

Establishing Energy Resilience for Military Sites through Standardisation and Sustainable Development



Background Description

The operation of military sites relies heavily on different kinds of functions to ensure **electricity resilience**. Usually, electricity supply is sourced from public electricity network for one or several points and power continuity (if needed) is ensured with **diesel generators**, uninterruptible power supplies (UPS) systems, batteries, etc. Energy resilience for camps becomes an exercise in establishing a hierarchy of facilities by importance to concentrate scarce resources where the most gains in energy security can be ensured.

A 2050 EU energy strategy goal is to **reduce 80-95% of greenhouse gas emission**. In this respect, new energy sources are also needed in the defence sector, or to define how the energy needs of the defence sector require technologies whose **environmental impact** is offset by reductions in civilian sectors. By the same time, **development of sustainable energy technologies** will perhaps have brought new solutions and mixes of energy production to **enhance energy resilience for military facilities**.

In different **military camps** (*), energy resilience is fostered by different means, despite overt similarities between facility sites. The multitude of different approaches results in **lack of standards** and loss of time.

Building a strong **energy architecture** is one of the solutions to **improve energy resilience**. Since the investments in strengthening energy architecture are often high, it is important to make investments only when necessary. This requires an understanding of **different kind of functions and their criticality** inside military camps.

Project Analysis

Each military camp tries to enhance its **resilience** on its own, **without standardized methodology**. Electrical architecture in military camps does not differ much from similar civilian sites. Often, **civilian standards could be utilised**, for example:

- Military sites requiring high electricity reliability: data centres; standard EN 50600-2-2:2014 Information technology. Data centre facilities and infrastructures. Part 2-2: power distribution;

* Note: In this project idea, military camp refers to fixed infrastructure and buildings inside Europe only.

- Military hospitals: standard IEC 60364 Section 710 related to low-voltage electrical installations – Installations in medically used rooms.

Military electrical networks need to **keep up** with new technologies in order not to fall behind the ongoing energy transition. In the future, **today's fossil fuel technologies will have become obsolete.**

Objectives

This project idea has the following three main objectives:

1. Propose European military standards for electrical installations for pre-identified key sectors **where resilience must be improved;**
2. Propose different **electrical architectures** taking into account the **priority of end users inside a network;**
3. Find **sustainable, robust and reliable power supply** based on green technologies to replace within the next 30 years diesel generators as emergency power supply or use combinations of them to achieve better resilience and lower or stop fossil fuels use.

Impact – Expected Outcomes

The first outcome is to enhance the power supply and electricity networks of critical military areas. **Improving electricity resilience inside military camps** will also enhance EU citizen defence response.

Second, using civil standards or dedicated military standards is expected to simplify the process of **strengthening the power resilience of military areas** with “pre-designed” proposed electrical architectures.

Third, making use of sustainable power **decreases the defence sector's carbon footprint** while enhancing electricity resilience at the same time.

Opportunities

Most of the objectives of this project idea are matters which need to be dealt with anyway while electrification spreads to military and the demand for more sustainable energy sources grows. These challenges can be solved together or individually. Co-operation will save resources and time.

The project is eligible for potential funding at the European level, for instance, through the LIFE Programme and the European Regional Development Fund (ERDF).

Challenges

It is possible that only a few or no civilian standards can be adapted for military uses. Also, national differences of electrical architectures can cause problems. In that case, several new military standards may need to be created and in that case the lack of resources and interest to create standards may become evident.

There may be a reluctance to discuss critical infrastructure inside military areas because of concerns related to spreading restricted data. This risk will be addressed in a way that no existing military bases will be studied. The electrical architecture can be determined with the allowed shortage of time based on standards.

Since many of the sustainable energy sources are not timetable, it is possible that green energies are not yet reliable enough to fully replace fossil fuel solution in the near future.

Methodology

This project proposes a three-step approach:

1. **Identification:** To set the frame, the project will focus on common military sectors where resilience must be improved, for example: data centre, hospital, air base, ammunition deposits, naval base, etc. The identification phase will not compile real site references (project will not look for locating or identifying national military camps). Inside each site, key sectors will be identified and categorised (for example: no black out allowed, <15s allowed, >15 s allowed) based on civilian standards. EN50600 is a promising option for categorisation. Results might be classified.
2. **Standardisation:** A survey of applicable civilian standards will be made through literature research. The resource will include the International Electrotechnical Commission (IEC) and European standards which are available in the entire EU. The result will be a list of all applicable civilian standards and sectors where military standard could be created. The aim of the survey is to produce electrical standards for each of the pre-identified key sectors.
3. **Architecture and sustainable energy sources:** A typical power supply architecture is proposed. Electrical architectures will be developed based on the results of the standards survey. In this “new” architecture, renewable, robust, and reliable energy will be added to replace fossil fuel generators. The sustainable power supply needs survey of the existing produces on the market and also what is coming in the future.

The three steps could be the bases for the implementation of an analytical study, starting from the constraints and the requirement (i.e. the total power dimension to be satisfied, the maximum duration of allowed outages, the susceptibility level with respect to the external energy supply, the type of military Installation, the expected resilience, etc.) and using artificial intelligence (AI) technique (like e.g. artificial neuron network, ANN, will identify the renewable technologies, or a combination of these, enabling to comply with the expected constraints by maximizing the cost-effectiveness).

By using the technological roadmaps of the different technologies, the viability and the duration of the efficacy of the proposed solution could also be assessed.

Way Ahead

This project will combine green energy, standardisation and resilience to face the requirements of **increasing resilience and decreasing greenhouse gases**.

Forming this project idea into a project requires knowledge from (electrical) engineering, standardisation, logistics, IT/control systems and military requirements. In this context, the following is necessary:

- Cooperation with civilian sector;
- Estimation of risk/reliability of supporting civil infrastructure.

This project idea was developed during the second phase of the Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS II) and does not entail any future commitment for the EU Ministries of Defence (MoDs) or the EU institutions or agencies. However, it provides the framework for enabling the formation of multi-national collaborations at the European level to help the MoDs to address common defence energy-related considerations and to move towards a defence decarbonised future. The potential of those ideas will be further explored in the context of the forthcoming CF SEDSS Phase III (2019-2023).