

Energy Efficiency in Military Camps

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Abstract

The article deals with the issue of the energy efficiency in military camps. The military camps are mostly built during military deployments in case of exercises or missions. As different kinds of temporary structures are typically used to shelter large part of the camps' facilities, the area of improvement for better energy efficiency lies mainly in the utilization of energy efficient devices, machines and pieces of equipment that are used by deployed personnel. The resulting lower energy consumption does not only bring lower financial and logistical burden to the military units but also contribute to the lower environmental impact of military activities. And ultimately, lowering energy use, especially fossil fuel, may result in cleaner environment and significantly affect health of deployed personnel. Overall, there are many benefits brought by energy efficient devices and equipment in several overlapped areas in military camps and their surroundings.

KEY WORDS: *energy efficiency, military camp, sustainable defence solution, environmental protection, energy management, military engineering*

1. Introduction

Frequently in the past, the heavy consumption of all types of resources and energies has attracted almost everybody's attention for various reasons and motivations. But under the current combination of dire circumstances in the world affairs, the issue of energy use has become even more burning and urgent. Moreover, this problem is not solely limited only to energy usage but covers the whole life cycle of energy from large-scale production up to energy recovery or reuse of resources.

The energy efficiency of devices and appliances that consume energy of any kind is becoming the significant feature when acquiring such new items. Even the International Energy Agency (IEA) aptly calls the energy efficiency the first fuel of a sustainable global energy system [1]. According to some scenarios mentioned in the IEA report on energy efficiency, the more efficient appliances can contribute to energy savings of 20% to 30% when being a part of energy management systems in the buildings [2].

As there are numerous types of electrical appliances and tools, which are commonly used throughout any military camp, this area can hugely contribute to the overall decreased levels of energy consumption. Despite the initial higher purchase price of such modern and sophisticated pieces of equipment, the total cost for operations will be considerably lower during their life cycle, as the energy cost is a major part of operation cost. Moreover, the deployment of new devices seems to be very promising in attaining the goal of less cost and fuel demanding military activities towards more efficient and resilient ones. While the number of modern machines and gadgets used by military personnel will inevitably continue to radically increase, there will be as well a big push for their better energy efficiency.

Currently, it seems that the extensive utilization of hi-tech, maybe even smart, devices is the only meaningful step with immediate effect towards lower energy consumption in the current situation for two reasons. Firstly, there is no doubt the investments into deployed infrastructure should be a major part of all energy saving measures but especially in governmental organizations, it can be hampered by the logical necessity of long-term planning in the scope of ten or more years. Then, a massive implementation of energy efficient devices is an essential prerequisite for behaviour shift of all users towards more conscious attitude about energy savings, that must be enforced not only in hierarchical organizations.

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2. Essential Documents

The energy efficiency is not only essential for households and private companies, but it is also strategically vital for the military. During the 2022 NATO summit in Madrid member states declared that they would contribute to combatting climate change by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness and a credible deterrence and defence posture [3].

The energy efficiency, together with energy use and energy consumption, is also one of three pillars of the energy performance concept as stated in the Czech technical standard ČSN EN ISO 50001 about energy management [4]. Also, in the same document, the energy efficiency is, in a very generic way, defined as a ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy [4].

3. Current State

There are many references focusing on the energy efficiency of temporary shelters and provisional buildings, that can be used as an integral part of humanitarian relief effort but also in military bases and camps for accommodation of the deployed forces. In [5], parametric studies are conducted using advanced materials to seek energy efficiency improvements in tents, and it provides a method of energy modelling for soft-wall shelters. In [6], two prototype emergency shelters were tested in controlled, low temperature conditions, with aim to improve conditions inside temporary shelters and to develop tools to assess shelter quality and comfort. In [7], a cost reduction in climatization for low-cost buildings using passive cooling and heating technologies are studied, and it shows they provide better thermal comfort, reduce initial investment and energy consumption.

The saving measures in the area of structural elements of the buildings need high investment and they are not suitable for the military environment because planning and acquisition are long-term processes, which would not deliver energy savings in the short time period. The area of technical systems inside the buildings offers more low-cost opportunities, for example to replace old electric devices or to introduce energy management system in the building [8].

4. Energy Efficiency in Military Environment

The energy efficiency in military environment is one of the principal tasks of military engineering. The military engineering is predominantly involved in energy efficiency of deployed forces during military exercises, and different types of tasks and missions. In this regard responsibilities of the military engineering consist of infrastructure management, including camp design and construction, support to contracting, and provision of main utilities, i.e. water and electrical power. In some cases, military engineering can also provide support to already existing facilities, e.g. installations in the area of deployment [9, 10].

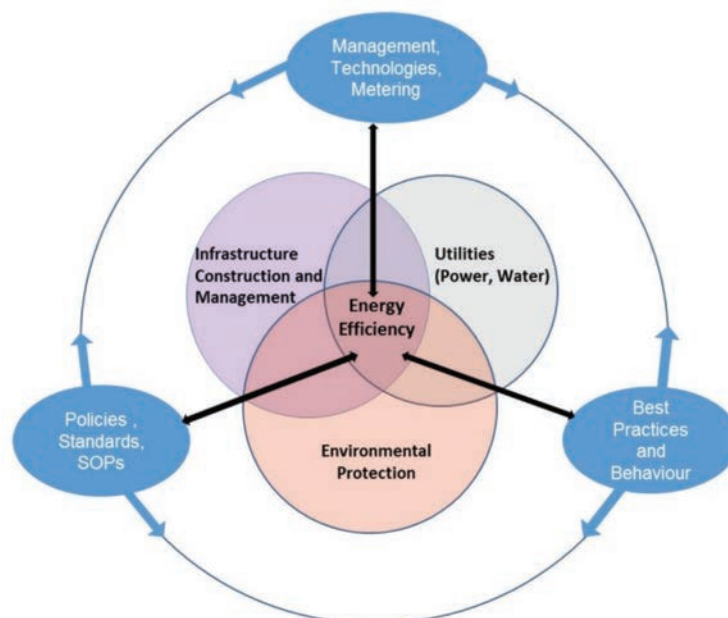


Fig. 1. Energy efficiency as a focal point of military engineering responsibilities [9, 10].

The military engineering staff, whose activities are focused on the infrastructure, environment protection and utilities, is responsible for ensuring the military units' compliance with energy policies, standards, and operating procedures, the management, technologies, and energy measurements, and the promotion of best practices and behaviour to deliver energy efficiency, Fig. 1, [9, 10].

Therefore, military engineering staff must consider the issue of energy efficiency, based on the strategic guidance, in the earliest stage of the planning process of missions and exercises. Furthermore, they also need to anticipate and adapt energy efficiency considerations, based on the information about location, environmental impact, utilized equipment, building material for construction works, and situation during the operation in the area of deployment [9, 10].

5. Energy Efficient Devices

In general, one of the key energy saving measures is to massively utilize energy efficient products and technologies, which relates to the entire life cycle of energy of any sort:

- generation and production and storage,
- distribution and supply,
- consumption, and reuse and recovery.

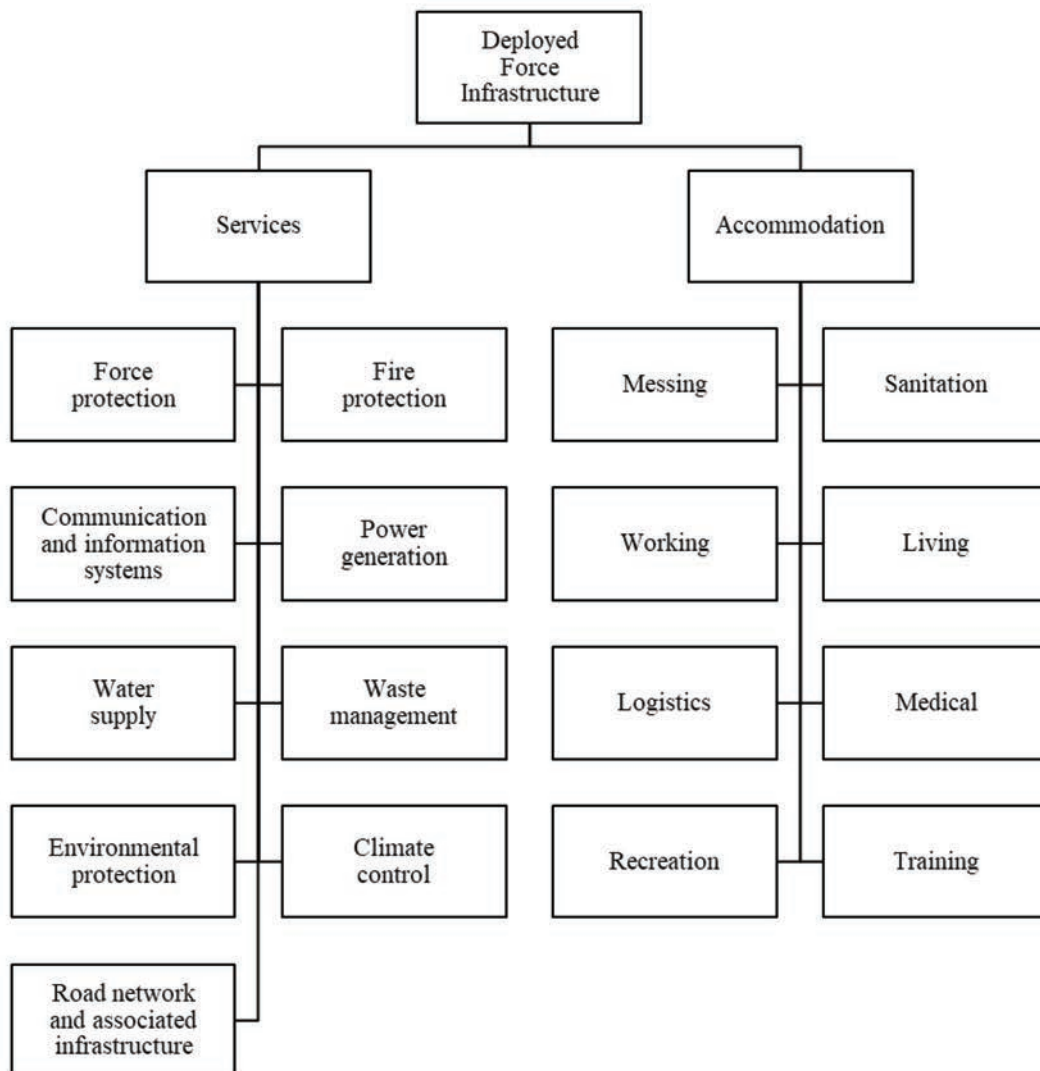


Fig. 2. Military camp functional areas –services and accommodation [11, 12].

Based on the standard model of functional areas in any deployed military camp, Fig. 2, it is possible to propose the several areas for installation of energy efficient devices and technologies [11, 12]:

- power generation – generators with enhanced performance, combined with battery storage,
- water supply – water purification and water reuse systems,
- waste management – water treatment units, including water reuse, solid waste incinerators,
- climate control – air cooling and heat production units, including ventilators and fans,
- messing – devices for refrigeration and freezing, ovens, water heaters, dishwashers,
- sanitation – water heaters, shower heads, washing and drying machines,
- working – laptops, desktops, monitors, data storage, servers, uninterruptible power supplies,
- living – replacement by LED sources, together with removal of redundant lights.

6. Conclusions

The energy efficiency is an important part of energy management system, as it is stated in Energy Management Handbook for NATO deployed force [13], where two areas of intervention are mentioned to achieve energy efficiency: technical and non-technical solutions.

In broader terms, the energy efficiency plays an essential role in the environmental protection in the military, during exercises and operations, especially when host nation is involved in this sort of activities. Within NATO, the requirements are arranged in a group of several standards called Allied Joint Environmental Protection Publications (AJEPP) [14–18], with primary aim to provide commanders and officers with best practices and standards in environmental protection.

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