ELSA Summary

Context and objectives of the project

Storage is one of the core elements of the forthcoming energy supply system to enable an increasing local production of renewable energy sources (RES) with fluctuating power output. Storage is actually a key enabler to accelerate the Smart Grid transition, as outlined by European climate and energy policy.
ELSA does not only give additional life to electric vehicle batteries before they are recycled, but also creates stationary storage solutions that comply with the high safety standards required for electric vehicle batteries in a cost-effective manner. ELSA proposes scalable, easy-to-deploy energy storage solutions for factories, large offices and residential buildings and districts.

The main objectives of the EU-Project ELSA were:

- To develop a stationary storage system based **on second life EV batteries without previous dismantling of the individual battery packs**
- To enable an increasing local production of renewable energy and to accelerate the Smart Grid transition.
- To design a low cost industrialized power converter specially designed to work with 2nd life batteries
- To develop innovative local ICT-based Energy Management Systems to interface the storage with the building EMS or with the distribution grid
- To include in the development works, communications and services in order to fully exploit the ELSA concept for local energy optimized management of hybrid virtual multi-source storage system and to integrate existing Web/IP based communication standards for Automated Demand Response (ADR)
- To demonstrate the economic viability and effectiveness and the environmental advantages of innovative storage services and related business models.

The ELSA consortium consists of 10 members from five EU countries: Bouygues Energies & Services, Renault SAS, Nissan West Europe SAS, RWTH Aachen University, United Technologies Research Centre Ireland Limited, Engineering Ingegneria Informatica S.p.A., B.A.U.M. Consult GmbH, ASM Terni S.p.A., Gateshead College and the Allgäuer Überlandwerk and its subsidiary EGRID.

Work performed during the project and overview of the results:

Identifying the services offered leveraging on distributed storage for ELSA, these included both potential envisioned services and actual services that could be implemented at the project timeframe conclusion, depending on the regulatory situations. The Use Cases describe in detail the specific ELSA functionalities and the set of possible sequences of interactions between ELSA systems and other actors.

A baseline was also defined for ICT infrastructure. Starting from the existing energy management systems, extensions were identified to evolve towards several ELSA integrated ICT platforms adapted to each local situation.

A regulatory and normative analysis has been carried out from international standards to national laws in six European countries of the ELSA consortium (France, Germany, United Kingdom, Italy, Spain and Ireland) to identify and assess potential regulatory barriers and possible normative gaps for preparing future regulatory and normative framework to better promote the development of electricity storage solutions, an essential contributor to the low carbon grid.

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The flexibility potential of each test site through an off-line assessment, implemented prior to deployment of the ICT platform, was done to give an indication of the range of flexibilities available at each pilot site and was tested successfully during the last period of the project

Design of the storage system:
Starting from the existing architecture, the aim was to design for a mass production and test a new power converter for the ELSA storage System able to implement the different Use Case defined for the project. Different architectures were analyzed with potential suppliers to find the most appropriate in term of technical functions and cost. A converter system fully adapted to handle directly the 2nd life EV batteries was developed, tested on 3 pilot sites and is now fully operational, including the provision of grid services.

The cost of this new system produced industrially will be approximately one fourth of the cost of the initial pilots used during the project.

Scalable ICT platform for storage and grid services management:
Four Scalable ICT platforms for storage and grid services management have been developed and tested on the different test sites during 2017 and 2018.

Installation and maintenance of the distributed storage systems:
Installation and commissioning requirements for the storage systems have been studied.
Safety considerations have been analysed in collaboration with inspection services, leading to the redaction of a Safety Concept document.

The storage system has been deployed on six pilot sites (Germany, UK, Italy and France), three pilot sites have been retrofitted with the final storage and converter system to test it and obtain results.

Economic and environmental impact assessment:
The market potential of the battery systems in the 5 countries of the project (UK, Spain, Germany, Italy and France) have been investigated and an assessment of the economic impact on the overall electricity system has been made. Operating ELSA battery storage systems can create significant benefits for the overall electricity system worth 2-3 times their cost. The study on the environmental impact shows that benefits in the operation phase out weight environmental costs of the other phases. In addition, ELSA systems have a clear environmental advantage over systems with new batteries.

Potential Impact:
The ELSA storage has been developed and successfully tested during the Project. It is an original and unique solution to allow a second life to EV batteries.
ELSA has been conceived to accelerate the market entry of a major breakthrough in the energy storage industry. Major European industrial players have joined forces with a strong commitment for the manufacture and sale of a storage solution that will be safer, smarter than any other existing system.

ELSA impacts in Europe are expected to be significant in terms of lowering energy cost, increasing energy independence and reducing energy environmental footprint. In addition, as the large majority of the planned industrial activities will be based in Europe it is expected that there will be a significant impact in local economies and job creation.

ELSA will strongly impact the current energy market revolutionizing the access to storage:
One of the major impact in the market segments will be an acceleration of the large office applications.

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A second one will be the integration of storage services in the distribution network management, increasing the grid security and stability and reducing grid congestion. This is helped particularly by exploiting storage with electronic interfaces to facilitate the integration of highly variable renewable generation and dispersed demand response and providing new grid supporting services (balancing and ancillary services) linked with the availability of storage.
ELSA will accelerate the move towards smart grids, intelligent and green buildings and smart cities and facilitate the development of electrical mobility through an economical second use of the EV batteries.