1) **Optimizing Energy Storage Systems:**

We are particularly interested in the innovation areas outlined below:

- Next Gen Storage: new technologies and architectures to achieve energy storage system cost < 100$/kWh
- Advanced tools to optimize BESS (Battery Energy Storage Systems)sizing by simulating actual degradation in relation to the defined use
- New BESS designs in:
    - Mobile BESS concepts for the relocation of BESS capacity where it is needed the most. Innovative approach to security and fast deployment and roll-in / roll out of the BESS solution.
    - Fire-fighting and suppression systems – at BESS design level (via sectioning) and at chemistry level.
    - PCS design with significant over-load capacity maximizing system reliability, but decreasing the overall system costs. Methodology and matrix for optimum PCS design to match maximum reliability / minimum costs.
    - Rapid maintenance systems – tools and methods and approach to deign to execute rapid, hot maintenance and replacement of the broken modules / racks / PCS modules.
    - To reduce footprint of BESS plants by stacking container solutions, while keeping safety and fire regulations of different geographical areas.
- Energy storage system diagnostics: solutions to enable real-time state-of-health monitoring for lithium-based energy storage system as well as predictive diagnostics
- Advanced BESS control systems to enable:
    - better use of batteries in terms of lifetime and degradation;
    - provision of stacked services to the energy and service markets;
    - coordinated control of a set of BESS located in the same plant or in nearby plants;
    - immediate plug-and-play integration of new battery modules within existing operation BESS in case of need to refill battery capacity
    - PCS control architectures to emulate inertia, being able to react to a transient sub frequency event in a small isolated grid with very low inertia. New solutions to traditional f meter to react faster than 100ms.
    - an optimal synergic use of an hybrid system based on different type of storage technologies (i.e. brand new and second life batteries modules, battery system and supercapacitor system; integration of electrochemical and kinetics systems, etc);
    - different combination of array configurations (also foreseen series and parallel configuration modification during the design phase of the system);
- Long term and seasonal storage technologies: hydrogen, flow batteries, other options to enable low cost long-term storage
- New bidding and forecasting techniques for markets where storage is already allowed for energy and services in front of the meter.
- End-of-life management and circular economy: processes that guarantee sustainable end-of-life management of batteries and avoidance of rare raw materials.
- Li-ion cathode and anode chemistry evolution: new materials and evolutions of existing ones.