cascading tripping of elements and limit the resulting power imbalances



(a) 16:36:32 between Event #2 and #3

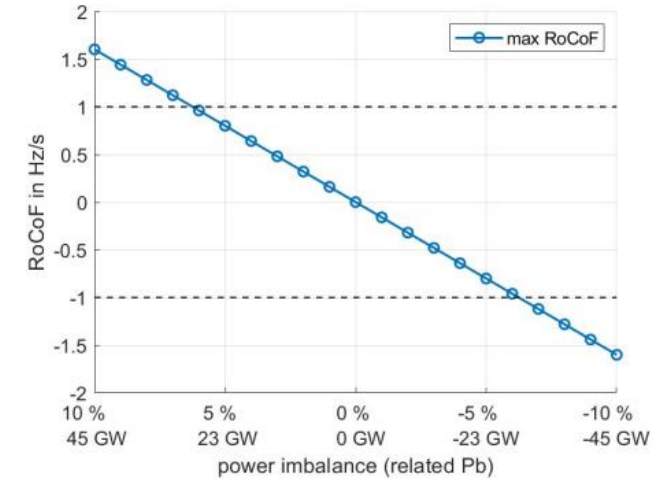
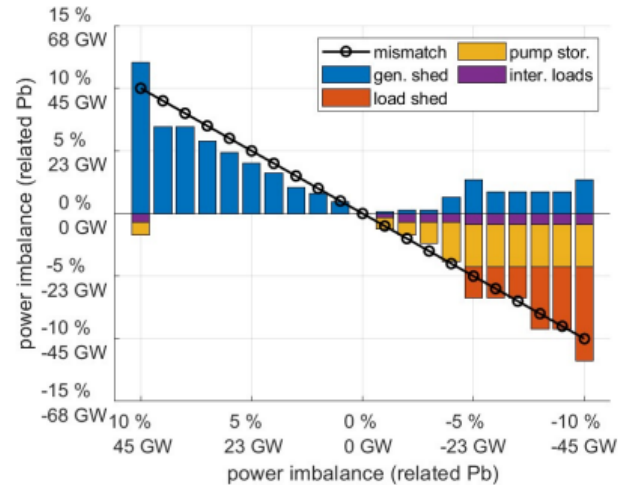
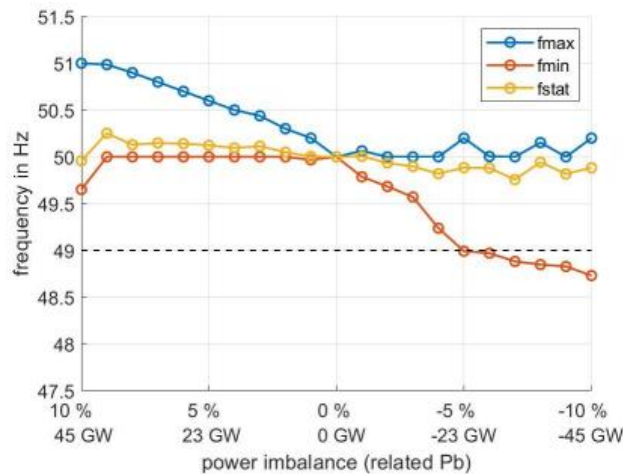
(b) 16:37:40 after Event #3



Source: Final report on the power system separation of Iberia from Continental Europe on 24 July 2021

# Assessment of inertia and system defence plan

- Assessment of existing inertia and reliability of system defence plan measures is done by SPD on a regular basis
  - Report „System Defence plan“ from 2022 ([link](#))
  - Report “Inertia and Rate of Change of Frequency (RoCoF)” from 2020 ([link](#))
- As long as the Continental European Power System is interconnected future system studies shows, that there is no need for minimum inertia and the system defence plan is reliable for imbalances up to 5 % of the total system load



- Requirements regarding system splits strongly depend on the topology of the split and require an assessment of the inertia and system defence plan measures of each sub-system
- Project inertia phase 2 aims for a definition of relevant system split scenarios

# Thank you for your attention

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