SMART ENERGY TEAM (SENT) COMPREHENSIVE REPORT

On Nations' Need for Energy in Military Activities, Focusing on a Comparison of the Effectiveness of National Approaches to Reduce Energy Consumption

6 May 2015

THE SMART ENERGY TEAM (SENT) COMPREHENSIVE REPORT

on Nations' Need for Energy in Military Activities, Focusing on a Comparison of the Effectiveness of National Approaches to Reduce Energy Consumption

EXECUTIVE SUMMARY

1. Energy is an enabler to operational capabilities, fundamental to the execution and sustainment of every military mission. Furthermore, operational energy efficiency is a key component of ensuring operational resiliency and reducing the financial and logistical challenges of sustaining NATO deployments. In 2011, NATO HQ's Emerging Security Challenges Division (ESCD) introduced the topic of energy efficiency in the military as "smart energy". At the Chicago Summit in May 2012, Allied Heads of State and Government declared their consensus on the subject of smart energy, agreeing to "work towards significantly improving the energy efficiency of our military forces". This pledge was iterated in the Wales Summit Declaration in September 2014. The Wales Summit Declaration also noted the Green Defence Framework, a document agreed to by the North Atlantic Council, which gives NATO staff and national experts guidance to continue working on smart energy in a multinational, collaborative manner.

2. Following the Chicago Summit Declaration, and through the initiative of an ESCD proposal, the Smart Energy Team (SENT) was established in October 2012. It was launched with a two-year mandate to contribute to the integration of smart energy into the NATO Defence Planning Process in the medium and long term through reports, fact-finding studies and, inter alia, identify the best practices and opportunities for multinational smart energy projects within the Smart Defence framework and Science for Peace and Security (SPS) Programme. Initial work narrowed the SENT focus to land operations, specifically operational energy and camp technologies, but also led it to examine strategies, policies, structures, processes and behaviours. SENT was tasked with six specific deliverables: 1) project proposals, 2) a comprehensive report, 3) field trip assessments, 4) contributing a component to Exercise CAPABLE LOGISTICIAN 2013, 5) raising public awareness and 6) establishing an information sharing internet platform. With the support of ESCD, these deliverables were achieved.

3. SENT identified that a number of NATO and Partner nations have established strategies, policies and standards for smart use of operational energy, and many have invested significantly in research and have successfully implemented smart energy technologies. There is a desire and willingness to share knowledge and work collaboratively, yet most national initiatives have been conducted in isolation from other nations. Specifically, there is a lack of cooperative effort between defence, scientific and industrial communities and a lack of communication and collaboration between the scientific and operations communities. Energy efficiency requirements in military procurement are typically lacking, as is standardized terminology and a level of appropriate knowledge and awareness of smart energy. Interoperability is deficient. Finally, NATO lacks a smart energy strategy or framework and a champion to act as a focal point or central hub for all smart energy matters.

4. The NATO Heads of State and Government agree that its military forces should become more energy efficient. In order to do so, SENT recommends the development of a smart energy strategy with four lines for effort: 1) education and training, 2) standards and doctrine, 3) research and technology, and 4) targets and objectives.

5. **To implement the strategy, a smart energy champion should be established, single national focal points should be identified, and a smart energy working group should be inaugurated, or at the very least smart energy should be incorporated as a functional area within the current NATO working group structure**.

A. INTRODUCTION

1. Energy is an enabler to operational capabilities, fundamental to the sustainment of every military mission and operation. Whether from electricity, fossil fuels or other sources, energy powers bases and platforms, ensuring the effective performance of every military asset so that it can fulfil its tasks. Camps, vehicles and soldiers require weapon systems and sustainment equipment to support current and future energy demands. This energy demand increases financial, logistical burdens and the risk to soldiers and contractors during resupply operations.

2. The financial and logistical challenges to sustain NATO deployments[1], and the risks to operations when the supply chain is disrupted, have demonstrated the necessity to significantly improve energy efficiency and operational resiliency for the military. When combined with personnel security risks and the opportunity to enhance positive relations with the local population, these challenges have led many nations to evaluate their energy use. Smart use of operational energy[2] has become a major issue for a number of Allied and partner nations.

3. NATO has also taken operational energy efficiency into consideration. In 2011, NATO HQ's Emerging Security Challenges Division (ESCD) introduced the topic of energy efficiency in the military as "smart energy", under which it organized and initiated seminars, conferences and exhibitions. ESCD and NATO Energy Security Centre of Excellence co-organized "Innovative Energy Solutions for Military Applications" (IESMA), a conference and exhibition aimed at providing a platform for information exchange on best practices and technologies for advancing energy efficiency in the military. Several seminars were organized in early 2012, including "Energy Security – Increasing Military Energy Efficiency Conference" hosted by Allied Command Transformation (ACT). Military energy efficiency was also addressed during the Concept Development and Experimentation Conference co-organized by ACT and US Joint Staff. These and other events led to a common recommendation to establish a NATO framework for exchanging lessons learned and best practices.

4. ESCD's smart energy initiative continued to bring together a large network of national and NATO stakeholders, who started (or already were) working on the topic independently. Initially, encouraging stakeholders to share information and raise visibility on their individual activities was a challenge.

5. In the Chicago Summit Declaration in May 2012, and again in the Wales Summit Declaration in September 2014, the Alliance Heads of State and Government agreed to (continue) to "work towards significantly improving the energy efficiency of our military forces". These Declarations supplied NATO with a mandate to address energy efficiency issues in the military, and in effect advocated a multinational approach.

---

[1] In accordance with NATO Strategic Policy 2010 NATO's core tasks are collective defence, crisis management and cooperative security.

[2] The "Operational Energy" term has different context in US and Canada. NATO does not currently have a definition of this term.

6. With regard to improving energy efficiency, the Wales Summit Declaration also noted the Green Defence Framework[3]. This Framework started as a non-paper on "Green Defence", an initiative of Denmark and Lithuania, first presented to the Ministers of Defence in June 2013. It was established by NATO's Defence Planning and Policy Committee and agreed to by the North Atlantic Council in early 2014. It addresses energy efficiency and environmental protection with the overarching aim of strengthening NATO's missions. As such, the Framework gives NATO staff and national experts guidance to continue their work in a multinational, collaborative manner.

B. THE SMART ENERGY TEAM (SENT)

7. Following the Chicago Summit Declaration, ESCD submitted a proposal for the establishment of a Smart Energy Team (SENT) to nations, a project to be funded for two years under NATO's Science for Peace and Security (SPS) Programme. The SENT Concept[4] was approved by all 28 Allied nations through the Political and Partnerships Committee (PPC) in October 2012. The SENT Concept can be found in Annex A and a list of current and former SENT members can be found in Annex B.

8. According to the Concept, SENT was established as an interdisciplinary ad-hoc group of experts from various relevant fields tasked to generate cross-cutting knowledge and contribute to the integration of smart energy into NATO Defence Planning Process in the medium and long term via integrating smart energy into Smart Defence. The roles and goals of SENT included an examination of how reducing the energy requirement can shrink the logistical footprint, thus improving operational capabilities, minimizing the potential environmental consequences of NATO military activities and reducing force protection requirements. SENT's most important goal was to identify and highlight the best practices and opportunities for multinational smart energy projects within the Smart Defence framework and SPS Programme. Finally, SENT sought to identify and extend the pool of energy experts within NATO, which in turn was expected to result in proposals/incentives for more multinational NATO smart energy activities.

9. Focus. During the preparation of the SENT Concept, when potential stakeholders were approached by ESCD, it was concluded that, so far, activities to advance energy efficiency for land operations, especially in power generation and management and soldier power, had lagged behind the advances made for naval and air force capabilities. Based on this finding, ESCD approached military and civilian experts in energy and land operations to become SENT members.

10. Scope. During the SENT kick-off meeting in January 2013, the discussions between the experts and NATO stakeholders focused SENT efforts on land operations, specifically operational energy and camp technologies. Literature reviews and site visits broadened SENT expertise and led to efforts to include examination of strategies, policies, structures, processes and behavioural studies. SENT defined "smart energy" as *the methods of providing energy to the user in a practical, effective, sustainable and environmentally responsible manner*. By adopting this definition, SENT provided an umbrella that focused efforts on energy efficiency, innovations and applications. Given the work of the NATO Petroleum Committee, SENT did not focus on fossil fuels as an energy source but limited

[3] AC/281-N(2013)0096-REV4 dated 29 January 2014

[4] PPC-N(2012)0146-REV3, dated 19 October 2012.

its scope to those technologies and applications with the potential to either reduce the use of traditional energy or increase energy efficiency (or both), thereby increasing operational capability and resilience.

11. Activities. Through its activities, SENT gathered information on national undertakings and shared the information with NATO stakeholders who are providing subject matter expertise in advancing smart energy initiatives, as depicted in Figure 1. The NATO stakeholders included NATO bodies such as the Logistics Committee (LC), the Military Engineering Working Group (MILENG WG), the Environmental Protection Working Group (EPWG), Allied Command Operations (ACO), Allied Command Transformation (ACT), the NATO Support Agency (NSPA), the MILENG Centre of Excellence (COE) and the Energy Security Centre of Excellence (ENSEC COE). SENT also has contributed to NATO policies, such as the NAC-approved "Policy on Power Generation for Deployed Force Infrastructure (DFI)"[5] and the non-paper on which the "Green Defence Framework" was based.

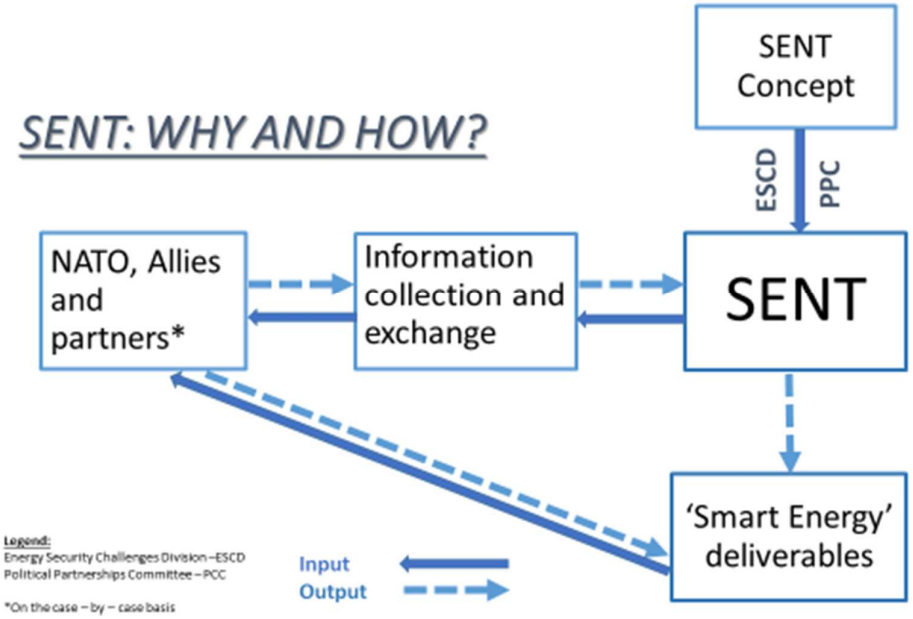


Figure 1: SENT Why and How

12. Deliverables. The SENT Concept identified six deliverables. The results achieved with respect to those deliverables are presented in Table 1.

[5] M(2014)0009 dated 11 Feb 2014; the NAC final agreement C-M(2014)0009-AS1 dated 18 Feb 2014.

Table 1: SENT Deliverables

Deliverable	Result	Reference
A package of concrete Smart Defence and SPS project proposals advancing smart energy solutions and enhancing standardisation and interoperability.	1. Smart Energy Training and Assessment Camp – SETAC (for more information see 36.3.9 and Annex D). 2. IESMA 2014 (with governmental session). 3. Battery Technology SPS project proposal.	1. Proposal in progress. 2. www.iesma.info 3. Proposal in progress.
A comprehensive report on nations' need for energy in military activities, focussing on a comparison of the effectiveness of national approaches to reduce energy consumption.	As per this document.	Delivered.
An assessment report after each field trip, identifying viable smart energy solutions, e.g. best practices, technologies and opportunities for interoperability.	10 field trips (for more details see Observations para 14).	Full reports available upon request from ESCD.
A smart energy component, consisting of smart energy solutions contributed by Allies, added to Exercise CAPABLE LOGISTICIAN 2013 (Ex CL13).	Participation in Ex CL13 of a Smart Energy Multinational Integrated Logistics Unit (MILU), led by ESCD and supported by DEU, GBR and NLD.	Ex CL13 report available upon request from ESCD.
Enhanced public visibility of nations' efforts in advancing smart energy, including through NATO feature stories, where appropriate.	Feature stories, presentations and articles.	www.enseccoe.org, www.iesma.info, Land Open Systems Architecture (LOSA), Combat Engineer 2014, national conferences, and briefings to different NATO bodies and Working Groups.
An internet platform for information sharing.	Smart Energy LibGuide	www.natolibguides.info/smartenergy

13. In addition to the assigned deliverables, three Progress Reports on the SENT activities and visits were published by ESCD (July 2013[6], February 2014[7] and March 2015[8]) and distributed to nations.

C. OBSERVATIONS AND DISCUSSIONS

C.1. Analysis of National and Multinational Technical Smart Energy Projects and Programmes

14. SENT reviewed existing technical and procedural methodologies within nations. As such, several visits were conducted from 2013 to 2014, summarized in Table 2. SENT observations highlighted the following key national and NATO considerations for smart energy: collaboration between stakeholders (military, academia and industry); lack of policies, procedures and standards; the need for closer collaboration on smart energy projects between the scientific and military agencies within NATO nations; and technology demonstrations required to validate scientific and industry solutions in a military environment.

Table 2: Summary of SENT Field Trips

Serial	Date	Event	Location	Themes
1	February 2013	Integrated Camp Energy – Technology Demonstration	Varennes, CAN	Research and Technology
2	June 2013	Ex CL13	Lešt, SVK	Education and Training; Standards and Doctrine; and Research and Technology.
3	November 2013	Defence Energy Summit	Austin, USA	Research and Technology; Education and Training; and Targets and Objectives.
4	February 2014	NATO Science and Technology Organization and Service des essences des armées	Paris, FRA	Education and Training; and Research and Technology.
5	June 2014	Smart Energy Technology Demonstration	Madrid, ESP	Research and Technology.
6	September 2014	Smart Energy Technology Demonstration	Vught, NLD	Research and Technology.
7	October 2014	Combat Engineer 2014	Munich, DEU	Education and Training; and Research and Technology.

[6] PPC-N(2013)0103, dated 2 July 2013.

[7] PPC-N(2014)026, dated 13 February 2014.

[8] AC/340-N(2015)0070

Serial	Date	Event	Location	Themes
8	October 2014	LOSA	Caerwent, GBR	Education and Training; and Research and Technology.
9	November 2014	IESMA 2014	Vilnius, LTU	Education and Training; and Research and Technology.

15. Integrated Camp Energy - Technology (ICE-T), Varennes, Canada, 19-21 February 2013 (Table 2, Serial 1).

a. Description. The ICE-T visit demonstrated the application of energy efficient equipment in a cold weather environment. It consisted of demonstrations and evaluations on four technologies: heat pump, heat recovery, fan coil and air plenum, and radiant floor heating.

b. Observations and Discussion. ICE-T was an example of a cooperative effort between defence, scientific and industrial communities. It illustrated the requirement for this cooperative approach to advance energy efficiency at the national level. ICE-T highlighted the value of technology demonstrations in validating and verifying requirements.

16. Exercise CAPABLE LOGISTICIAN 2013 (Ex CL13), Lešt, Slovakia, 13-21 June 2013 (Table 2, Serial 2).

a. Description. Ex CL13 was a multinational logistic exercise where several logistic capabilities were exercised in a real-life environment. SENT participated through the demonstration of a Smart Energy MILU. The following technologies were demonstrated: air to water generation (GBR), hydrogen fuel cell (DEU), flexible solar panels (NLD), insulated tent (GBR), and power and storage components of a micro grid (NLD and GBR).

b. Observations and Discussion. The Smart Energy MILU within Ex CL13 highlighted challenges with the interoperability of equipment in a multinational activity. It was also noted that there are limited standards for procedures and technical solutions in regards to energy efficiency. Finally, this event highlighted the fact that NATO lacks appropriate knowledge and awareness on smart energy.

17. Defense Energy Summit, Austin, USA, 10-13 November 2013 (Table 2, Serial 3).

a. Description. The annual Defense Energy Summit seeks to accelerate the development and deployment of new energy and infrastructure solutions for the US military. The conference and exhibition hosted a multinational audience, including academia and industry partners.

b. Observations and Discussion. The Summit illustrated the requirement for both a top-down and bottom-up approach to energy efficiency for the US military on a global scale. The Summit also demonstrated a collaborative approach to energy efficiency between defense, scientific and industrial communities.

18. NATO Science and Technology Organization (STO) smart energy related activities, Paris, France, 11-13 February, 2014 (Table 2, Serial 4).

a. Description. NATO STO conducts a number of projects, including some in the following subject areas: power and energy storage, alternative and renewable energy sources, propulsion, and reduced consumption.

b. Observations and Discussion. The visit revealed the vital aspect of effective communication and collaboration between the scientific and operations communities. A coordinated effort between NATO STO and NATO stakeholders is key to advancing smart energy across the spectrum of policy makers, scientists and operational personnel.

19. Smart Energy Technology Demonstration, Madrid, Spain, 11-13 June 2014 (Table 2, Serial 5).

a. Description. The visit consisted of an introduction to a Spanish technical solution related to geothermal and smart installations in Geothermal and Renewable Energy Modular Architecture (GREENMAR).

b. Observations and Discussion. GREENMAR demonstrated a high efficiency technical solution to energy which can be applied for military purposes. The project is a good example of collaboration between key stakeholders (defence, scientific and industry) as well as public and private collaboration.

20. Smart Energy Technology Demonstration, Vught, the Netherlands, 8-12 September 2014 (Table 2, Serial 6).

a. Description. SENT was presented with the following technical solutions to energy efficiency and water treatment for military applications: water analysis and purification, waste to energy recovery, solar panel container; and containerized energy storage unit. Elements of this equipment will be integrated, deployed, verified and validated by the NLD during the United Nations mission in Mali in 2015.

b. Observations and Discussion. The demonstration displayed a technical solution to energy efficiency and water treatment which can be applied for military use. The project is a good example of collaboration between key stakeholders (defence, scientific and industry) as well as public and private collaboration. It also highlighted the value of technology demonstrations in validating and verifying requirements.

21. Combat Engineer 2014, Munich, Germany, 27-29 October 2014 (Table 2, Serial 7).

a. Description. The event consisted of a multinational military and civilian symposium on new and mature technologies applicable to combat engineering. SENT and the MILENG COE provided presentations on the effective power generation and distribution for deployed force infrastructure.

b. Observations and Discussion. The presentations generated an increased awareness in smart energy within the combat engineering community.

22. Land Open Systems Architecture (LOSA), Caerwent, Great Britain, 22-25 October 2014 (Table 2, Serial 8).

a. Description. The LOSA event was an experiment aimed at developing an understanding of open systems architecture and the development of associated UK defence standards, which would inform future procurement.

b. Observations and Discussion. LOSA demonstrated a collaborative approach to energy efficiency between defence, scientific and industrial communities. It also highlighted the value of technology demonstrations in validating and verifying requirements.

23. IESMA 2014, Vilnius, Lithuania, 11-13 November 2014 (Table 2, Serial 9).

a. Description. The purpose of IESMA 2014 was to provide a platform for information exchange on best practices and technologies for advancing energy efficiency in the military. The event had two components, **a conference and an industrial exhibition**. The conference brought together experts from academia, industry and the military who exchanged knowledge and discussed lessons learned, with a focus on standard, advanced and cutting-edge energy saving technologies. The industrial exhibition gave an opportunity for innovative energy technology and solution providers to display and explain their offerings to the participants.

b. Observations and Discussion. Innovative energy solutions are a significant part of a general context of energy efficiency for NATO, which still needs to be clearly defined within the Alliance. The event highlighted the importance of cooperation between the military, industry and academia. It also highlighted the need to address the interoperability challenges resulting from disjointed national initiatives aimed at enhancing energy efficiency. It was noted that the lack of a focal point in NATO was a challenge to promoting and advancing smart energy initiatives.

24. Advanced Research Workshop (ARW) 984464 “Sustainable Military Compounds: Towards a Zero Footprint Compound”, October 2012 – June 2014.

a. Description. The project consisted of four workshops with one of the objectives focused on smart energy, specifically the development of a sustainable camp model. The model enables military planners to calculate the environmental and energy footprint for operations and provides technical solutions to assist in reducing the footprint. A secondary objective was the addition of a section on energy management within STANAG 2582, *Allied Joint Environmental Protection Publication – 2* (AJEPP-2). SENT members participated in each of the workshop syndicates.

b. Observations and Discussion. The workshops promoted discussions on energy initiatives in NATO and Partner nations. The sustainable camp model will be validated by NATO planners during NATO exercises in 2015. The workshop was a good example of a bottom-up initiative.

C.2. National Strategies, Definitions and Projects: Analysis of National Responses to SENT Questionnaire

25. The purpose of the SENT questionnaire was to gather information from all NATO nations and Partner nations on a case-by-case basis, to better understand the needs for advocating energy efficiency related to their strategies, projects and definitions. Feedback was received from 13 nations (11 NATO nations and two Partner nations). The consolidation of national responses to the questionnaire can be found in Annex C.

26. The limited number of responses received (less than 50 % of NATO nations), highlighted the difficulties in gathering an overview on national efforts related to military energy efficiency. The main issue was that many nations were unable to provide a single point of contact on smart energy. Furthermore, the data revealed a lack of systematic approaches given that the issue of energy is complex and interrelated to other national policies.

27. The following information summarizes the responses received from NATO and Partner nations to this questionnaire:

a. Only a few nations are developing or have already approved Defence Energy Strategies.

b. In most nations, strategic military energy topics are addressed in either National Defence Strategies, National Energy Strategies, National Environmental Strategies, National Military Environmental Strategies or National Security Strategies. However, for a number of nations it is abstract and no direct guidance is provided regarding further developments in the military energy domain.

c. Nations stated that a consolidated energy strategy could enhance interoperability of forces and define required resources.

d. A few nations have approved definitions of “military energy efficiency” and/or “operational energy”. In most cases these are the nations that are developing or have already approved Defence Energy Strategies. It was observed that nationally approved definitions of energy efficiency were used in both civilian and military contexts.

e. The majority of nations indicated that energy efficiency requirements for military procurement, education of personnel and cooperation with industry are enablers for enhancing military energy efficiency.

f. Nations are taking different steps to enhance energy efficiency in the military. The main national efforts towards enhancing energy efficiency in the military are concentrated in the following fields: infrastructure (e.g. heating, cooling and ventilation); reduction of use of fossil fuels; reduction of CO^2 emissions; integration of renewable energy sources (diversification); and adaptation to climate change.

g. The majority of national efforts are concentrated around improving energy efficiency for domestic defence infrastructure and only a few nations are addressing energy efficiency during deployed operations.

h. Some nations outsource the responsibility for energy generation and storage to the private sector. Moreover, a few nations discussed the idea of privatization of military utilities by allowing private capital to be invested in the military projects. This is done by allowing companies to install commercial technologies, and to conduct all maintenance on select military installations.

C.3. Analysis of NATO Allied Publications Related to Smart Energy

28. The purpose of this analysis was to better understand how smart energy is being addressed by Allied Publications (APs). The analysis showed that even though it is a relatively new topic in NATO, energy is addressed in more than 60 out of 134 APs. SENT observations highlighted the following key elements for national and NATO smart energy considerations: development of NATO standards; development of interoperability; integration of energy efficiency into capability development requirements; and increase of knowledge and awareness.

29. The analysis of NATO APs yielded the following primary observations:

a. Even though the number of APs related to energy is relatively significant, only a few are relevant to smart energy. Those APs that are directly relevant to energy topics are very conceptual or very prescriptive.

b. The majority of energy related APs standardize various aspects of fuel, from setting quality standards to technical solutions for fuel supply.

c. Several APs are being currently revised and will include aspects of smart energy. Examples are:

(1) STANAG 2536, *Allied Joint Doctrine for Petroleum* (AJP-4.7);

(2) STANAG 2406, *Land Forces Logistic Doctrine* (ALP-4.2);

(3) STANAG 2582, *Environmental Protection Best Practices and Standards for Military Camps in NATO-Led Military Operations* (AJEPP-2); and

(4) STANAG 2394, *Allied Tactical Doctrine for Military Engineering* (ATP-3.12.1).

d. The *Policy on Power Generation for DFI* and MC 469/1, *NATO Military Principles and Policies for Environmental Protection (EP)*, are two documents that are umbrella documents for further development of NATO standardization in the area of smart energy. Current reviews of EP related (e.g. AJEPP-2) and power generation related (e.g. ATP-3.12.1) NATO APs are logical and consistent steps to enhance energy efficiency in NATO.

C.4. Awareness Raising and Behavioral Change

30. SENT also reviewed the tools and initiatives related to raising the knowledge and awareness of smart energy within NATO. In many cases, education and training tools were

considered the most effective in raising soldiers' understanding of smart energy and its importance to operations.

31. Nations are taking different steps to raise knowledge and awareness on smart energy. The main national efforts are related to incorporating smart energy topics into individual education programs. It is usually done by augmenting existing education curriculums with smart energy modules (e.g. operational energy module incorporation into the Program of Instruction (core curriculum) in the United States West Point Military Academy).

32. NATO bodies and agencies are also making efforts to raise knowledge and awareness on smart energy:

a. The Military Committee (MC) has recently approved the NATO Energy Security Training and Education Plan[9], which aims to unify and synchronise the education and training effort by providing a holistic and deliberate planning approach, and by setting the conditions for success through appointment of SHAPE J5 as Requirements Authority and the NATO ENSEC COE as Department Head for Education and Training on this topic[10].

b. NATO ENSEC COE and ESCD have developed an Energy Security Strategic Awareness Course, which aims at fulfilling the need for strategic focus on global energy developments and vulnerabilities as emerging security challenges. This course will be facilitated at the NATO School Oberammergau (NSO).

c. Additionally, NATO ENSEC COE introduced the NATO Advance Distance Learning (ADL) Energy Security Awareness Course, which will open by September 2015.

d. Energy efficiency considerations are being successfully incorporated into different NATO individual training activities (e.g. NSO course M3-77, Environmental Management for Military Forces).

33. Among the other means being introduced to increase awareness, NATO ENSEC COE has launched a project entitled "Energy Efficiency: Cultural Change". This project aims to identify the cultural means which facilitate (or hinder) turning energy into a critical enabler for military operations and an efficient capability in power projection in areas of concern for NATO. Identifying these cultural means will allow NATO to strengthen and expand the culture of energy efficiency within militaries. The results of this study are to be tested during experiments, approved by authorized bodies and used for preparation of tailor-made education and training courses and exercises. The latter shall enable the development of common standards, terminology and procedures, as well as capabilities which will improve logistics and ensure better use of energy resources.

D. CONCLUSIONS

34. SENT concluded that a number of NATO and Partner nations have established strategies, policies and standards, and invested significantly in research, technologies and

[9] MCM-0169-2014, dated 19 February 2015

[10] SH/PLANS/J7/PLL-20130402/13-302449,5000/TPX0110/TT- 9381/Ser:NU0028, Outline of Responsibilities for New Education and Training (E&T) Framework, dated 31 May 2013.

successful implementation of smart energy. The very exsistence of SENT, as well as its observations, clearly indicate that there is desire and willingness for nations and international bodies to share knowledge and to collaborate toward smart energy. Initiatives at the political level in NATO HQ, such as the Green Defence Framework, further demonstrate the willingness to cooperate.

35. Notwithstanding the initiatives undertaken by many nations, they have been primarily conducted in isolation. Hence, there is a need to better consolidate national and multinational efforts and initiatives to better address energy efficiency during multinational deployed operations.

36. Further, SENT concluded that, to varying degrees, there is a lack of:

a. cooperative effort between defence, scientific and industrial communities;

b. effective communication and collaboration between the scientific and operations communities;

c. standardization including smart energy related terminology;

d. energy efficiency requirements in military procurement;

e. appropriate knowledge and awareness on smart energy, and other tools and mechanisms to institute behavioural change;

f. adequate adoption of energy efficiency during deployed operations; and

g. interoperability.

37. In addition, NATO has no comprehensive smart energy strategy, which would provide a framework for the issues identified above. The Alliance also lacks a champion to act as a focal point and a central hub for all smart energy matters.

E. RECOMMENDATIONS

38. Based on the observations, discussions and conclusions, SENT recommends for NATO to develop a strategy on smart energy, with supporting road maps, by establishing four lines of effort as depicted in Figure 2: 1) Education and Training; 2) Standards and Doctrine; 3) Research and Technology; and 4) Targets and Objectives.

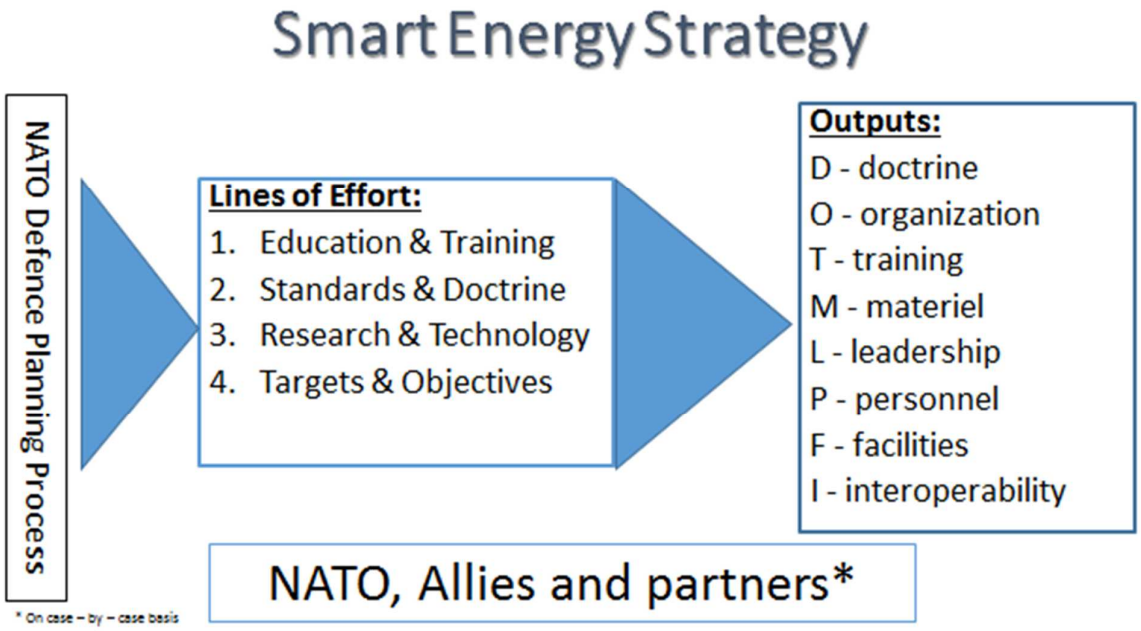


Figure 2: Smart Energy Strategy

39. Education and Training.

a. Smart energy education and training should have following three objectives:

(1) to incorporate smart energy awareness into the military routine of the individual service person's education

(2) to develop smart energy awareness as early as possible in the career of all personnel. Career steps should include instruction that matches their increase in responsibility

(3) to increase awareness in senior commanders of their smart energy responsibilities

b. Smart energy training should as much as possible be incorporated into existing training programs, including best practices, lessons learned and guidelines. Training opportunities include:

(1) Individual Training**.** The basic training courses, Junior Officer courses, and Non-Commissioned Officer (NCO) courses may be the best opportunities for the majority of smart energy awareness, procedures and supervisory instruction.

(2) Collective Training. This provides the opportunity for initiatives such as the presentation of standing orders for exercises and training areas, waste handling and pollution prevention. Collective training exercises also provide excellent opportunities to raise awareness through the use of smart energy deployable equipment such as incinerators and waste treatment systems. Military exercises could be conducted with imposed fuel limitations, and

introduce new energy management tools and resources (e.g. alternative energy).

(3) Continuation Training. Smart energy knowledge and training will need to be continually updated and refresher training provided as legislation and best practices develop.

c. Education and training tools (e.g. aids, computer based training) for achieving behavioural and cultural change should be developed and implemented.

d. In line with NATO's approved Education and Training Directive[11], SENT recommends the establishment of a Requirement Authority and Department Head for smart energy.

e. NATO should support the establishment of multinational smart energy training and testing site similar to the ones that already exist in individual nations (e.g. Base Camp Integration Lab (USA)), aimed at improving the interoperability of energy efficiency solutions. SENT supports the establishment and development of a Smart Energy Training and Assessment Camp (SETAC). A SETAC concept can be found in Annex D. The Conceptual Model developed during the SPS ARW "Sustainable Military Compounds: Towards a Zero Footprint Compound" should be used as a planning and validation tool in SETAC.

40. Standards and Doctrine.

a. Energy should be properly addressed in NATO planning and standardization processes. Minimum smart energy related standardization and interoperability requirements should be considered in capability development processes in order to ensure that forces can conduct the full spectrum of NATO missions within the framework of NATO-led multinational operations. In order to ensure a comprehensive capability, the complete spectrum of joint capabilities integration development system (DOTMLPFI[12]) should be considered.

b. NATO should develop definitions for "smart energy" and "operational energy". In defining these terms, it is important to understand that while power generation (including energy consumption, storage and distribution) is a key aspect of improving energy efficiency, it only partially addresses the topic of smart energy.

c. Additionally, SENT recommends to:

(1) consider tested and proven energy reduction methods in current and future NATO standards and doctrine (e.g. Generic Soldier Architecture, Generic Vehicle Architecture and Generic Base Architecture (GBR), power generation, renewable energy)

(2) include and synchronize smart energy considerations in the applicable APs.

[11] Bi-Strategic Command Directive 75-2, Education and Training Directive, 2 October 2013, (http://www.act.nato.int/bi-sc-75-2).

[12] Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities, Interoperability

41. Research and Technology.

a. Results of smart energy related STO activities should be disseminated amongst relevant NATO committees and working groups, especially those which draft NATO APs and standardization documents.

b. Nations should strengthen the engagement between the public and private sectors (including knowledge institutions) in order to enhance collaboration as outlined in the Framework for NATO-Industry Engagement[13].

42. Targets and Objectives.

a. Nations should consider smart energy in NATO and national planning and procurement processes.

b. NATO should conduct a comparison of national targets and objectives related to smart energy. This analysis should be used to quantify how NATO develops its own targets and objectives on smart energy. Measures of effectiveness should be determined to understand the benefit and monitor the progress of the stated targets or objectives.

c. For the purposes of operational planning, resource management, procurement, education and training, a NATO smart energy database should be developed. NATO should identify a custodian for this database (e.g. NATO ENSEC COE).

43. Implementation. In order to implement the proposed smart energy strategy, SENT offers the following additional recommendations:

a. Establish a NATO Smart Energy champion, who:

(1) acts as a focal point as agreed in the Green Defence Framework

(2) functions as a hub for information exchange and advice

(3) coordinates the establishment and maintenance of the smart energy database

(4) ensures the maintenance of the Smart Energy LibGuide internet site (www.natolibguides.info/smartenergy) on the NATO Multimedia Library page

b. Establish single national representative points of contact who will cooperate with NATO on energy efficiency initiatives.

c. Inaugurate smart energy working group or incorporate smart energy as a functional area within the current NATO working group structure.

---

[13] Framework for NATO-Industry Engagement, 2013, (http://innovationhub-act.org/sites/default/files/u2416/FNIE%20Brochure.pdf).

Annex A

Smart Energy Team (SENT)

NATO Science for Peace and Security Programme

Improving Energy Efficiency for Military Forces (and their Support)

CONCEPT – MAIN BODY

19 October 2012

Please note:
this is only the main body of the SENT concept, document PPC-N(2012)0146-REV3, dated 19 October 2012. The calendar and the contacts of SENT members have been separated from this main body as Annexes, as they will be continuously updated:
Annex 1: Calendar
Annex 2: Contact details

INTRODUCTION

1. In the Chicago Summit Declaration Allied Heads of State and Government agreed that NATO should work "towards significantly improving the energy efficiency of our military forces", hereafter referred to as smart energy. In the Report to the Heads of State and Government on Progress Achieved in the Area of Energy Security, Allies indicated that NATO will "focus practical work on significantly improving the energy efficiency of the military forces (and their support) of NATO, individual Allies, and partners" (para 30.2 of PO(2012)0219). This proposal is one activity that would contribute to the implementation of the Chicago Summit recommendation in the field of energy efficiency of the military.

2. Smart energy has become a major topic for a number of Allied governments who seek to reduce the energy dependency in order to increase capabilities and the security of their militaries. Various national field studies have been undertaken to establish where opportunities to improve energy efficiency in the military exist.

3. These studies clearly show that there is a substantial potential to, inter alia, reduce energy consumption, especially in military compounds. In the light of the dynamic security

environment and constrained economic circumstances, investing in smart energy by improving management, processes, training and technologies can improve capabilities and optimize scarce resources.

4. Advancing only with national approaches, however, bears the risk of driving the capabilities of nations apart. The longer nations wait before exchanging knowledge and standardising innovative capabilities, the more difficult it will become for the Alliance and its partners to share these capabilities and to make them interoperable.

5. Therefore, it is of utmost importance to get an overview of existing technologies and processes for advancing smart energy and to identify those that could be integrated into NATO's Smart Defence framework.

6. Smart Energy is a cross-cutting subject that is touched upon by many NATO committees and working groups. Furthermore, the topic of smart energy is still in its infant stage and therefore requires further research and development (R&D) in which some nations are investing heavily. These opportunities can be best understood by subject matter experts from academia and the military, who must work in close contact with policy makers and standardisation groups.

7. Combining R&D knowledge with policy making and standardisation at an early stage would offer the advantage of sharing resources right from the beginning and avoiding duplication. Relevant subject matter expertise is available in some NATO and partner nations, but it requires a process to enable experts to share knowledge and transfer their findings and recommendations to other nations through NATO committees and senior advisory bodies.

RECENT NATO ENERGY EFFICIENCY ACTIVITIES, PARTLY FUNDED BY SPS

8. As a first step to understand the extent of knowledge and activities in energy efficiency and alternative energy solutions, ESCD co-organized the event "Innovative Energy Solutions for Military Applications" (IESMA 2011) that was held on 10 November 2011 in Vilnius, Lithuania. This conference brought together over 200 experts from academia, the military and the private sector. It was co-organised by the Lithuanian Energy Security Centre of Excellence, the Ministry of Foreign Affairs of Ukraine, NATO Support Agency (NSPA) and NATO's Emerging Security Challenges Division with support of the SPS Programme.

9. A report on IESMA 2011 can be found at reference PPC(EAPC)N(2011)0061.

10. One of the recommendations of the experts was to organise a briefing by those nations that have already put in place energy efficient and renewable energy solutions in their military activities. Accordingly, ESCD organized a seminar on energy efficiency in the military at NATO HQ on 5 March 2012.

11. Allied Command Transformation (ACT) hosted the 'Energy Security – Increasing Military Energy Efficiency Conference' on 9 February 2012. Its findings included the recommendation to establish a framework for exchanging lessons learned and best practices and to develop of a strategic training plan.

12. Following these events, as well as discussions with experts, ESCD concluded that there were only a handful of experts from a few countries that have been strongly engaged in practical scientific energy efficiency activities for the military. Moreover, many of these experts were asking ESCD for help in sharing their expertise across NATO and advancing smart energy towards interoperability.

THE SMART ENERGY TEAM (SENT)

13. Based on the above rationale, the Emerging Security Challenges Division proposes to establish an interdisciplinary ad-hoc Smart Energy Team (SENT) under the SPS Programme, comprising experts from various relevant fields who will generate cross-cutting knowledge and steer the process of integrating smart energy into Smart Defence. While focussing on smart energy solutions with a quick return on investment, SENT will also contribute to the integration of smart energy into the NATO Defence Planning Process in the medium and long term through reports, fact-finding studies and identifying smart energy priorities in the Smart Defence framework.

Role and Goal of SENT

14. SENT fulfils the role of a steering group to draw together the various ongoing activities on smart energy, which otherwise risk to remain disconnected. SENT serves to link activities and expertise on smart energy and facilitate further R&D.

15. With the view to incorporating smart energy into NATO defence planning, SENT will help NATO to establish a hub for pooling scientific knowledge and relevant data, including the results of ongoing R&D activities, sharing information and best practices, and facilitating standardisation and interoperability in the domain of energy efficiency in the military.

16. SENT will examine how reducing the energy requirement can shrink the logistical footprint, thus improving operational capabilities, minimising the potential environmental consequences of NATO military activities and reducing the force protection obligations. SENT's most important goal is to identify and highlight the best opportunities for multinational smart energy projects within the Smart Defence framework and Science for Peace and Security (SPS) Programme.

17. Furthermore, SENT will seek to identify and extend the pool of energy experts within NATO which in turn should result in proposals/incentives for more multinational NATO activities and a better representation of energy experts in NATO working groups, including the SPS Independent Scientific Evaluation Group.

Building on existing activities

18. SENT will take into account the cross-cutting character of smart energy by pooling the work of relevant NATO bodies, committees and groups, and will interact, inter alia, with NATO's Defence Investment Division, Defence Policy Planning Division, the Logistics Committee, their subordinated groups (including the Petroleum Committee and the NATO Senior Joint Engineer Conference), relevant NATO Centres of Excellence (COE) as well as the inter-divisional NATO Energy Security Task Force. Structured cooperation with the new Science and Technology Organization (STO) will ensure coherence in the acquisition and provision of S&T advice and will strengthen the link to the NATO Chief Scientist as the advisor to NATO's leadership.

19. SENT will also closely keep abreast of other activities related to energy efficiency in the military and environmental protection, such as the studies by the Energy Working Group of the Quadrilateral Logistical Forum and the SPS project "Sustainable Operational Military Compounds - Toward a Zero Footprint Compound".

Structure, Members and Observers

20. SENT membership will be open to Allies and, on a case by case basis, to partner nations that can contribute substantial knowledge and demonstrate expertise and capabilities.

21. Based on intentions already expressed by various nations, it is proposed to bring together 8 subject matter experts, 6 of which will be from Allied nations (Canada, Germany, Lithuania, the Netherlands, UK and US) and 2 from partner countries (Australia and Sweden) who will be supported under the SPS Programme *(see Annex 2)*.

22. The proposed SENT members were chosen for their expertise and involvement in large energy efficiency projects, in which nations have already put a great effort. It turned out that of *force-contributing partner countries* only Australia and Sweden had such expertise. As was the case with NATO countries, the experts of these two partner countries have asked NATO to help them with sharing the knowledge they gained and advancing interoperability.

23. The Energy Security Centre of Excellence is also part of SENT and will be one important platform for communicating the findings and reports of SENT. While SENT will work on the subject matter expert level, the Energy Security Centre of Excellence will use the findings for drafting standardisation agreements and developing concepts at a strategic level, under the guidance of (ACT).

24. IS, IMS and NATO bodies, such as ACO, ACT, NSA, NSPA, NATO MILENG COE and STO, and relevant NATO Working Groups, such as the Environmental Protection Working Group (EPWG), will be invited to join SENT meetings as regular observers.

25. ESCD will coordinate and facilitate the SENT meetings.

26. The structure of SENT, as described above, will not be subject to change for the envisioned duration of two years, unless agreed by the PPC.

Communication

27. The aim of SENT is to assist force-contributing Allies and partner countries to increase interoperability of smart energy solutions in the military. It is expected that the establishment of SENT and its activities will bring smart energy from the periphery to the centre of NATO and raise the interest of those nations that are not yet involved. It will eventually benefit *all* force-contributing countries and therefore NATO's future missions.

28. All SENT deliverables will be shared with Allies and the two partner nations represented in the SENT. The main channel of communication will be through written reports and oral briefings in the PPC, NATO committees and working groups.

29. Furthermore, public strategies, studies, reports and articles on energy efficiency that are publicly available will be collected on the LibGuide platform "Smart Energy". The purpose is to be able to easily refer to such publications and to raise the interest of other nations to join these efforts in the future.

30. The sharing of SENT deliverables with partners will be carried out in accordance with existing NATO Security Arrangements as well as with the provisions of the Supporting Document on Information and Intelligence Sharing with Non-NATO Entities (AC/35-D/1040-REV3).

Partnership

31. SENT will have close working relations with two NATO partners: Australia and Sweden.

32. Other partner nations, however, will benefit from the collection of publicly available papers which should trigger their interest in starting their own energy efficiency programmes. Upon completion of the SENT project and subject to PPC approval, ESCD will organise a workshop dedicated to partner nations with SENT, force-contributing partners and observers sharing views and experiences. Nations and experts that want to participate will be invited to brief the workshop attendees on their own smart energy initiatives**,** upon PPC approval.

33. Nations also have the opportunity to participate in specific bilateral or multinational projects focused on identified issues and solutions. It will be one of SENT's tasks to recommend which smart energy related projects would be most beneficial for NATO's future missions, and thus steer the efforts of force-contributing nations towards the most efficient and effective way ahead.

Public Diplomacy

34. As a support to SENT's work, ESCD and PDD will jointly work on raising awareness of national efforts on advancing energy efficiency. Standard public diplomacy products, for example NATO news stories, NATO feature stories and NATO TV channel videos, will be

produced on activities, such as the testing of new insulation material, the implementation of smart grids and training activities on energy efficiency in the military. The work will, of course, be subject to authorisation by the respective nation and its experts. ESCD has already been approached by several scientific and technical experts, as well as their authorities with the request to help them showcase their efforts and successes.

Deliverables

35. Scientific, technical and others:

- A package of concrete Smart Defence and SPS project proposals advancing smart energy solutions and enhancing standardisation and interoperability in time for the next NATO Summit;
- A comprehensive report on nations' need for energy in military activities, focussing on a comparison of the effectiveness of national approaches to reduce energy consumption;
- An assessment report after each field trip, identifying viable smart energy solutions, e.g. best practices, technologies and opportunities for interoperability;
- A smart energy component, consisting of smart energy solution contributed by Allies, will be added to the exercise Capable Logistician 2013 (CL13). CL13 is organised by the Multinational Logistics Coordination Centre (MLCC) and Slovakia as the host[14] (June 2013);
- Enhanced public visibility of nations' efforts in advancing smart energy, including through NATO feature stories, where appropriate;
- An internet platform for information sharing.

Preliminary schedule of activities

36. To ensure the most efficient use of the budget, participation of the SENT members in the activities below will be subject to availability and need, as decided by ESCD and SENT. SENT members are not expected to participate as a full team at all meetings and visits. However, it is deemed important that SENT will meet as a whole team on three occasions: the kick-off meeting at NATO HQ in 2012; the meeting at the NSPA in Luxembourg in March 2013; and the concluding SENT meeting in 2014.

Calendar

37. The main dates are the following:

[Editorial comment: as the calendar is being updated regularly, it has been removed from the main body of the concept and is now treated as SENT Concept Annex 1. The original

[14] "The aim of the exercise is to assess the interoperability of logistics system and equipment, and the commonality of procedures, in order to make recommendations for improvements, and to enhance the overall interoperability of logistics systems and the standardization of procedures in current and future coalition operations." (from ANNEX A of Calling Notice for CL 13 Main Planning Conference, MLCC(CL13)N(2012)0003. The IS has been in contact with the organizers of the event with regard to the smart energy component.

calendar is still available with the original SENT concept, dated and approved by the PPC on 19 October 2013.]

Relevance to Security and Defence

38. *Improved operational capabilities*: Reduced energy consumption will mean increased range, endurance and agility as well as provide commanders with increased operational flexibility and resilience.

39. *Increased security in the theatre*: Fuel supplies to operational bases are highly vulnerable to attack and require military protection. Reducing the logistical footprint through lesser energy and fuel consumption will mean reduced risk of casualties and reduced risk of disruption to the operational tempo.

40. *Reduced energy costs*: Saving on fuel means that constrained defence budgets can be used to support other ongoing operations and/or invest in future capabilities, which will be important due to the growing complexity of military operations.

Key Stakeholders and End-users

41. SENT (national), NATO IS bodies: ESC, DI, DPP, OPS, PDD; Allied Command Operations (ACO), Allied Command Transformation (ACT), Science and Technology Organisation (STO), International Military Staff (IMS) Logistics, Military Engineers Centre of Excellence (MILENG COE), Energy Security COE, NATO Support Agency (NSPA), Military Committee (MC), Logistics Committee (LC), Committee for Standardization (CS), NATO Standardization Agency (NSA), the Conference of National Armament Directors (CNAD), the Civil Emergency Planning Committee (CEPC) and relevant NATO Working Groups (WG), such as the Environmental Protection WG (EPWG) and the Military Engineers WG (MILENG WG).

Total Budget of SENT for 2 Years

42. SENT members will have a professional affiliation and their salaries and overhead costs are paid by their respective nation. The SENT budget will not cover any salaries.

43. The project related travel expenses of SENT members will be covered for two years under the SPS Programme. A possible continuation of the SENT beyond this date will be subject to an evaluation by the Political and Partnerships Committee.

44. With 8 members, whose travel, accommodation and subsistence will be covered under the SPS Programme, and other miscellaneous expenses, the SENT budget will amount to 100,000 EUR. For three concrete missions (see paragraph 43) the attendance of all SENT members is required. For these missions an estimated amount of 2,000 EUR per SENT member and mission (travel and subsistence for an average mission duration of four days), i.e. 48,000 EUR is envisioned.

45. For the remaining missions, an average of four SENT members will take part in the activities. Based on the above calculation, an amount of 48,000 EUR is envisioned.

46. The remaining 4,000 EUR will cover the costs of the smart energy exhibition at the CL13 exercise.

47. The expenses in connection with the transport of “smart energy” equipment to CL13 will be covered by the participating nations.

48. Observers will join on a self-funded basis.

49. Hence, the following budget overview can be given:

SENT full team missions (3 missions, 8 persons travel each)	€48K
SENT selected team missions (6 missions, average 4 persons travel each)	€48K
SENT Smart Energy Exhibition expenses for CL13 exercise	€4K
Total	€100K

Annex 1of SENT Concept

NATO SMART ENERGY TEAM (SENT)

Calendar of Activities

[Editorial comment: The updated calendar replaces the one following item 37. of the SENT Concept, reference PPC-N(2012)0146-REV3.]

2013

- **January 21-22**, Brussels, BELGIUM: The SENT Plenary Meeting at NATO HQ aimed at getting an overview of national and NATO activities related to smart energy, drafting the Terms of Reference and agreeing on the tasks and responsibilities for SENT. *(1st field trip)*
- **February 19-21**, Varennes, Quebec, CANADA: The SENT Plenary Meeting resulted in the first project ideas for Smart Defence. The participants also attended a demonstration of the "Integrated Camp Energy Technologies" (ICE-T) organised by the "Defence Research & Development Canada", Department of National Defence (DND). ICE-T showed the effectiveness of modern energy efficient technologies and materials in cold climates. *(2nd field trip)*
- **June 13-21**, Let, SLOVAKIA: As one of SENTs deliverables, the Smart Energy Multinational Integrated Logistic Unit (MILU) was set-up at the military exercise "Capable Logistician 2013" (CL13). The purpose of this MILU was to raise awareness, demonstrate possible solutions and give recommendations for NATO standardization agreements. Equipment and manpower were contributed by DEU, GBR and NLD using national funds. Results: Over 500 CL13 visitors; several news stories, articles and video clips; recommendations by SENT included in the overall CL13 evaluation report that has been provided to allied nations in autumn 2013. *(3rd field trip)*

- **September 16-18**, Brussels, BELGIUM: Plenary Meeting at NATO HQ aimed at bringing together NATO stakeholders for information exchange, developing concrete SPS activities and discussing the way ahead. SENT also briefed the NATO Political and Partnerships Committee (PPC) on its activities, results and recommendations. *(4th field trip)*

- **November 5**, Fort Devens, Massachusetts, USA: Several SENT members attended the VIP day of the "Base Camp Integration Laboratory" (BCIL) demonstration where various equipment and material for reducing energy consumption were showcased. *(5th field trip)*

- **November 11-13**, Austin, Texas, USA: Several SENT members participated at the "Defence Energy Summit" where a conference and an industrial exhibition brought together international key players on energy efficiency, including the private sector. This event helped SENT to get a good idea about the advancements in the US and to make broaden contacts for future cooperation. *(6th field trip)*

2014

- **February 11-13**, Paris, FRANCE: Following the invitation by the French Ministry of Defence, SENT met, among others, with the Directorate for Strategic Affairs, the Defence Staff (EMA), the Armaments Procurement Agency (DGA), and visited the

French Joint Fuel Service and Defence Industry Service, and the International Energy Agency. The vists were followed by a Plenary meeting at the NATO STO/Cooperative Support Agency. *(7th field trip)*

- **May 5-8,** Stockholm, SWEDEN: meeting focused on the first draft of the final comprehensive report.

- **11-13 June** Madrid, SPAIN: SENT Several SENT members visited the Spanish Ministry of Defence *(8th field trip)*

- **September 8-12**, Vught, the Netherlands: meeting focused on continuing the comprehensive report and on drafting a first concept for a Smart Energy Training and Assessment Camp (SETAC). The Royal Netherlands Army also organised an exhibition with international companies demonstrating various aspects of energy production, storage and consumption. SENT was joined by additional experts. (*10th field trip*)

- **October, 21-23**, Caerwent Training Area near Chepstow, Wales, UK: meeting to continue drafting the comprehensive report and to participate at the "Land Open Systems Architecture" (LOSA) demonstration. LOSA has been triggering the movement of a generic framework for base camp, soldier and vehicle equipment. (*11th field trip*)

- **November 12-14**, Vilnius, LITHUANIA: Several SENT members participated at the SPS supported conference and exhibition “Innovative Energy Solutions for Military Applications 2014” (IESMA 2014) that brought together experts from academia, industry and the military (SPS 984864). (*12th field trip*)

2015 - PLANNED

- **February 3-5**, Brussels, BELGIUM: SENT plenary meeting to continue drafting the comprehensive report. SENT offers to brief the nations on their findings and progress. (*13th field trip*)

- **May, 6-7,** NATO HQ, Brussels, BELGIUM: Final SENT Plenary meeting to present the final version of the SENT comprehensive report. (*15th field trip*)

Annex 2 of SENT Concept

Smart Energy Team (SENT)

SENT Contact Details

(updated: 16 February 2015)

[Editorial comment: as the membership and contact details are being updated regularly, this has been removed from the main body of the concept and is now treated as SENT Concept Annex 2. The original list of potential SENT members is still available with the original SENT concept, dated and approved by the PPC on 19 October 2013.]

NATO countries

CANADA

Maj. Henry Berghuis
Canadian Joint Operations Command
Joint Engineer Environment
National Defence Headquarters
101 Colonel By Drive, Ottawa, On K1A-0K2
Tel.: +1 613-945-2017
Fax: +1 613-990-3417
Email: henry.berghuis@forces.gc.ca

GERMANY

Michael Schulz, Dipl. Ing (FH)
Technischer Regierungsrat (OF-3)
Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw)
Department of Power Supply & Energy Management for Bulk Consumer
Ferdinand-Sauerbruchstr. 1
56073 Koblenz
Tel.: +49 (0) 261 400-5870
Fax: +49 (0) 261 400-6622
Email: michaelschulz@bundeswehr.org

LITHUANIA

Rasa Pažarauskienė, Expert
Doctrine & Concept Development Branch
NATO Energy Security Centre of Excellence
Silo str. 5A, LT-10322 Vilnius, Lithuania
Tel: +370 706 71012
Mobile: +370 686 71645
Email: rasa.pazarauskiene@enseccoe.org

THE NETHERLANDS

Kap Kennard Hofland
Staff Officer (NLD) Force Support Engineering
Military Engineering Centre of Expertise
Engineer Training Centre
Brederodekazerne
Lunettenlaan 201
Building H, Room 105
5263 NT Vught
The Netherlands
Tel: +31 (0)73 688 20 12
Mobile:+31 (0)6 11 08 57 51

Email : K.Hofland@mindef.nl

UNITED KINGDOM

James W McMenemy, IEng MIET
Director Technical – Technology Delivery
Logistic Systems Project Manager
Ministry of Defence
Larch 3A #2316
MOD Abbey Wood South
BRISTOL BS34 8JH
Tel: +44 (0)1179134012
Mobile: 0+44 7810181239
Email: DESTECH-TDLogSys1@mod.uk

UNITED STATES OF AMERICA

Desmond T. Keyes
Program Manager,
Army Operational Energy vice Acting Chief,
Operational Energy and Contingency BasingArmy G-4, G-45/7
Department of Defence (DOD), USA
500 Army, Pentagon, Room 1D343-540
Washington, DC 20310-0500
Tel COM: +1 703.692.5128 – work
BB: +1 202.446.8725
Mobile: +1 240.273.8105
E-Mail: desmond.t.keyes.civ@mail.mil

Partner countries

AUSTRALIA

Assistant Director Strategic Fuel - Futures
Fuel Services and Logistics Assurance Branch Department of Defence
CP4-2-099
PO Box 7913
CANBERRA BC ACT 2610
Tel: +61-(0)2 612 70018
Fax:+61-(0)2 626 64961
Moble: +61-(0)423 035228
Email: robert.barnes2@defence.gov.au

SWEDEN

Naznoush Habashian
Head of Research and Development (R&D)
Swedish Armed Forces HQ - Joint Environmental Dep.
Banérgatan 62
10785 Stockholm, Sweden
Tel. +46 8 788 8585
Mobile: +46 73-096 85 85
Fax: 46 8 788 8419
Email: naznoush.habashian@mil.se

Annex B

Smart Energy Team (SENT)
Improving Energy Efficiency for Military Forces (and their Support)
SENT Members

Rasa PAŽARAUSKIENĖ, Lithuania – NATO Nation Co-Director

Ms. Pažarauskienė studied political science and international relations in Vilnius University and serves as an expert for concept and doctrine development at the NATO Energy Security Centre of Excellence (NATO ENSEC COE), located in Vilnius, Lithuania. At this capacity she is responsible for development of NATO energy security related concepts, doctrine and procedures. Prior to joining the NATO ENSEC COE, Ms Pazarauskiene was and Adviser for Policy Planning in the Energy Security Centre under Ministry of Foreign Affairs of the Republic of Lithuania. She was, inter alia, responsible for the Concept development for the NATO Energy Security Centre of Excellence. Prior to joining Energy Security Centre she worked as a Senior Analyst at Defence Policy And Planning Department of the Ministry of National Defence of the Republic of Lithuania. She has also organized the SPS funded conference & exhibition "Innovative Energy Solutions for Military Applications" that took place in Vilnius in November 2011 (IESMA 2011) and in November 2014 (IESMA 2014). She also co-organised energy related events with ACT and is NATO country co-director of SENT since its launch in October 2012.

Naznoush HABASHIAN, Sweden – Partner Nation Co-Director

Ms. Habashian is currently Head of R&D at the Swedish Armed Forces HQ, Joint Environmental Department, a position she has held since 2006. In this position, she awards contracts to Swedish Defense Material Administration (FMV), Swedish Defense Research Agency (FOI), colleges, and other institutions in order to advance and develop environmental matters in military context. She has two Masters of Sciences (M.Sc.) both from the Royal Institute of Technology in Stockholm, Machine Design and Environmental Management She has an Industrial Ph.D. at Stena Metall AB & Royal Institute of Technology. She also has a Master of Business Administration (MBA) from IHM Business School in Gothenburg. She has been engaged in many international programs. Throughout these years she has been involved in UN, EU and NATO environmental engagement and programs. She has been acting the focal point and national expert. Ms. Habashian has a deep knowledge in energy related challenges in a military context. The last years she has been the Partner for Peace (PfP) Co-director for two NATO SPS programs: NATO Zero Foot Print camp and SENT.

Michael SCHULZ, Dipl. Ing. (FH), Germany

Mr. Schulz is an engineer in the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) Department of Power Supply & Energy Management for Bulk Consumer. He designed and implemented different power generation solutions in the German camp in Mazar-i-Sharif, Afghanistan and gained extensive experience in other German power projects. He succeeded the former German SENT member in September 2013.

Rob BARNES

Mr. Barnes is an Assistant Director for Strategic Fuel – Futures in Fuel Services and Logistics Assurance Branch Department of Defence in Australia. He is a former Royal Australian Air force (RAAF) logistics & movements officer with nearly 30 years military experience. Mr. Barnes succeeded Andrew Gillespie as Australia's SENT member in August 2014.

Henry BERGHUIS, Maj, Canada,

Maj Berghuis is a staff officer (Joint Engineer Environment) in the Canadian Joint Operations Command, responsible for environmental management support to Canadian operations overseas and in the Canadian North. From July 2010 to July 2014, he was the Environmental Management Staff Officer at NATO's Supreme Headquarters Allied Powers Europe (SHAPE). He succeeded Lloyd Chubbs as Canada's SENT member in August 2014.

Albert de HAAN, Maj., The Netherlands

Maj. Albert de Haan has studied engineering in The Hague (The Netherlands). As a royal Engineer he has many positions in the field / discipline of construction. As the head of the branch Force Support he is responsible for basing, waste, water and energy. By virtue of his position, knowledge and experience he took part in several national and international working groups with a focus at energy, water and basing (infra). He has also written a defense study related to future basing with a lot of recommandations about energy, force protection, doctrine and water (waste). Finally he maintain many contacts with a lot of companies and scientific institutes related to energy, water and infra.

Desmond KEYES

Mr. Desmond Keyes is a retired military officer with over 30 years of logistics, operational energy and contingency basing expertise. In his current job he is the United States Army Program Manager for Operational Energy (OE) which includes Contingency Basing (CB) initiatives. He was the co-architect for the development of both the OE/CB Lines of Efforts designed to support not only the Army but Multinational and NATO strategies / frameworks.

James W MCMENEMY, IEng MIET, UK

Mr. McMenemy is an Engineer/Project Manager within the UK MOD, employed in Defence Equipment and Support (DE&S), Director Technical – Technology Delivery - Logistic Systems. As the trials/project manager, he delivered the UK's PowerFOB initiative in Cyprus and Kenya (a two year tactical base smart microgrid project) and currently works in the team delivering the UK Land Open Systems Architecture Demonstrations. He has participated in SENT activities since he succeeded the former UK SENT member Thomas Barker in October 2013, although he has participated in SENT related activities since Feb 2013 and delivered the UK element to support the Smart Energy activity during CL13(Slovakia). He is also the deputy to the UK ENSEC COE Steering Group member (Dr Rachel Leslie).

Former SENT members:

Tom BARKER, IEng MIET, UK

Tom Barker is a Chartered Engineer/Project Manager within the UK MOD, employed in Defence Equipment and Support (DE&S), Director Technical – Technology Delivery - Logistic Systems. He participated in the UK's PowerFOB initiative in Kenya. He currently works in the team delivering the UK Land Open Systems Architecture Demonstrations and developing the DE&S Additive Manufacture Strategy. He participated in the initial SENT activities and was a member of the UK team supporting the Smart Energy activity during CL13 (Slovakia).

Lloyd CHUBBS, LCol., Canada,

LCol Chubbs is a military engineer who has been working on energy issues since 2011. He worked with the Canadian Joint Operations Command/Joint Engineer Environment, where he worked for four years until he took over the position of SHAPE Staff Officer Environmental Management in July 2014. During the years 2012 till 2014, LCol Chubbs co-directed the SPS Advance Research Workshop "Sustainable Military Compound" and was a SENT member from its beginning in October 2012 until August 2014.

Carl-Sibrand FÖRSTER, Germany

Mr. Förster was Defence Technical Test Center for Engineer and General Field Equipment. He was a German SENT member from January 2013 till September 2014.

Ltcol Paul van der HEUL.

Ltcol Paul van der Heul was the commander of the Dutch Military Engineering Work Force (from 2010 -2013). In his position / period he was responsible for designing and building of several mission camps in Afghanistan, Turkey and Dubai. So it was his daily business to work with energy, water and waste. He had also an engineering degree (master degree) in water management (with a lot of connections to energy savings).

Andrew GILLESPIE, Australia

Mr. Gillespie was a Director Strategic Fuel of Strategic Logistic Branch, Joint Logistic Command of Australian DOD. He was an Australian SENT member from January 2013 till August 2014.

Shelia J MCCLANEY, Col.(R), US

Co-Architect with the development of the United States Army Operational Energy (OE) and Contingency Basing (CB). She shaped the development of both the OE/CB Lines of Efforts pushed and for the standardization of similar NATO strategies / frameworks. The US responsibility was handed to Mr. Desmond Keyes in late 2013.

COL Romualdas PETKEVIČIUS, LTU

COL Petkevičius was a first Director of the NATO ENSEC COE and also a first NATO Country Co-Director of SENT. He now serves as Director of Weaponry and Control Systems Department in the Ministry of Defence of the Republic of Lithuania.

Paul ROEGE, US

Paul Roege is a lifelong energy aficionado who is focusing on the role of energy in growing resilience from the community and regional levels. He recently spent four years on active military duty to establish the Army's concepts and strategies, seeking to use energy most effectively toward operational outcomes. He substantially influenced the Army's and other military strategies, including adoption of a concept for "Energy-Informed Operations" - weaving appropriate energy considerations into system design, operational and business processes.

Annex C

SMART ENERGY TEAM (SENT)

Smart Energy Questionnaire – National Responses

Question 1. Does your country have a Military Energy Strategy or related Energy Strategy? (explain)	
CANADA	No. However, a Defence Operational Energy Strategy (DOES) is currently being developed based on a set of approved energy targets. The DOES is expected to be published in 2014.
CHECH REPUBLIC	There is no Military Energy Strategy or Energy Strategy in place yet, nevertheless CZE is expecting a new European directive regarding energies in state sectors (directing decrease of energy state sector consumption by 30% in 2020).
DENMARK	Danish MOD has launched a Climate and Energy Strategy. (http://www.fmn.dk/ED813794-C3B7-49D2-BA17-0510EA5E4A1E/FinalDownload/DownloadId-AFEA88D83CBD28821BAC71CCCE65309B/ED813794-C3B7-49D2-BA17-0510EA5E4A1E/eng/news/Documents/Climate-and-energi-strategi.pdf) . The document focuses exclusively on climate and energy issues, including carbon emissions and energy consumption, within the entire field of responsibility of MOD. The Ministry of Defence has selected six focus areas for the Strategy period 2012-2015. Each focus area contains concrete and date-specific goals: Energy optimisation of buildings Energy and the environment in operations Renewable energy and energy conversion Climate-appropriate and energy-appropriate behaviour Climate accounts Energy management (ISO 50001). LOA (by 2020): 1) reduced energy consumption by minimum 20% in relation to 2006 (by min 15% by the end of 2015); 2) increased share of electricity consumption from renewable energy yo at least 60% (at least 25% by the end of 2015); 3) reduced carbon emissions stemming from military activities (not operative) by 40% in relation to 1990 (30% by the end of 2015)
GERMANY	The Bundeswehr participates in implementing the **Energy Concept of the Federal German Government** dated 28 September 2010 and the **Cornerstone Paper on Energy Efficiency** dated 6 June 2011 in its area of responsibility. The energy policy trias combining supply security, affordability and environmental compatibility as objectives of equal importance remains the starting point and yardstick for all instruments of energy policy. The "Defense Policy Guidelines" issued by the Federal Minister of Defense on 27 May 2012 call for the Bundeswehr to be oriented towards probable future missions. This implies that the Bundeswehr must be able to perform missions across the entire intensity spectrum, including observer missions, advisory and training support and preventive security measures. Modular units and assets have to be quickly mission-tailored in order to provide a flexible and robust force with adequate escalation and enforcement capabilities. Reliable supply with energy, including fossil fuels, is a factor gaining increasing importance in this context. The Bundeswehr intends to reduce the dependencies resulting from this situation. From the Bundeswehr point of view, the issue of energy with all related aspects, e.g. security of energy supply, reliance on multiple sources of energy, measures to save energy and reduce pollution, use of alternative drive technologies and energy supply systems - is of fundamental importance.
GREECE	Greece follows the EU strategic plan on Energy, pursuant to the 20-20-20 commitment of all EU Member States. There is no specific reference on military activities. Within its Environmental Policy, the Hellenic Ministry of National Defence (HMoND) acknowledges

Question 1. Does your country have a Military Energy Strategy or related Energy Strategy? (explain)	
	the reduction of energy footprint and the increase of energy efficiency as fields of environmental interest. Within the Strategic Planning of HMoND on Environmental Protection, energy efficiency and utilization of Renewable Energy Sources are set as Operational Targets under the overarching Strategic Target of integration of Sustainability into the Armed Forces.
HUNGARY	Hungary has adopted a National Energy Strategy which also covers premises, buildings, infrastructure and heat providing installations used for defence purposes.
LATVIA	The Action Plan of Environmental Strategy of the Ministry of Defence of the Republic of Latvia for 2011-2015 provided for development of the Ministry of Defence Program for Reduction of Consumption of Energy Resources 2012-2020. The program was approved on May 9, 2012. The Action Plan of the program contains specific activities and deadlines for implementation.
LITHUANIA	There is no separate Military Energy Strategy in Lithuania. However, energy security challenges are highlighted in the National Military Strategy and National Security Strategy as well as included in defence planning documents, such as Long-term Development Programme of the National Defence System. However, MOD is considering a possibility to initiate the drafting of such strategy. The National Energy Independence Strategy (endorsed in 2012) does not specifically mention energy issues in defence sector. Lithuania is actively contributing to the activities of NATO Energy Security Centre of Excellence
NETHERLANDS	NLD has a concept Operational Energy Strategy and a renewed Defence Environmental paper, both documents will be formalised in Q1 of 2014.
SPAIN	Following the rules of the Directive2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, the Spanish Ministry of Defence has developed its own instruction on environmental sustainability and energy efficiency (Instruction 56/2011 of the Secretary of State for Defence). The Spanish Ministry of Defence also has the "Defence Technology and Innovation Strategy (ETID)". The document is a public reference tool, facilitating the coordination and alignment of the Ministry's technological research and innovation, in order to attain specific objectives directly linked to developing the required military capabilities. It also serves as an essential instrument to foster cooperati on between different national and international technology suppliers. (www.portalcultura.mde.es/Galerias/publicaciones/fichero/Defence_technology_2010.pdf). In the ETID's functional area of Platforms there is a functional sub-area of Energy.
UNITED KINGDOM	a) DEFENCE PLAN 2010-2104: EXTRACT: Sustainable Development Strategy is the single source of strategic direction for all sustainable development work in the MOD. It sets out our objectives in five priority areas: Sustainable Consumption and production; climate change and energy; natural resource protection and environmental enhancement; creating sustainable communities and fairer world and delivery. In addition to this, the UK National Security Strategy and UK Strategic Defence & Security Review recognized that new and emerging threats to global stability and national security include increasing costs and access to natural resources (food, energy, water, and materials) and the risk multiplying effect of climate change to existing security threats. To address these issues, the Defence sector must meet these challenges as part of good business and risk management. MOD will place increasing importance on managing these risks in its capability requirements, with outputs expected to reduce costs and supply chain risks while enhancing operational endurance and resilience. Other info, possibly useful:

Question 1. **Does your country have a Military Energy Strategy or related Energy Strategy? (explain)**	
	The Operational Energy management strategy dtd 18MAY10 (Reference DES/JSC/DFG/Deliver\OEM\Governance\Strateg) MoD Energy Plan : DRAFT NOT GOVT POLICY (Version 1.0 21/12/2011)
UNITED STATES	a) The Department of Defense Operational Energy Strategy was released by the Deputy Secretary of Defense in June 2011 with the goal of assuring reliable supplies of energy for 21st century military operations. b) See here: http://energy.defense.gov/Portals/25/Documents/Reports/20110614_Operational_Energy_Strategy.pdf
FINLAND	Energy related issues have been included in to Ministry of Defence of Finland Strategy 2030. It defines general operational principles and long term energy related objectives in MoD administrative branch. Energy security is an important element of the Security Strategy for Society 2010. It provides the guidelines to ministries and also to regional and local administration for achieving goals of the strategy. The Strategy is based on a comprehensive concept of security and covers the preparedness of society and crisis management of normal and emergency conditions. The Strategy provides information to the authorities in public administration, the business community and organizations and harmonizes the grounds of planning in preparedness, crisis management and security of supply.
SWEDEN	Sweden's energy policy is guided by two government Bills which were approved by the Swedish Parliament in 2009. The bill on "integrated climate and energy policy" sets out ambitious targets in support of and beyond the 20/20/20 objectives of the EU, in pursuit of a sustainable policy for the environment, competitiveness and long-term stability.

Question 2. **Does your country have an implementation plan of the Strategy?**	
CANADA	Not yet
CHECH REPUBLIC	Not yet.
GERMANY	N/A
GREECE	Currently, the 2nd National Energy Efficiency Action Plan is in force (published in 2011), in line with Directive 2006/32/EC, covering the period 2008 - 2016. In order to adjust to the targets that have been set by the new Directive 2012/27/EU on Energy Efficiency, a new (3rd) National Energy Efficiency Action Plan has been prepared and is under promulgation. Within the HMoND, the exact values of the targets (Performance Indicators) to be set for all Operational Targets of the Strategic Plan on Environmental Protection (included those related to energy efficiency) are under internal negotiation with the General Staffs.
HUNGARY	Hungary has adopted a National Action Plan for the implementation of the National Energy Strategy.
LATVIA	Yes, the above mentioned Program for Reduction of Consumption of Energy Resources has the Action Plan with certain activities and designated financial resources till year 2020.
LITHUANIA	As for today - no. However, in 2013 we finished a huge study on energy efficiency in the National Defence System which evaluated energy consumption habits, trends, and the most persistent problems in all the branches of our Armed Forces. We expect to start implementing it in the near future. In cooperation with NATO ENSEC COE we are also working on a pilot project which will explore applicability of energy efficient technologies in one of our battalions (Grand Duke Kęstutis Mechanized Infantry Battalion) and offer solutions for such issues as efficient use of energy, waste management, water management, and use of renewables.
NETHERLANDS	In the Military Energy Strategy an implementation plan is incorporated. For all the goals mentioned in the strategy different required measures are described with (if possible) the planned year in which they are executed.
SPAIN	There is an “Energy saving plan of defense” with different objectives such as global savings of 20% by 2016, new master plan to 2016 with Pre-commercial Public Procurement, use of tri-generation in the main military hospital or 22.8% savings with use of solar panels (thermal and electrical), micro-generation and management. For the Defence Technology and Innovation Strategy (ETID) there is a roadmap with the activities to accomplish the objectives established.
UNITED KINGDOM	DEFENCE PLAN 2010-2014 : EXTRACT: The Sustainable Development Action Plan 2009 underpins this Strategy by setting out our key sustainable development targets and actions until 2012. These targets are likely to be updated during 2014. In April 2014, the UK MOD will be standing up a new board, led at 3* level by the Deputy Chief of Defence Staff for Military Capability (DCDS MilCap). This board, the Sustainable MOD and Energy Steering Group, will be responsible for ensuring that the strategy is implemented, and will discharge its responsibilities through the MOD Energy Programme Board (chaired at 1* level) and its subordinate group, the MOD Equipment Energy Working Group.
UNITED STATES	a) The Secretary of Defense signed the Operational Energy Strategy Implementation Plan in March 2012. The Implementation Plan includes seven targets: i) Measure operational energy consumption; ii) Improve energy performance and efficiency in operations and training;

Question 2. **Does your country have an implementation plan of the Strategy?**	
	iii) Promote operational energy innovation; iv) Improve operational energy security at fixed installations; v) Promote the development of alternative fuels; vi) Incorporate energy security considerations into requirements and acquisition; and vii) Adapt policy, doctrine, professional military education, and Combatant Command activities. b) The Implementation Plan also established the Defense Operational Energy Board (DOEB) as a mechanism for reviewing, synchronizing, and supporting implementation of the Operational Energy Strategy. c) See here: http://energy.defense.gov/Portals/25/Documents/Reports/20120306_OE_Strategy_Implementation_Plan.pdf
FINLAND	The MoD administrative branch has implementation plan for building related energy covering electricity, heat and water. It contains detailed short and medium term goals and actions to achieve national energy policy and the MoD strategy objectives. At the moment The Finnish Defence Forces is renewing the implementation plan of the Strategy. The Finnish Defence Forces Energy and Climate Action Plan is going to cover not only the building related energy but also operational energy and climate change adaption. In addition, the Finnish Defence Forces have a long term environmental protection plan that includes elements of energy efficiency.
SWEDEN	Regarding SwAF environmental objectives, yes. Short- to medium-term targets for 2020: • 40% reduction in greenhouse gases (GHGs) or about 20 million tonnes of carbon dioxide equivalent (Mt CO2-eq), compared to 1990, to be achieved outside the European Union Emissions Trading Scheme (EU-ETS) with two-thirds in Sweden and one-third by investments in other EU countries or the use of flexible mechanisms; • at least 50% share of renewable energy in the gross final energy consumption; • at least 10% share of renewable energy in the transport sector; and • 20% more efficient use of energy compared to 2008. Long-term priorities: • by 2020, Sweden aims to phase out fossil fuels in heating; • by 2030, Sweden should have a vehicle stock that is independent of fossil fuels; • Sweden is committed to develop a third pillar in electricity supply, next to hydro and nuclear power, with increased co-generation, wind and other renewable power production to reduce vulnerability and increase security of electricity supply; and • by 2050, the vision is that Sweden will have a sustainable and resource-efficient energy supply with zero net emissions of GHGs. Sweden sees a role for natural gas as a transition fuel in industry and co-generation. With a view to implement the priority of a fossil-fuel independent vehicle fleet by 2030, a committee has been created by the government to present concrete proposals on how Sweden can reach the 2030 decarbonisation goal. In 2013 Sweden adopted a Climate Roadmap. The roadmap identifies scenarios for achieving the long-term 2050 priority. Sweden has also adopted an action plan for renewable energy as well as an action plan for energy efficiency. Currently the Swedish Government is establishing a specific Energy Commission with the objective to settle a long-term parliamentary agreement on the Swedish Energy Policy. The ambition is that the Commission shall present a proposal in 2017.

Question 3. **From your national perspective what are the most important elements (challenges) for the implementation of the Strategy?**	
CANADA	The backing and support of senior leadership without which the strategy will fall short of its goals. Up front funding approval in order to achieve longer-term energy efficiencies.
CHECH REPUBLIC	Renewable energetic sources, implementation of Smart power network, implementation of low power appliances.
GERMANY	The Bundeswehr has not yet formulated a specific energy strategy. From the point of view of **future- oriented planning**, however, the following overarching objectives appear to be important to pursue: 1. The responsible use of energy is becoming part of the self-perception of the Bundeswehr. The Bundeswehr is promoting an energy awareness among all its military and civilian personnel by means of a dedicated information policy. As part of initial and advanced training programs they undergo, the Bundeswehr personnel learn how to act responsibly in this field. 2. The consumption of energy and the levels of emissions that are harmful to the climate have to be reduced. 3. Dependencies on single sources of energy have to be reduced or avoided. 4. The share of renewable or alternative energies in the overall energy consumption of the Bundeswehr has to be further increased. 5. The share of independent, de-centralized energy production in theaters of operations has to be further increased in order to reduce the dependence on the transport of energy sources. 6. The energy and climate efficiency of Bundeswehr systems and facilities has to be further increased. 7. Research into and development of new technological solutions has to be carried out systematically and in a coordinated way against this background. Solutions available on the market have to analyzed and examined for their potential for adaptive further development. Measures related to the issue of energy are pursued and implemented within the organization in the framework of (specialist) responsibilities resulting from primary competences.
GREECE	a. Funding b. Behavioral change of personnel c. Legal framework changes that will enable Power Purchase Agreements (PPAs) with third parties.
HUNGARY	Our National Energy Strategy aims for the followings: a.) to enhance energy saving and energy efficiency b.) to increase the ratio of renewable energy c.) to integrate into Central European pipeline system, to establish cross-border capacities, and to preserve the current nuclear power capacity; d.) environment friendly utilization of the coal and lignite reserves for the purpose of producing electricity.
LATVIA	The strategy (Program for Reduction of Consumption of Energy Resources) concentrates mainly on saving of energy and energy efficiency in buildings thus the biggest challenge is the budgetary restrictions.
LITHUANIA	NIL

Question 3. **From your national perspective what are the most important elements (challenges) for the implementation of the Strategy?**	
NETHERLANDS	Where the exact challenges will be is not yet determined. First order of business is completing the implementation plan and secondary establishing possible challenges.
SPAIN	The big challenge for the implementation of the Strategy is to reduce the dependence on fossil fuels in electricity generation in military bases and camps. It is very complicated because the diesel generators used have only a 20% of efficiency, there are very different conditions in the international missions with fuel logistics problems, there is an inefficient energy use in buildings and facilities (tends, hangars, hospital…), etc. The challenge includes the development of both self- generating power systems (photovoltaic panels, mini wind turbine/generators or fuel cells) and energy efficiency enhancement systems (thermal solar, cogeneration or trigeneration energy sources). Also to be considered is the development of in situ small-scale fuel production systems by means of energy recovery from waste or biomass, or through algae cultivation in photobioreactors.
UNITED KINGDOM	• Understanding and educating the MOD on "Energy as a Capability" to fight better, longer, and harder in order to achieve the mission • Getting buy-in to procure capability that is more expensive up-front, but which demonstrates through-life energy cost savings • Influencing and implementing behavioural and cultural change within MOD to consider energy as a capability or capability enabler, in the same way as they do for Comms, for example.
UNITED STATES	a) The Operational Energy Strategy identifies three primary ways the Department can improve energy security for the warfighter, including: i) Reducing the demand for energy, ii) Expanding and securing the supply of energy, and iii) Building energy security into the future force.
FINLAND	The main challenges in the implementation are financial issues together with long life cycle of the buildings and military materiel. In buildings energy efficiency improvements are usually made at the same time with big and expensive renovations. Time between renovations is usually long which makes it difficult to achieve big energy and financial savings in a short period of time. In operational energy one challenge is a long life cycle of military vehicles, vessels and aircrafts. In many cases big improvements of energy efficiency of that materiel is possible and realistic to make only at the end of their life cycle or in major updates. New military materiel is normally more energy efficient and possibilities to use alternative energy sources are usually better. Innovation and out-of-the-box-thinking are key in developing both energy efficiency and the use of renewable energy sources. Pilot projects have included production of bio-fuel from leftovers of garrison restaurants. There has also been some testing to use and produce biofuel for military aircraft. There is still considerable room for improvement in the area of energy efficiency.
SWEDEN	Cooperation with other authorities and contractors. Lack of internal and external communication regarding the energy efficiency objectives and the economical and operational benefits. Ability to invest in new technology and new solutions (initial investment and pay-off-time). Long term strategy vs. short term objectives.

Question 4. **Does your country have a definition for energy efficiency of the military / operational energy?**	
CANADA	a. Energy efficiency – measured as the net result of total energy use minus the energy attributed to activity, weather, structure, service level and capacity utilization."- Definition taken from Natural Resources Canada b. Operational energy – The energy required for training, moving and sustaining a military forces and weapons platforms for military operations. c. Smart energy –No national or defence specific definition
CHECH REPUBLIC	a. Energy efficiency? Yes (CZE complies with EU standards which are currently in use, due to EU directives). b. Operational energy? No c. Smart Energy? Yes (Depending on Smart power networks, renewable power sources - mainly water and solar power plants).
GERMANY	No
GREECE	No
HUNGARY	a.) energy efficiency The National Energy Strategy puts great emphasis on energy efficiency, highlighting the importance of analyzing the whole supply chain. From the production of the energy up to the consumption of it, one should take into account the technical solutions, the economic incentives and the changing attitude of the society. It stresses the importance of the building energetic program, and the modernization of the electric power plants and distribution systems, the industrial technologies, the agriculture and the transportation. According to the „Green Scenario", the industrial energetic rationalization and the energetic innovation also foster the efficient use of energy, which eventually can reduce the tempo of the increase in the consumption of energy. b.) operational energy - c.) smart energy Cannot fully interpret this definition, but if it relates to the usage of common capacities, Hungary in certain cases supports the common usage of electric distribution systems with the surrounding countries.
LATVIA	The definition of "energy efficiency" is specified in Law for Power Industry (Paragraph 1, Clause 5). Terms "smart energy" and "operational energy" have not been used in EC Energy Efficiency Directive and have not been introduced in national legislation. A new Long-term Strategy for Power Industry of Latvia 2030 has been developed and approved. The terms might be defined and included in the new Law on Energy Efficiency which is still in development.
LITHUANIA	Terms mentioned above are not specially defined. However, Lithuania constantly adopts NATO STANAGs.
NETHERLANDS	a. Energy efficiency? No b. Operational energy? Energy required by operational units for training, preparing for combat readiness and operations (national and international). c. Smart energy? No, we apply the NATO definition
SPAIN	No definitions
UNITED KINGDOM	a. energy efficiency? - Not exactly, but broadly the UK considers Energy Efficiency to mean being able to deliver the same effects as now but using less energy. b. operational energy? - Operational energy is that which is used to generate and sustain military capability. c. smart energy? - Smart energy covers ways to understand and intelligently manage energy requirements.

Question 4. **Does your country have a definition for energy efficiency of the military / operational energy?**	
UNITED STATES	a) Energy efficiency: The Department has defined energy performance instead of energy efficiency. Specifically, a draft DoD Directive defines energy performance as "The degree to which DoD achieves missions, functions, or goals for the amount of energy consumed." b) Operational energy: Title 10, United States Code section 2924(5) defines operational energy as "energy required for training, moving, and sustaining military forces and weapons platforms for military operations." c) Smart energy: DoD does not have a formal definition for Smart energy.
FINLAND	a) energy efficiency Energy efficiency is ratio of output of performance, service, article or energy to energy input. b) operational energy No c) smart energy No
SWEDEN	The energy intensity is measured as primary energy used per unit of GDP. SWE has no definitions for military / operational energy

Question 5. **What are your national efforts towards enhancing energy efficiency? (define)**	
CANADA	Natural Resources Canada (NRCan) works in the fields of housing, building, communities, industry and transportation to help Canadians realise energy efficiency potential. http://www.nrcan.gc.ca/energy/efficiency Best example of where they are assisting the military is in the Integrated Camp Energy Technology Demonstration Programme (ICE-T).
CHECH REPUBLIC	Procurement of efficient equipment, limit power transfer losses, limit building thermal losses, etc.
GERMANY	N/A
GREECE	There are various national sectoral and cross-sectoral action plans for implementing energy efficiency in national level, such as: a. New legislation on Energy Performance of Buildings (new requirements, Energy Performance Certificate) b. Financing part of energy performance upgrade renovations. c. Upgrading of existing buildings through Energy Services Companies under Energy Performance Contracts (EPC) d. Installation of PV with Feed in Tariffs (FIT). e. Implementation of Energy Management Systems in tertiary and public sectors. f. Promotion of high-efficiency cogeneration of heat and power (CHP) and district heating systems.
HUNGARY	During the change of the energy structure, according to the National Energy Strategy, one should implement the followings: a.) energy efficiency programs that cover the whole supply and consumption chain; b.) increase the electricity production that has low CO2 emission, primarily building on renewable resources; c.) increase the usage of renewable and alternative heat sources; d.) increase the share of low CO2 emission transportation modes.
LATVIA	In the field of state defence the main efforts include: - Energy audits of the buildings built/reconstructed before year 2009 - No more use of fossil fuel for heating of the buildings - Different measures to increase energy efficiency of the buildings - Education of the personnel.
LITHUANIA	Lithuania is still dependent on foreign energy resources and this factor is recognized as reducing military effectiveness, therefore there is a Capability Requirement "Effective and economical usage of energy resources" stated in the Military Strategy. According to it, energy effectiveness must be considered in any planning, and especially in Operations. Together with Denmark Lithuania initiated a discussion on Green Defence in NATO. Currently this idea is also being proposed to the Northern Group (NG) format with an aim to identify and approve further actions. Energy security was among the priorities of the Lithuanian EU Presidency. We have successfully organized a Seminar "Energy Security in the EU CSDP: Guidelines for the Future". Moreover, our main proposals on promoting energy efficiency in the EU CSDP were endorsed by the Council of the European Union on the 25th of November. We expect that some of these proposals will also appear in the December European Council Conclusions. Information on the study about energy efficiency in the NDS – see above. Information on the battalion pilot project – see above.
NETHERLANDS	The goals on energy efficiency mentioned in the "Defensie Energie- en Milieubeleidsnota 2014" are:

Question 5. **What are your national efforts towards enhancing energy efficiency? (define)**	
	• The Ministry of Defence will realize an energy saving of 2% a year on real estate and civil vehicles; • The ministry of Defence is 100% sustainable regarding the use of electricity and natural gas for the heating of buildings; • The Ministry of Defence will give third parties the change to realize sustainable energy projects where this is possible within the daily operations; • The Ministry of Defence will monitor all geothermal energy systems and take measures to improve their efficiency; • The Ministry of Defence will reduce the dependency of materiel on fossil fuels and the related CO2 emissions with 90% in 2050 compared to 1990; • The Ministry of Defence shall seek close collaboration with the industry and knowledge institutes (golden triangle) and with international partners in their efforts towards sustainable and energy efficient materiel.
SPAIN	The main effort is concentrated on the HVAC (heating, ventilation, and air conditioning) technology of indoor environmental comfort using geothermal, cogeneration, trigeneration and thermoelectric materials.
UNITED KINGDOM	THE GREENING GOVERNMENT COMMITMENTS DEC 2012 : EXTRACT: MOD approach to sustainable procurement MOD has continued to mainstream sustainability within Departmental processes and activities, from initiating a voluntary Sustainable Procurement Charter from 2008 which all key suppliers have signed, to mainstreaming sustainability both within Defence strategies and objectives. The Department is also conducting research and development into delivering sustainable solutions on the front line. This addresses resilience to resource security (energy and materials) and the impacts of climate change in both equipment and support solutions for all military capability programmes. With an annual spend on equipment energy of £628M, this research includes investigations into how reductions in energy consumption can be achieved on military operations by using a system that intelligently manages energy demand while incorporating energy storage and using a mix of conventional and alternative energy ('Power Forward Operating Base'), and looking at options for sustainable aviation technology. MOD also has a 'Green Warship' group that closely monitors environmental legislation and constantly seeks to adapt the latest commercially available technology to minimise environmental impact and reduce wider costs whilst sustaining capability. MOD approach to sustainable procurement (cont'd) Sustainable procurement is now an integral element to the planning and delivery of military capability, not least because reducing reliance on fossil fuels and operational energy consumption, reduces operational risk (for instance, from attacks on the logistics chain) and through-life costs while enhancing mission endurance. MOD's procurement guidance requires new equipment that is resilient to long-term climate change. It is also now mandatory that all business cases should consider sustainability as part of their development. In addition to publishing detailed online sustainable procurement guidance, including a Sustainable Procurement Assessment of Risk tool and Sustainable Procurement Commercial Policy Statement, the Department has developed sustainable procurement training courses, which are run by the Defence Academy. With sustainability featuring in one of its four structural reform priorities, the Defence Business Plan commits the Department to complying with Government Buying Standards by 2015 and as such has started an internal audit programme on GBS, and to agreeing targets to reduce our key suppliers' greenhouse gas emissions by 2014, and water and waste by 2015. A separate target aims to reduce reliance on fossil fuels for operational energy by 18% by 2020-21 (from 2009-10 baseline). MOD will continue

Question 5. What are your national efforts towards enhancing energy efficiency? (define)	
	to work with suppliers, encouraging them, for example, to capture data on carbon emissions
UNITED STATES	Plan commits the Department to complying with Government Buying Standards by 2015 and as such has started an internal audit programme on GBS, and to agreeing targets to reduce our key suppliers' greenhouse gas emissions by 2014, and water and waste by 2015.
FINLAND	In Finland energy efficiency efforts are mainly based on EU legislation (Energy Efficiency Directive, EED). Finland is going to achieve goals of the directive by using political, economical and technical measures. The following national measures have connection to MoD administrative branch: • National energy and climate strategy, 2013 • Energy efficiency regulation • Improvement of energy efficiency (renovation) of public buildings (3%/year, 2013-2020) • Energy efficient public procurements • Energy efficiency agreements and audits • Use of energy management systems • Increase of using renewable energy sources
SWEDEN	Sweden's energy efficiency policy works within the context of EU directives and regulations. They set the overall objectives or policy, a framework for monitoring and reporting of progress through periodic national energy efficiency action plans (NEEAPs), and technological specifications in several areas. Sweden has a long history of promoting energy efficiency improvements. Overall funding from the state budget in the area of energy efficiency is around SEK 530 million (EUR 61.44 million) per year. About half of this annual budget is managed by the Swedish Energy Agency through the energy efficiency programme. It supports regional and local climate policy initiatives, green public procurement, and energy management, energy audit and procurement of energy-efficient technologies in small and medium-sized enterprises. The programme aims to overcome information and knowledge deficits in various sectors with a combination of independent, yet intertwined, measures and policy levers. Overall, Sweden has a comprehensive energy efficiency policy mix. Price signals have been set through carbon dioxide and energy taxation, and the EU-ETS. These price signals are supported by targeted regulations, and the provision of information about energy use for both domestic households and businesses through various channels. Sweden is also among the first European countries to roll out smart metering to provide consumers with more accurate electricity bills. Information, training and dissemination tools are particularly strong at the local and regional level. Targeted R&D programmes are coordinated effectively by the Swedish Energy Agency.

Question 6. What are the ongoing or planned national projects in the area of military energy efficiency?	
CANADA	**Automated Fuel Data System (AFDS)** - the AFDS will capture all the fuel transactions throughout DND/CF, both on and off base, for improved accountability and strategic visibility. Data will be available down to vehicle/platform level. Strategic Fuel Reserve (SFR) - DF&L performs an analysis looking at the strategic needs in fuel for DND/CF in order to meet the worst type of operational scenarios. DF&L will suggest the needs for a SFR and the CDS has the approval authority.

Question 6. **What are the ongoing or planned national projects in the area of military energy efficiency?**	
	Fuel Strategy for the North - DF&L will develop the Fuel Strategy for the North that would support the fuel requirements for operations in the North for the next 5 years. CanadaCOM and CANOSCOM are key stakeholders. All environments have representatives in the working group for the Fuel Strategy for the North. **Fuel Injection Systems** - DND/CF will use commercial aviation jet fuel (Jet A1) that will be mixed with the military additives at the point of DND/CF wings. This will improve the jet fuel supply chain for our operations. Single Fuel Policy - using one type of fuel (military jet fuel) in operations, where feasible, will reduce the logistics burden and will improve the flexibility in our operations. **Renewable fuels** – biodiesel in commercial fleet - DF&L AIG-002 provided the green light in using up to 5% biodiesel in the commercial vehicle fleets. DF&L provides strategic guidance on and monitors the biodiesel usage in DND/CF **Green Lubricant Trial** - DF&L proposes a trial with green lubricants in the vehicle fleets at one base for proving and encouraging the use of green lubricants in our supply chain. **Green Flight Test** - DF&L will collaborate with the National Research Council (NRC) and QETE for a future military flight on algae-based jet fuel. **CF-wide Fuel Training** - ensuring the necessary tools / courses and policies are in place in collaboration with the key stakeholders. **CF Supply Manual complete review for fuels/energy** - Chapter 18, Petrol, Oil and Lubricants (POL), is under review for updating the policies and the right procedures for POL products in DND/CF supply system Fuel Exchange Agreement – Canada/US - the agreement is under the final review before being renewed. This is the main supply line for DND/CF deployed operations. **Blueprinting of Fuel requirements to ensure compatibility with DRIMS** - managing the fuel and lubricants products in the supply system has to be in compliance with all regulations and standardized throughout the DND/CF. DF&L will work at bringing all fuel data capture systems on line and ensuring compatibility with DRIMS. **Mapping of Fuel Farm Assets** - strategic overview of all DND/CF fuel farm equipment / assets in order to ensure standardization and operational effectiveness. **Optimize Lubricants, Oils, Filters (OLOF)** - extending the life of the engine oil by doubling the mileage before an oil change will reduce the hazardous wastes, will reduce the carbon footprint of our operations, will reduce the downtime and will reduce our operational costs. **Criteria for environmentally preferred products** - DF&L develops criteria for environmentally preferred products for lubricants and hydraulic fluids to be used in the next Standing Offer Agreements in order to introduce green products in our supply chain. **Hydraulic Fluid Conversion** - represents one of DND/CF green targets in the Federal Sustainable Development Strategy (FSDS). Thirteen aircraft fleets will be converted to an environmental friendly hydraulic fluid. Hybrids vehicles for the low cost high density **(LCHD) fleet in the next 3 years** - ADM(Mat) intends to subsidize the procurement of Green Vehicles over the next 3 FYs in order to ensure that the LCHD Fleet is entirely composed of the most fuel efficient vehicles available on the market and GHG emissions are reduced **Field Heater** Project - Will replace all CF tactical Field Space Heaters and Field Immersion Water Heater of current efficiency between 40 – 60% fuel efficient with modern high efficient heaters of > 86% measured efficiency. **Central Power Systems** - The project procured 100 Central Power Distribution Systems for the Army with 117 Tactical Quiet Generators in support of CF during their Tactical Deployment. The Central Power Distribution System is equipment with Power Management Unit focused to increase the efficiency and the reliability of the deployed camps and reduces fuel consumption in the field.

Question 6.
What are the ongoing or planned national projects in the area of military energy efficiency?

Synchronization Power Distribution Box - The project developed and procured 4 Central Power Distribution Systems with synchronization capability. The equipment will be capable to synchronize any generator used by the Army. This new capability will increase the reliability, efficiency, supportability and the fuel consumption in the deployed tactical power generator.

Advance Mobile Electrical Power System (CLS 13) - The project procured Central Power Distribution Systems for the Army and Tactical Quiet Generators in support of CF during their Tactical Deployment. The Power Distribution equipment will be equipment with smart power management system capable to select and synchronize multiple power sources, manage the load and store excess generated energy to increase the efficiency, reliability, sustainability of the deployed camps and reduces fuel consumption.

CVT-Corp Generator - Continuous Variable Speed (CVT) generator manufactured by CVT Corp in Montreal, QC is a new technology. The generator adjust the speed and the power of the engine to match the load demand. The technology has a potential of fuel saving around 20%. Field trial at OP Nanook 2012 will be conducted by CANOSCOM and Engineering qualification trial at NRC will be conducted to check the suitability for using the Generator in Army deployed environment.

Softwalled Shelter Systems - Solar Shades - Solar shades are fabric components that fit over CF owned soft wall shelters (tents) and are meant to block over 80% of UV and infrared radiation. Studies have shown a significant reduction in heat accumulation inside the shelters with a corresponding reduction in air conditioning loading and diesel fuel consumption along with providing a greener environment.

Expandable and soft wall shelters efficiency - Performance of different insulation packages for soft wall shelters has been tested and industry implemented double insulation liners therefore reducing heat and fuel requirements.

Use of solar light with firefighting first-in kit - Solar lights were introduced for the firefighting first-in kit as a way to illuminate the fire point container on a deployable camp. This unit which is inexpensive, Canadian made, sturdy, has a minimum life of 4 years without any issues. It is self-sustained and does not require any electricity therefore contribute to energy reliability, affordability and sustainability.

Evaluation of a Military Solar Power Shade and a Hybrid Solar Power System
Evaluate a DLEPS 6 Designed, Field Dry Cell Battery Charging Center
Investigation of Standard Flashlight Bulbs and Light-Emitting Diode
Evaluation of Portable Solar Panels
Portable Power Packs and Solar Chargers
National Renewable Diesel Demonstration Initiative – Particle Formation Kinetics in Biodiesel and Petrodiesel Blends Above the **Cloud Point**
Biodiesel Fuel and Emission Testing on Military Equipment
Biodiesel Storage Stability Study - Thermal Stability
Storage Stability of Biodiesel & Ultra Low Sulphur Diesel Fuel Blends: an Oxidative Environment Study
Biodiesel – Water Contamination Stability
Certification of CF Engines on Synthetic Fuels.
Certification of GE F-404 (CF 18 AC) engine on semi-synthetic fuel (Fischer-Tropsch fuel in collaboration with USAF/USN)

Certification of CF Engines on Synthetic Fuels - Certification of RR/Allison T-56 (CC 130 AC) engine on semi-synthetic fuel (Camelina biojet fuel in collaboration with USAF). A demonstration flight is scheduled for May 23, 12 at 8 Wing Trenton.

Approval of Synthetic Paraffinic Kerosene (SPK) in National Standards. Amendment of CGSB Aviation Fuels Stds; CAN/CGSB-3.23, CGSB-3.24 to approve the use of SPKs certified to US ASTM D7655 specification.

Leopard 2 Trickle Charger – Allows tank training to take place without having to start the engine, therefore fuel savings. Driver is operational effectiveness.

Leopard 2 Gel Batteries – More efficient battery that holds a charge for a longer period of time. Driver is operational effectiveness.

Question 6.
What are the ongoing or planned national projects in the area of military energy efficiency?

Underwater Anti-Fouling Coating System Trial - A trial in HMCS TORONTO to assess the potential for use in the CF Fleet of a new paint technology claiming to provide up to 12% improved hydrodynamic efficiency, translating into improved fuel use efficiency.

Ship's Lighting Replacement Evaluation - This project's objective is to replace existing fluorescent and incandescent lights with Light Emitting Diode (LED) types estimated to reduce electricity demand for lighting by 75% but more importantly, significantly longer life between replacements.

Halifax Class Stern Flap Addition - Extension of ship's hull past the ship's transom is estimated to provide up to 7% improvement in hydrodynamic efficiency, translating into improved fuel use efficiency.

Replace Cathode Ray Tube (CRT) - Video displays with flat panel monitors in the Fleet. Though not unique to any one section, flat panel video screens have replaced the CRT screens in most ship applications. Industry claims of up to 70% energy reduction per monitor by this change.

Operational Power and Energy -

- Develop a baseline of current Power and Energy usage data to determine the requirements for Power and Energy in operations.
- Develop relevant performance measures to conduct options analysis for Power and Energy consumption optimization.
- Develop a suite of tools and models that captures the Fully Burdened Cost of Energy, including the complete life cycle, to better inform and influence the decision making process and manage the risks associated with operational Power and Energy issues for NATO members.

Energy Security (PG0 A10a) - Alternative Power Energy Options for Reduced-Fuel Arctic Infrastructure Project (13po)

The objectives of this project are as follows: (1). completion of a baseline audit of current energy use at CFS Alert (2). Assessment of the viability of wind, solar, deepwell geothermal, various hydro- and sea-water heat pump technologies plus other alternative options (3) The development of a strategy to reduce the use of diesel for electrical power and thermal energy based on baseline energy use and (4) Derivation of a common methodology for identifying alternative sustainable power and energy options that can be applied to other Arctic locations.

Camp Power and Energy (CaPE) Enabling technologies to reduce fossil fuel consumptions in camp operations at remote locations. The technology concept is for increase use of renewable energy, energy management and conservation, dispersed grid supply, and camp autonomy in tactical situations up to 100KW electrical power demand.

Integrated Camp Energy Technologies (ICE-T) - Exploit technological opportunities to manage, reduce significantly, or eliminate fossil fuel consumptions for deployed camps.

Advanced Soldier Adaptive Power (ASAP)

Develop and demonstrate a lightweight, efficient advanced power system for future dismounted soldier systems, e.g.

- Decrease the current weight of power systems carried by soldiers by a factor of 3, and endeavour to achieve a 500 g energy source for 24 hr mission
- Ensure that the soldier can deploy for 72 hours based on energy sources of no more than 2 kg
- Implement transparent connectivity and demonstrate dynamic power management to improve duration for selected devices
- Demonstrate the above within a modular 10 watt system

Bionic Power Inc. – Assistive Energy Harvesting – DIRP 024 - generates power from walking with little or additional effort - goal is to have ability to keep batteries

Question 6. **What are the ongoing or planned national projects in the area of military energy efficiency?**	
	charged in the field for dismounted soldiers (reduce weight, save costs, prevent injuries - load carriage etc) **Capteur Energie Solaire -** To produce a combined solar power generator and accumulator based on advanced organic polymers **Power and Load Control (12sz15)** - DIR with GD Canada started by Vivier Lefebvre on vehicle power distributio **Solar to hydrogen production via photochemical water splitting using InGaN nanowires** **Clean Fuels on the Battlefield** - Chemical transformation of CO2 into methanol via solar-powered artificial photosynthesis on semiconducting nanowire array and fabrication of novel electrodes **Energy Security** - Analyze meaning of energy security in the contemporary context and research approaches of states and organizations to energy security and highlight ongoing findings and validate same with members of academia, military and government and incorporate key findings from Case Studies to determine implications of global energy security situation for Canada and DND/CF in near, mid and long term. **Energy audit of CFS Alert** **Electrical metering** **Building and sub-metering level at CFS Alert** **Heat flow meter installations at CFS Alert** **Fuel Metering at CFS Alert** **NATO Sustainable Military Compounds** **Quadrilateral Logistics Forum** - Energy Working Group Innovative methods of energy provision for Deployed Operating Bases Canadian Forces Operational Support Concept (CFOSC) Operational support to operations **Op NANOOK 12**- Northern domestic operation with energy and environmental data collection. OS Engr Gp is procuring equipment to reduce the energy and environmental footprint for deployed camps. This is more short term whereas the CFOSC is long-term. **Land Force Modern Power Source** - The project will procure Central Power Distribution Systems for the Army and Tactical Quiet Generators in support of CF during their Tactical Deployment. The Power Distribution equipment will be equipment with smart power management system capable to select and synchronize multiple power sources, manage the load and store excess generated energy to increase the efficiency, reliability, sustainability of the deployed camps and reduces fuel consumption.
CHECH REPUBLIC	N/A
GERMANY	Especially in the field of operation of military compounds, the Bundeswehr has made significant efforts in the past few years to reduce the consumption of energy. Apart from densifying the use of compounds and buildings, accompanied by decommissioning and demilitarizing objects no longer needed, reconstruction or refurbishment measures aimed at improving the energy efficiency of the buildings and facilities have been taken. Examples are modernization of heat supply installations, thermal insulation of buildings, refurbishment of lighting installations, installation of building automation systems and enhancing the energy saving awareness of the personnel by means of an initiative called "mission E". Where building modification or maintenance measures are necessary, the building structure and the technical installations are adapted to the current requirements of building legislation. Going beyond that, the level of energy efficiency is raised by 20 % in conformity with the guidance on "sustainable building" issued by the Federal Ministry

Question 6. **What are the ongoing or planned national projects in the area of military energy efficiency?**	
	in charge. In addition, initiatives of the German Federal Government such as the "Energy Saving Program for Federally-Owned Properties", the "Economic Stimulus Package II" and the "Refurbishing of Barracks – West" program have been used to raise the buildings and technical facilities to a better standard of energy efficiency.
GREECE	Ongoing: a. Construction of RES posts in remote areas (mountain peaks, islands, etc). 2 have already been completed by utilization of small PV and Wind Turbines. b. LIFE11/ENV/GR/938 Military Energy & Carbon Management Programme (funded 50% by EU): application of ISO 50001:2011 in non-operational activities of 3 military installations (Airbase, Naval Station, Army Barracks) combined with pilot projects (perimeter lighting from PV, energy efficiency upgrade of selected buildings). c. Replacement of conventional light bulbs with LED lights. d. "Energy Management in Armed Forces" 1 week course (in cooperation with National Academy of Public Administration) that covers energy efficiency interventions in buildings and an introduction to Energy Management Systems iaw ISO 50001:2011. Future: a. Integration of hydrogen technologies in RES solutions (H2 generation, storage and use). b. Energy recovery from waste gasification in certain activities (i.e. hospitals).
HUNGARY	on the premises of the HUN MoD, in 9 cases, solar electricity production projects are in their final phases, and in an additional 20 cases the applications will be turned in shortly; in the case of building energetic development, we plan to apply for with 12 projects; we also plan to participate in 2014-2020 EU applications for energy saving projects, in order to improve premises, buildings, public infrastructure and heat providing installations used by the MoD.
LATVIA	There are no special projects planned for military activities, training or missions. The planned projects include energy efficiency for buildings and education of the personnel.
LITHUANIA	The research on possibilities to use aviation and/or other alternative fuels for the Lithuanian Armed Forces' ground transport means is conducted in the Military Academy of Lithuania. We expect it will enhance NATO Single fuel policy. Study "Efficient Use of Energy Resources: Case of Lithuanian NDS" - Purpose of this study is to evaluate the efficiency and trends of use of energy resources of the LAF. Analysis is conducted by statistically assessing the rates of consumption of various divisions of the Lithuanian NDS and suggesting more efficient ways of energy use and generation. Study is undergoing a preparation of implementation plan of recommendations.
NETHERLANDS	N/A
SPAIN	"La Marañosa" Institute of Technology (ITM), a research and technologycal centre of the Spanish Ministry of Defence is working on a project in the area of military energy efficiency: the GREENMAR project (Geothermal & renewable energy in modular architecture system). It is a Public Private Partnership in Research. The research and innovation activities of this project are focus on the study and development of a system of rapid building in modular architecture with high energy efficiency. GREENMAR Project is funded by the INNPACTO Program (Call 2012) from the Spanish Ministry of Economy and Competitiveness who assumes the responsibility for fostering research and innovation. This public funding, under the scheme of "Collaborative Project", tries to develop new technologies, products and services which will give Spanish industry a leading position on European and world markets. There are 4 Parties in the GREENMAR Consortium: 3 SME's, in the Private sector;

Question 6. **What are the ongoing or planned national projects in the area of military energy efficiency?**	
	and a R&D Centre, the ITM, in the Public sector. GEOTER and CLYSEMA are SME's in the energy sector and GAPTEK is a SME in the building sector. "La Marañosa" Institute of Technology collaborates with the Spanish Air Force in the Requirement Engineering, Validation and Evaluation. A Consortium Agreement specifies, with respect to the GREENMAR Project, the relationship among the Parties, in particular concerning the organisation of the work between the Parties, the management of the Project and the rights and obligations of the Parties concerning inter alia liability, Intellectual Property Rights, Access Rights and dispute resolution. GREENMAR Project tries to reduce the Fossil-Fuel Dependence in military operations at Forward-Deployed Locations, such as Afghanistan: reducing energy consumption, increasing energy efficiency across buildings and facilities and increasing use of renewable and alternative energy.
UNITED KINGDOM	N/A
UNITED STATES	a) Department-wide i) Operational Energy Capability Improvement Fund (OECIF) - In January 2012, the Department released $18 million to fund six different programs reducing the energy demand of future contingency bases. In 2013, DoD continued to fund OECIF and established four consortia to spur additional innovation. ii) Fully Burdened Cost of Energy (FBCE) – The Department now includes the FBCE in analyses of alternatives conducted for all developmental DoD systems with end items that create a demand for energy. FBCE assesses energy-related costs to sustain specific pieces of equipment, including procurement of energy, logistics needed to deliver energy, related infrastructure, and force protection for logistics forces involved in energy delivery. iii) Energy Key Performance Parameter (Energy KPP) – Pursuant to the Joint Capabilities Integration and Development System Manual, the Department is implementing the Energy KPP, which helps limit growth in future system energy demand by ensuring energy performance issues are captured, defined, and included in acquisition decisions. iv) DoD-DOE Memorandum of Understanding – Through the MOU, the DoD is cooperating with the Department of Energy on a range of projects. For example, the Hybrid Energy Storage Module joint program with the Advanced Research Projects Agency-Energy aims to develop modular hybrid energy storage technology that addresses long endurance and rapid charge/discharge needs for forward operating bases, aircraft power management, and future shipboard weapons systems.v) See here: http://energy.defense.gov/Portals/25/Documents/Reports/20131015_FY12_OE_Annual_Report.pdf
FINLAND	The main project at the moment is to implement national energy and climate goals and MoD strategy objectives. The Finnish Defence Forces Energy and Climate Action Plan have an im-portant role in this process. Here are examples of ongoing or planned national projects in MoD branch: Buildings: • Renovation and maintenance of buildings and other infrastructure • Development of energy reporting and metering • Enhance effective use of premises (give up or demolish unnecessary premises)

Question 6. **What are the ongoing or planned national projects in the area of military energy efficiency?**	
	• Enhance of using alternative energy sources in buildings Army, Navy, Air Force • Regular maintenance and updates of vehicles, vessels and air crafts • Economic driving education (personnel and conscripts (drivers)) • Enhance use of simulators • Improve of storage conditions • R&D, enhance of using alternative energy sources in military applications
SWEDEN	Yes, defined in national legislation regarding energy efficient authorities.

Question 6. 6.a. Army	
CANADA	Annex A
CHECH REPUBLIC	CZE is engaged into EDA Go Green Project (implementation of photovoltaic plants to the roof tops of military buildings, expected power output 170 kWp, testing on as a pilot case on military museum Lešany 4 roofs, agreement to be signed at the beginning 2014, FOC 2015, joint investment project of 7pMS, implementation is negatively influenced by decrease of state support in majority of EU countries, caused by state quarantined power redemption price).
GERMANY	N/A
GREECE	N/A
HUNGARY	N/A
LATVIA	N/A
LITHUANIA	NATO ENSEC COE on the request of LAF is developing a Feasibility study "Energy Management of Expeditionary Environment: Towards Smart Energy Base". This project is initiated in order to provide a model for energy efficient battalion size military unit. Project is designed to provide multifaceted, integrated and fesible solutions to increase energy efficinecy of military units bosth in fixed location and during deployed operations by proposing inovative management and technological solutions and maintaing and where possible increasing combat capabilities of such unit.
NETHERLANDS	a. Replacing all the old generators for new generators which are more energy efficient b. Base of the future, with the scope on reducing the footprint by reducing all energy consuming systems and improving the use of smart energy c. Development project on diesefuelcells d. Development projects on waste-energy re-use
SPAIN	N/A
UNITED KINGDOM	Army: The UK has carried out research into PowerFOB, which looked at technologies that could be employed to enable Forward Operating Bases (FOBs) to be self-sustaining. This is now being taken forward under a reserach project looking at Sustainable FOBs and determining what/how these methods could be applied to the MOD fixed estate.
UNITED STATES	b) Army – As outlined in its 2013 Operational Energy Policy, the Army is undertaking an array of policies and initiatives, to include: i) Increasing tactical and operational effectiveness through efficient use of energy in all modes, including dismounted, mounted, aviation and base camp/sustainment operations. ii) Enabling energy informed operations by integrating energy considerations into operational planning activities. iii) Integrating operational energy into the Army capability development process by including energy as a key performance parameter in accordance with Joint Capability Integration and Development System guidance. iv) Incrementally improving the energy performance and efficiency of existing platforms, systems, sub-systems, and devices during periodic product improvements, engineer changes, retrofits and rebuilds. v) Reducing energy consumption in order to reduce the frequency and vulnerability of energy-related resupply operations. vi) Increasing the use of renewable energy, developing operationally viable alternative energy sources, expanding flexibility in system energy use and integrating energy networking capabilities.

Question 6. **6.a. Army**	
	vii) Increasing the functionality and reliability of energy systems and increase energy efficiency across platforms and facilities. viii) Establishing an energy-informed culture through education, training and awareness programs that values energy as a resource that enables enhanced capabilities (agility, endurance, flexibility, resilience) and lowers operational risk. ix) Integrating sustainability into the Army operational culture with attention to reducing adverse impacts on the environment. x) See here: http://usarmy.vo.llnwd.net/e2/c/downloads/295964.pdf
FINLAND	N/A
SWEDEN	Yes

Question 6. 6.b. Navy	
CANADA	– A stern flap and an Integrated Platform Management System (IPMS) are being fitted to the Halifax class frigates. Experiments with onboard LED lighting are being undertaken. Novel hull coatings are being investigated. Defence Research & Development Canada (DRDC) have been tasked to develop energy initiatives and technologies with the specific goal of increasing energy efficiency while decreasing the energy density of RCN platforms.
CHECH REPUBLIC	N/A
GERMANY	N/A
GREECE	N/A
HUNGARY	N/A
LATVIA	N/A
LITHUANIA	N/A
NETHERLANDS	Electric powered tugboats
SPAIN	N/A
UNITED KINGDOM	GREEN NAVY COMMAND ENVIRONMENTAL MATTERS (2010 publication) An innovative scheme using advanced computer software has helped cut energy bills and carbon emissions at ten Royal Navy sites across the region. The Strategic Energy Management Programme (SEMP) launched in April last year (2009). It uses SMART metering to allow energy managers to spot opportunities for saving both fuel and money.
UNITED STATES	c) Navy - As outlined in its 2012 Strategy for Renewable Energy, the Department of the Navy (DON) has outlined the following goals: i) Increase Alternative Energy Use DON-Wide: By 2020, 50% of total DON energy consumption will come from alternative sources. ii) Increase Alternative Energy Ashore: By 2020, DON will produce at least 50% of shore based energy requirements from alternative sources; 50% of DON installations will be net-zero. iii) Reduce Non-Tactical Petroleum Use: By 2015, DON will reduce petroleum use in the commercial vehicle fleet by 50%. iv) Sail the “Great Green Fleet”: DON will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016. v) Energy Efficient Acquisition: Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings. vi) See here: http://www.secnav.navy.mil/eie/Documents/DoNStrategyforRenewableEnergy.pdf
FINLAND	N/A
SWEDEN	No

Question 6. 6.c. Air Force	
CANADA	Annex A

Question 6. 6.c. Air Force	
CHECH REPUBLIC	N/A yet, however if power procurement goes as expected, it is envisaged to proceed also with Air Force, logistics and MoD buildings.
GERMANY	N/A
GREECE	N/A
HUNGARY	N/A
LATVIA	N/A
LITHUANIA	N/A
NETHERLANDS	N/A
SPAIN	N/A
UNITED KINGDOM	The Royal Air Force incorporates the target to reduce fossil fuel usage by 18% by 2020 (based on the 2010 baseline). In order to support this, it is getting support from the Science and Technology community through the „Sustainable Military Aviation Research Technology Initiative“ – SMARTI.
UNITED STATES	d) Air Force – The 2013 U.S. Air Force Energy Strategic Plan has identified four priorities toward improving energy efficiency and security: i) Improve Resiliency: Identify vulnerabilities to energy and water supplies, such as physical and cyber attacks or natural disasters; mitigate impacts from disruptions in energy supplies to critical assets, installations, and priority missions. ii) Reduce Demand: Increase energy efficiency and operational efficiency for Air Force systems and processes without losing mission capabilities. iii) Assure Supply: Integrate platform-compatible alternative sources of energy; diversify drop-in sources of energy; increase access to reliable and uninterrupted energy supplies. iv) Foster an Energy Aware Culture: Integrate communication efforts using training and education opportunities to increase awareness of energy impacts to mission; ensure the acquisition process reflects energy as a mission enabler. v) See here: http://www.safie.hq.af.mil/shared/media/document/AFD-130325-132.pdf
FINLAND	N/A
SWEDEN	N/A

Question 6. 6. d. Marines	
CANADA	N/A
CHECH REPUBLIC	N/A
GERMANY	N/A
GREECE	N/A
HUNGARY	N/A
LATVIA	N/A
LITHUANIA	N/A
NETHERLANDS	N/A
SPAIN	N/A
UNITED KINGDOM	No special initiative for Marines
UNITED STATES	e) Marine Corps – The 2011 U.S. Marine Corps (USMC) Expeditionary Energy Strategy and Implementation Plan "Bases to Battlefields" outlined the following goals and targets: i) Goals (1) Embed Expeditionary Energy into USMC ethos. (2) Lead and Manage Expeditionary Energy. (3) Increase Energy Efficiency of Weapons Systems, Platforms, Vehicles, and Equipment. (4) Meet Operational Demand with Renewable Energy. ii) Targets (1) Reduce Energy Intensity – From 2003 to 2015, reduce energy intensity at installations by 30%. (2) Reduce Water Consumption – Through 2020, reduce water consumption intensity by 2% annually. (3) Increase Renewable Facility Energy – By 2020, increase the amount of alternative energy consumed at installations to 50%. (4) Decrease Petroleum Consumption – by 2015, decrease non-tactical petroleum use by 50%. iii) See here: http://www.hqmc.marines.mil/Portals/160/Docs/USMC%20Expeditionary%20Energy%20Strategy%20%20Implementation%20Planning%20Guidance.pdf
FINLAND	N/A
SWEDEN	N/A

Question 7. **Has your Ministry of Defence incorporated/fielded energy efficiency technologies during operations (explain)?**	
CANADA	Canadian Joint Operations Command (CJOC) has incorporated energy efficient equipment such as a Variable Speed Generator during one Exercise (Op NANOOK 12). We have also incorporated a heat pump during one exercise in 2013. However, no fielding of such equipment has occurred. CJOC is investigating equipment and procedures to improve energy efficiency on operations but we are primarily focused on energy data collection and monitoring. The fielding of equipment will most likely not take place for 3-5 years. CJOC is working with the Canadian Army (DLR) on future procurement programs which will include alternative energy and smart energy systems. This, again, is 5-10 years away from fielding.
CHECH REPUBLIC	No, since CZE in not self-sustained during operational deployment and relies on Allies and partners, up to now CZE uses classical power sources (power generators. etc.).
GERMANY	N/A
GREECE	N/A
HUNGARY	N/A
LATVIA	No. National Armed Forces of the Republic of Latvia participate in missions, but usually incorporated as a unit in contingents of other NATO countries.
LITHUANIA	N/A
NETHERLANDS	In October 2012 thinfilm solarpanels were installed on a Netherlands military base in Mazir el Sharif Afghanistan. The average energy production was 48000kWh a year, with a return on investment of approximately 1 year.
SPAIN	The Army and "La Marañosa" Institute of Technology (ITM) are planning to incorporate the GREENMAR project and some modifications on power generators during international operations, in UNIFIL-ONU (United Nations Interim Force In Lebanon).
UNITED KINGDOM	LAND EQUIPMENT : Tent insulation, LED lighting. It is also developing the Land Open Systems Archictures framework to enable energy efficient technologies to be incorporated into land vehicles in an open, modular and scalable way. NAVY: The Affordable Maritime Presence research programme is actively examining ways to make Navy vessels more energy efficient.
UNITED STATES	a) In Fiscal Year 2012, the Department fielded a broad array of initiatives to improve operational capabilities and reduce the sustainment burden on deployed forces, including: i) Through the Experimental Forward Operating Base (ExFOB) process, the USMC accelerated delivery of the Solar tirtable Alternative Communications Energy System (SPACES) and Ground Renewable Expeditionary Energy Network Systems (GREENS) to Afghanistan and globally deployed USMC forces. ii) The Army's "Energy to the Edge" program fielded a diverse array of energy-efficient gear to selected units conducting operations in Afghanistan and Africa. iii) The Army's new Advanced Medium Mobile Power Sources (AMMPS) generate power, on average, 21% more fuel efficiently than prior generators. iv) The Army's Logistics Civil Augmentation Program (LOGCAP) completed 96 energy savings initiatives that saved over 6.3 million gallons of fuel in Afghanistan. b) See more here: http://energy.defense.gov/Portals/25/Documents/Reports/20131015_FY12_OE_Annual_Report.pdf
FINLAND	Finland has not incorporated large scale energy efficiency technologies during operations. In a smaller scale MoD branch has started using renewable energy

Question 7. **Has your Ministry of Defence incorporated/fielded energy efficiency technologies during operations (explain)?**	
	sources in own heat energy pro-duction, developed a sustainable building designs for military crises management operations and increased efforts to test biofuels in military aircrafts.
SWEDEN	Waste heat from generators used to heat barracks

Question 8. **National POC**	
CANADA	Maj Lloyd Chubbs M.Eng, EP, PMP CJOC/COIC J Engineer Environment/J Ing Environnement Star Top 2SB01 Telephone | Téléphone 613-945-2017 Mobile | cellulaire 613-668-2543 Facsimile | Télécopieur 613-990-3417 lloyd.chubbs@forces.gc.ca
CHECH REPUBLIC	LTC Stanislav COUFAL, Senior Officer, Support Division, CZE MOD Contact: office: +420 973 214 285, cell: +420 608 757 018 stcoufal@seznam.cz
GERMANY	Bernd Krämer Branch Chief Planning I 2 Street Address: Fontainengraben 150, D-53123 Bonn, Germany Mail Address: Postfach 1328, D-53003 Bonn, Germany Phone: +49(0)228-99-24-5638/7648 Fax: +49(0)228-99-24-3033 E-mail: BMVgPlgI2@BMVg.Bund.DE
GREECE	Major (Eng.) Nektarios Alexandris (GRC AF) Environmental Engineer, M.Sc. Mechanical Engineer Aircraft Engineer Ministry of National Defence General Directorate of Economic Planning & Support Directorate of Military & Technological Support Department of Infrastructure & Environment Energy Efficiency Office / Head Papagou Camp, 227 - 231, Mesogeion Ave., 154 51, Holargos, Attica, Greece. tel. +30 210 6598592 fax +30 210 6598722 mob. +30 698 3516100
HUNGARY	N/A
LATVIA	Agnese Krauze Vides nodaļa Valsts aizsardzības militāro objektu un iepirkumu centrs Ernestīnes iela 34, Rīga, LV-1046, Latvija Tālr.: (+371) 6 7300245, (+371) 2 6514664 Fakss: (+371) 6 7300207 E-pasts: agnese.krauze@vamoic.gov.lv,
LITHUANIA	Mr. Karolis Aleksa Deputy Director, Defence Policy and Planning Department Ministry of Defence of the Republic of Lithuania Totorių str. 25/3, LT-01121 Vilnius, e-mail: karolis.aleksa@kam.lt

Question 8. National POC	
NETHERLANDS	Maj Albert de Haan Senior Officer (NLD) Force Support Engineering Military Engineering Centre of Expertise Engineer Training Centre Brederodekazerne Lunettenlaan 201 Building H, Room 109 5263 NT Vught The Netherlands Tel: +31 (0)73 688 18 54 Mobile:+31 (0)6 41 88 07 54 Email : NA.d.Haan.01@mindef.nl
SPAIN	Under-directorate for Technology and Innovation (SDG TECIN) Arturo Soria, 289 28033 - Madrid (SPAIN)
UNITED KINGDOM	James McMenemy: UK Defence Equipment and Support DESTECH-TDLogSys1@mod.uk (or Rachel Leslie from Defence Science and Technology Laboratory, rlleslie@dstl.gov.uk
UNITED STATES	Mr Oliver Fritz, Director for Policy Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs +1-571-256-0796 oliver.h.fritz.civ@mail.mil
FINLAND	Mr Sami Heikkilä Planning Officer Community and Environment Unit Ministry of Defence of Finland Mobile +358 295 140452 sami.heikkila@defmin.fi P.O. Box 31 FI-00131 Helsinki Finland
SWEDEN	Ingela Bolin Holmberg Produktledare miljö och drivmedel FMV-Försvarets materielverk Logistik och Gemensam materiel 115 88 Stockholm Telefon 08-7824176 Mobil 070-6664929 e-post: Ingela.bolin.holmberg@fmv.se<:%20Ingela.bolin.holmberg@fmv.se> Web: www.fmv.se

Annex D

Smart Energy Team (SENT)
NATO Science for Peace and Security Programme
"Improving Energy Efficiency for Military Forces (and their Support)"

Smart Energy Training & Assessment Camp (SETAC)

(updated: 17 February 2015)

Description

One of the ideas to improve energy efficiency on military bases is to create a test base facility in which troops can train and the used energy is measured, new technologies and energy management tools can then be applied to measure the differences in power usage. The idea is supported by several NATO members and partners, this training and assessment camp must be complemental to the already existing test camps of several nations.
This idea will be referred to as SETAC (Smart Energy Training & Assessment Camp). The goal of this initiative is to get more detailed information about the use of utilities like energy and water on a manned compound and test new systems to improve energy efficiency. By testing new techniques and making troops aware about the importance of energy reduction the dependency on fossil fuels might decrease significantly.

Basics:

- Test base for a maximum of 150 pax, to simulate a military pattern of life;
- Type of base for operational use, systems must be transport ready on a relatively short base (days rather than months);
- The Conceptual Model developed during the SPS ARW "Sustainable Military Compounds: Towards a Zero Footprint Compound", should be used as a planning and validation tool in SETAC.
- Test facility only to use for testing purposes, not for development of systems/equipment.

Guidelines:

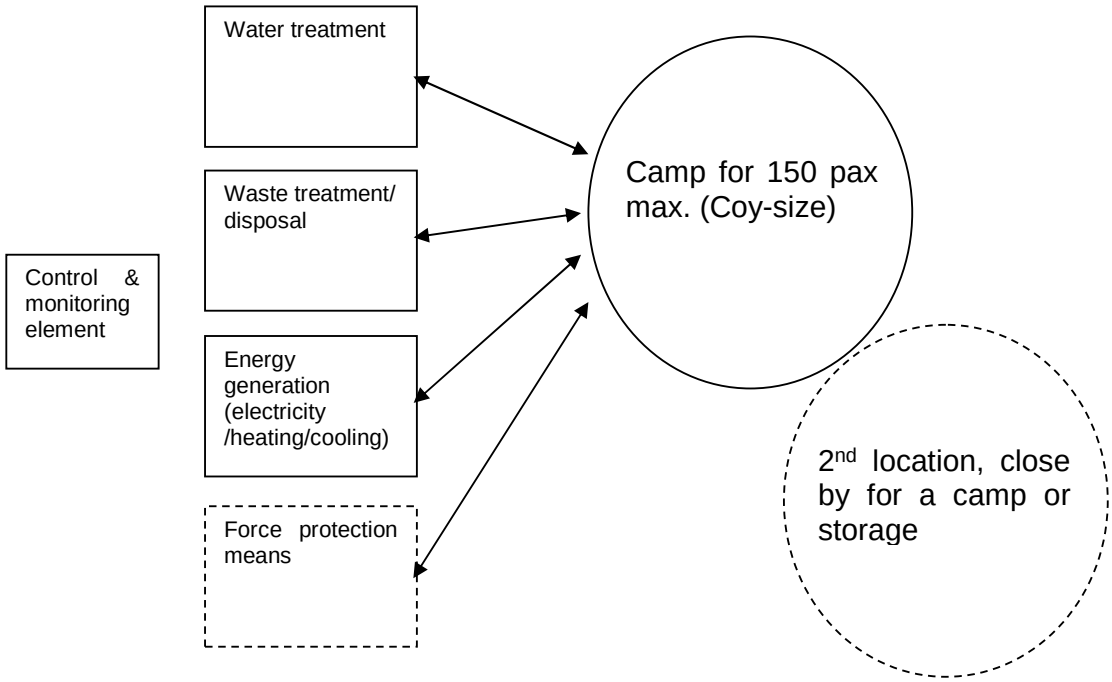
- Involvement of three parties, military, civilian companies and knowledge institutes;
- International and national companies/manufacturers can use the facility to test their products.

Possible setup for a test and assessment camp

The test camp itself can be built up with standard equipment as being used for the last years in building temporary camps. It will contain standard elements like an command post, dining facility, communications center, medical post, sleeping area etc.
Each of these facilities can be connected to the electrical power grid and if needed the water infrastructure. The infrastructure for electricity and water needs to be underground at the camp site. Several outlets above the ground can then be used for power and water connection. Every outlet can be equipped with measuring instruments, so that each individual power and/or water user can be monitored.
Public utilities, needed for running the camp, like power generation, water delivery, waste and wastewater treatment will be located just outside the camp area. The utilities can be divided over some functional "islands". Each island can be used by companies or manufacturers to serve the camp.

The connection lines to the camp, which can be water pipes or electricity cables will get measuring instruments in them to measure the flow to the camp.
All measurements taken will be monitored and possibly stored in some kind of control and monitoring room. Wireless measuring equipment could be a possibility for this.

Simple sketch of a test and assessment camp:



Water Treatment Island

Different types of water treatment systems can be placed on this island and connected to the camp. Performance measurements of various systems can be measured here. Piping infrastructure for potable water and non-potable water and/or sewer systems must be designed. The underground piping infrastructure will then be connected to the water treatment island.

Waste Treatment Island

Different types of waste treatment systems can be placed on this island and (connected) to the camp. Performance measurements of various systems can be measured here.
If waste disposal systems are being used to generate some kind of energy (Electricity or thermal) these systems might be placed on the energy generation island.

Energy Generation Island

Different types of energy generation systems can be placed on this island and connected to the camp. Performance measurements of various systems can be measured here.
It must also be possible to connect several energy systems together on this island to feed the camp. For example, a combination of solar systems and diesel-generators.
It should also be possible to install local power generation systems on the camp, if for example they are incorporated in a roof of a housing system.

Force Protection Island
This island may be used to test some force protection systems to protect a camp, whether this island is necessary, is not clear yet.

Monitoring Element
To operate the camp and to keep supervision, a small control center might be needed.

The so called “islands” can be used by companies/manufacturers to test their systems; the test-facility will only be used for testing, not for development of the systems. The facility will be available for national and international companies/manufacturers. The bases can be used by company sized military units to mimic the life on a military camp with its specific cycle of power and water use.

The camp should also have training value for a company, so they can use it to fulfill their own military training purposes.