EDF-2021-ENERENV-D: Energy efficiency and energy management

EDF-2021-ENERENV-D-NGES: Next generation electrical energy storage for military forward operation bases

This call aims at optimising the distribution and management of energy within or between defence systems, e.g. by making use of innovative solutions based on artificial intelligence.

Proposals are invited against any of the following topics:

EDF-2021-ENERENV-D-NGES: Next generation electrical energy storage for military forward operation bases

Budget

The Union is considering a contribution of up to EUR 133 000 000 to support proposals addressing the abovementioned topics and their associated specific challenge, scope, targeted activities and main functional requirements.

Several actions, addressing different topics, may be funded under this call.

Electrical power for Forward Operating Bases has been produced mainly by diesel gensets for decades. Gensets have been seen as a reliable, stable and easy to deploy power source for FOBs and other deployable infrastructure for decades. Nevertheless, a combined momentum for increase of energy consumption during operations, reduction of GHG emissions, concerns about logistical routes safety in long-term international operations and the increase of cost and difficulty of access to fossil fuels lead to a required change of future electrical power supply in FOBs. Considering the technological trends in the energy sector, future FOBs will probably require the use of smart grids combining diesel generators with renewables supported by storage systems.

Specific challenge

The specific challenge of this topic is to assess the current energy storage systems that are developed for civil use and that might be used at a military level. Nevertheless, several factors as lack of European leadership in the technologies, scarcity of resources and geopolitical issues are leading to a European strategy to develop alternative technologies to achieve more sustainable, safer and cost-efficient energy storage systems. In addition, a supplementary effort on these alternative technologies should be made to assure that they are adapted to a deployable, more severe military environment subject to different geographical locations, weather and climate conditions (including extreme environments).

Scope

The proposal must address the development of an application-oriented analysis, including a draft guideline recommendation for novel energy storage technologies is safer and usable for military deployments in forward operation bases; and achieve validation in relevant environment.

Additionally, a set of military requirements (including but not limited to application specific duty-cycles, loading cycles, storage and tactical and environmental conditions) must be collected, aligned and analysed to derive design targets for future energy storage system(s). The proposal will comprehend both components and system integration analysis.

These requirements will then be transferred into a guideline recommendation for the energy storage systems and their integration to be used as a basis for the creation of standards and requirement specifications for procurement procedures. An evaluation of the availability of different energy storage alternatives within the industry and from reliable sources must be made. Additionally, tests of a representative application-specific energy storage system will be carried out for validation of these requirements with the aim to create a European platform for the implementation of these systems.

Targeted activities

The proposals must cover the following activities as referred in article 10.3 of the EDF Regulation, not excluding possible upstream and downstream activities eligible for development actions if deemed useful to reach the objectives:

- Studies, such as feasibility studies to explore the feasibility of new or improved technologies, products, processes, services and solutions.
- The design of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such design has been developed which may include partial tests for risk reduction in an industrial or representative environment.

The proposals must address in particular the following objectives:

Studies:

- Analysis of civil-developing novel energy storage technologies and their suitability for deployable, stationary-use applications as FOBs.
- Compilation of specific military requirements for energy storage systems from Member States including the energy and power densities, low maintenance and cost comparison.
- Review safety requirements, military interoperability issues and operational aspects.
- Assess European research, development and industrial capabilities on this area to fulfil future military needs.

Design:
"Based on the requirements derived from the feasibility study, and in compliance with them"

- Design of a functional technological demonstrator based on the novel energy storage technologies identified, both at component and system level.
- Building of the technology demonstrator to de-risk suitable energy storage technologies and their combinations in hybrid systems to achieve functional requirements, including development of advanced software and hardware for power and energy storage management (like Battery management system –BMS) and validation in relevant environment.

Functional requirements

The proposed solutions should fulfil the following requirements:

General:

- Compliance with safety and risk requirements addressing its whole lifecycle.
- Compliance with applicable standardisation requirements for energy storage systems design and military interoperability.

Logistics and deployment:

- Integration in military standard 20-feet containers.
- The system must be capable of maintaining its performance after long storage time in a military infrastructure, with minimum maintenance and cost levels.
- The system must be safe and ready for transportation on military conditions, including aerial deployment.
- The system must be easily deployable and recoverable.

Operational conditions:

- The system must have high energy density.
- The system must be capable of short charging and discharging cycles while keeping its performance.
- The system must have reduced noise and electromagnetic signatures.
- The system must be capable of performing in severe environmental conditions including use in extreme climatic or sensitive environments.
- The system must have a long lifetime (both in high number of cycles and calendar life).
- The system must be ready for smart hot plug in and out ability of elements and complying with standardization of interfaces for EU Member States.
- The system must present high level of operational autonomy and reduced maintenance.

Expected impact

At strategic level:

- Enhance force protection.
- Reduce the logistic needs of camps.
- Reduce the carbon footprints of military missions and hence tackle the climate change in line with the Union's policies.
- Reduce the direct cost of military missions.
- Enhance the interoperability of EU Member States' armed forces.
- Reduce European dependency on critical raw materials for energy storage systems.

At mission level:

- Improve situational awareness, resilience and security of EU operations.
- Reduce the logistic needs of camps.
- Enable the increase of renewable energy generation in FOBs by maintaining distribution capacity and power quality.
- Reduction of hazardous materials from Energy Storage devices components.