Island case : today key energy challenges !

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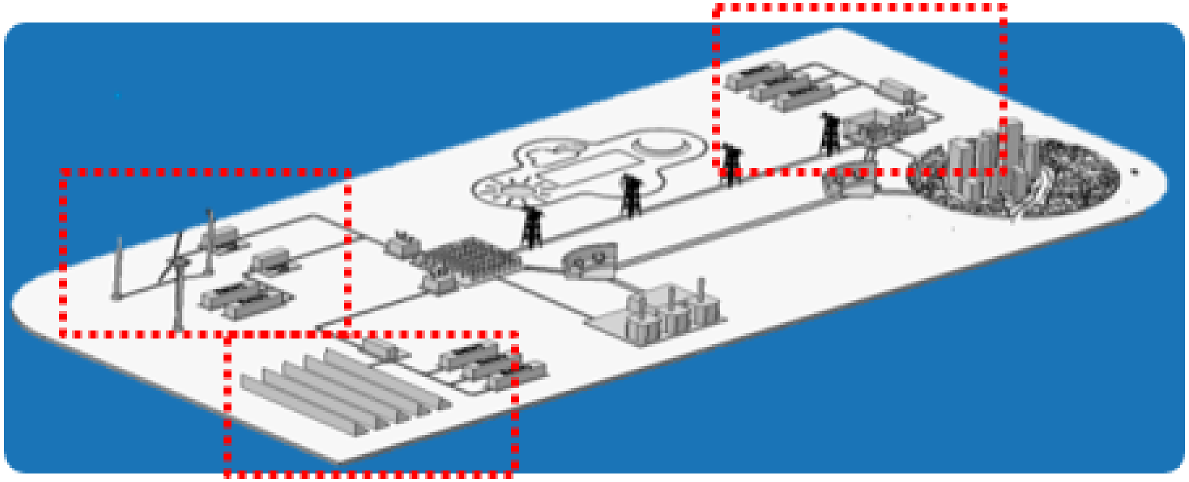
Storage benefits across the electrical landscape



Renewable integration + grid stability

Congestion management

Challenges	Key benefits
Integration of renewable or distributed energy resources	Stabilization of intermittent renewable energy
Ageing of the electrical grid	Better grid stability (ancillary service)
Management of energy flow variations	Congestion management

Battery Energy Storage Solution = Multi functionalities
➔ Business model to build on the full value chain

Island case : today key energy challenges !

Today our Key Energy Challenges :

- "20-20-20 European Union" targets by 2020 : -20% of CO2 emissions ; -20% of energy consumption ; 20% of energy from RES
- As the global need for electricity increases, so does the expectation for clean, reliable power.
- Most of the Islands are favourable area for RES power generation such as wind & solar.
- RES production can be unpredictable, making network operators hesitant to become dependent on elements they cannot control.
- While increasing RES penetration, how to assure there will always be electricity 'at the flick of a switch' for the customer and maintain competitive electricity cost ?
- Synchronous generators are the main contributors of the grid stability : what will be the impact of the RES on the grid safety ?
- Battery deployment strategy : large-scale (MWh), building, residential (tens kWh) ?

Island = Real size "Lab" to define tomorrow energy models

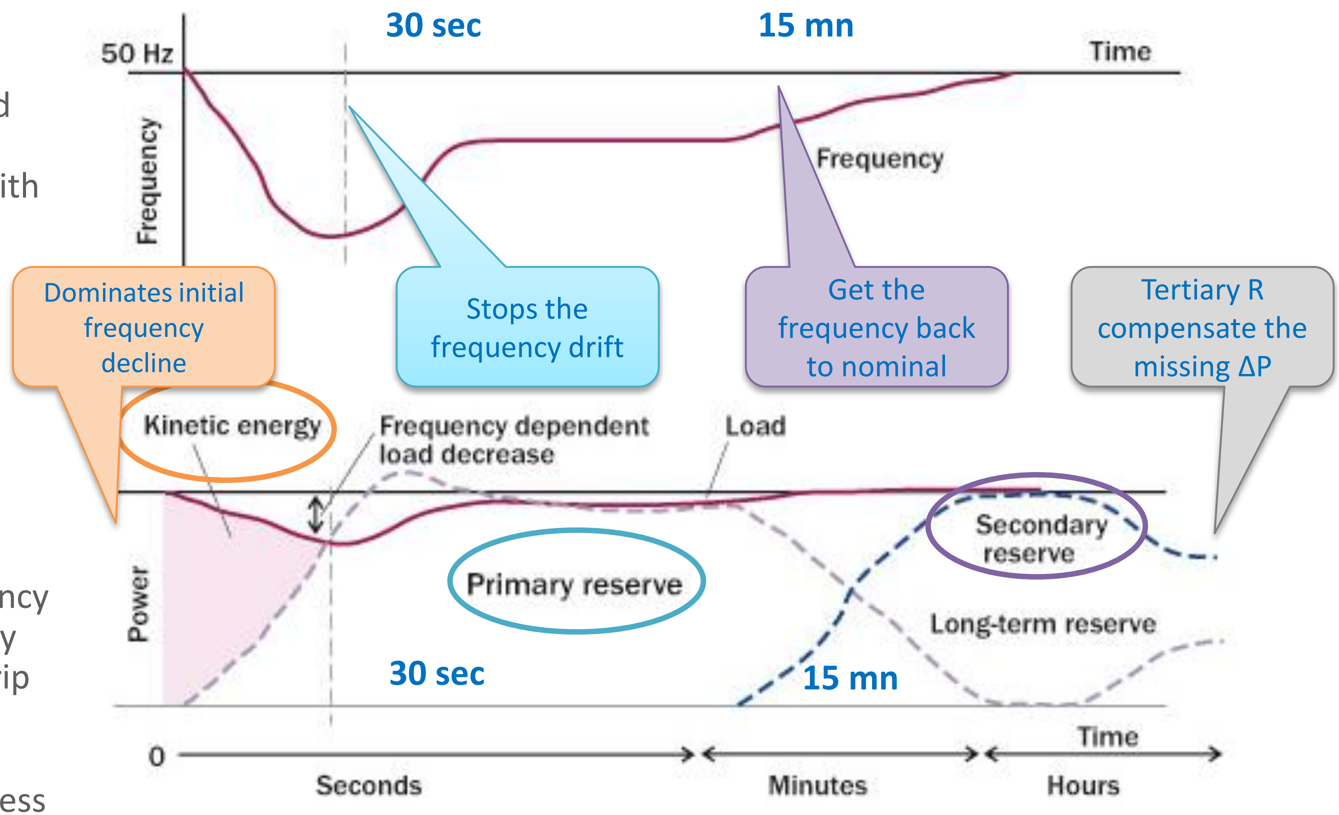
How much to value the Island Grid safety with more RES generation ?

TODAY :

- Frequency is presently regulated from inherent inertial response from synchronous generation with low RoCoF (Rate of Change of Frequency).
- Primary reserve (PR) : main contributor = synchronous generation.

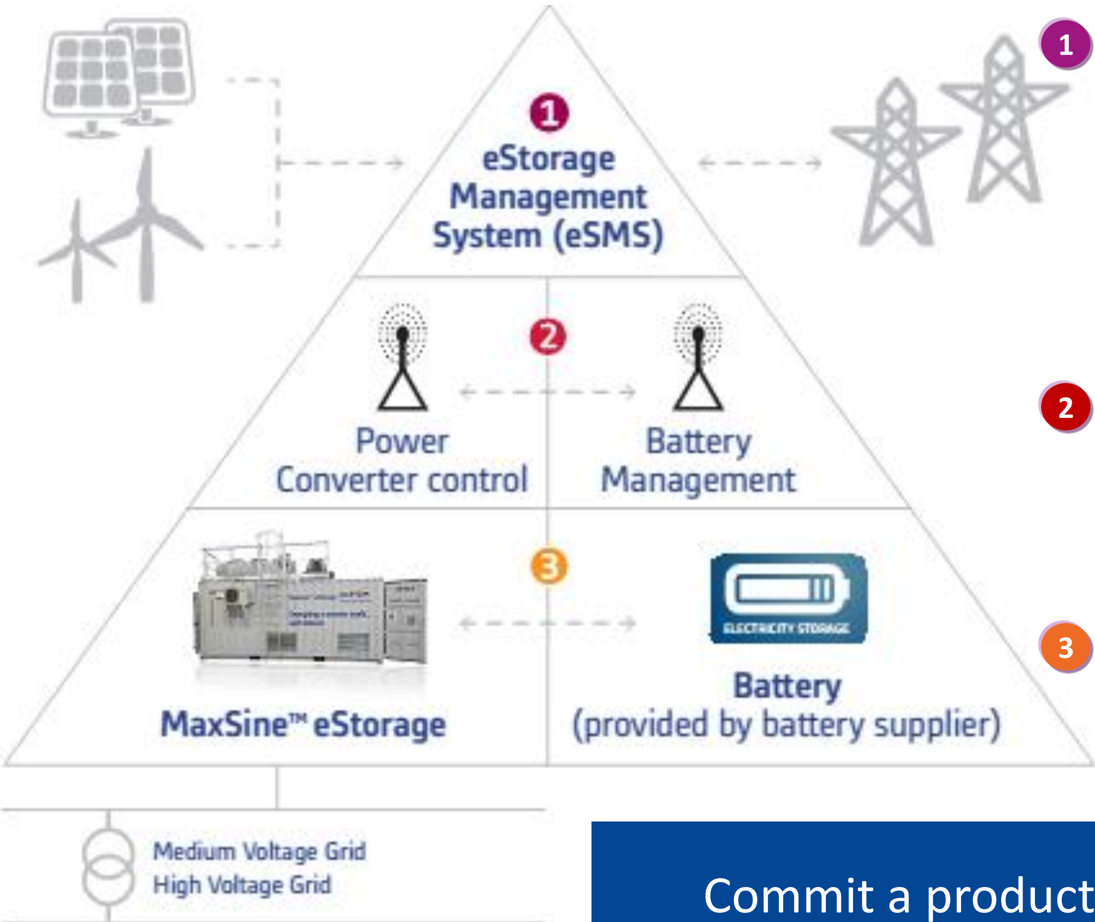
With higher RES penetration :

- RES do not contribute to frequency regulation. But impact frequency with higher RoCoF = potential trip of synchronous generation.
- Less synchronous generation = less PR available capacity.
  Declining PR results in deeper frequency drift & cascaded outages.



Battery storage = Dynamic regulation signal with very GOOD performance

Ways to transform intermittent & unpredictable RES into stable supply integrated into the Island Grid…



1 eStorage Management System (eSMS)

- Integrates & adjust RES forecast for a "day-ahead" production plan
- Optimizes battery oepration & lifecycle
- Connect with T&D grids and energy markerts
- "Smart-Grid Ready" solution compliant to IEC 61850

2 MaxSine^{TM} eStorage : Smart Converter

Power Converter control layer integrates with with eMS, and synchronises the converter to the grid

3 MaxSine^{TM} eStorage connects the battery storage system to the power grid.

Commit a production plan = stable supply of RES

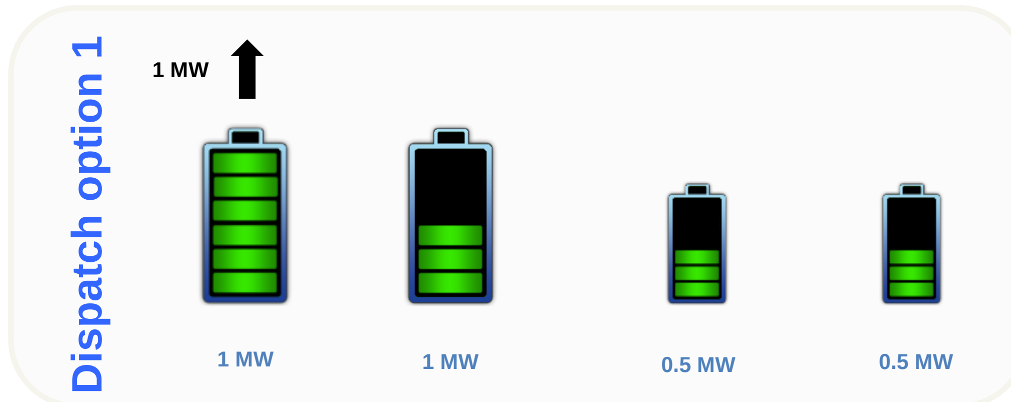
Multi batteries operation strategy into the Island Grid

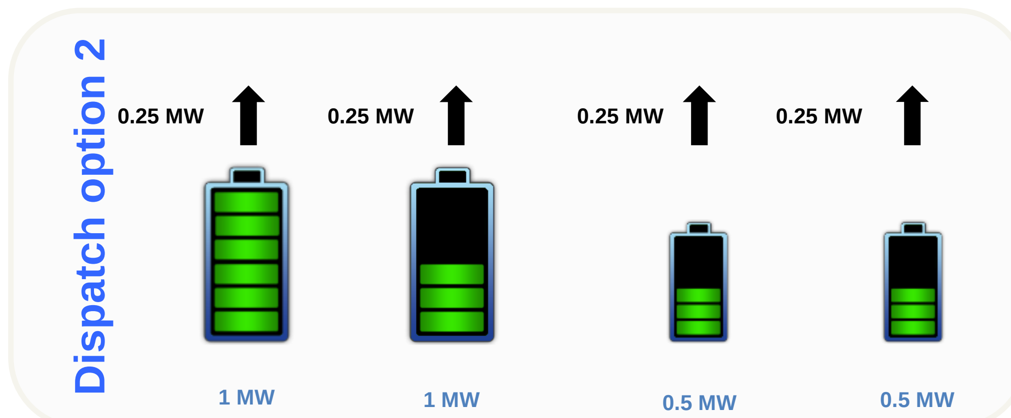
How to dispatch Grid operator setpoints while optimizing battery operation ?

Example:

- BESS installed capacity $P_{installed}$= 3 MW
  (2 x 1 MW + 2 x 0.5 MW)
  with different battery techno

- Grid operator requirement $P_{setpoint}$= 1 MW





Thank you for your attention

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