SCIENCE AND TECHNOLOGY COMMITTEE

NEW ENERGY IDEAS FOR NATO MILITARIES: BUILDING ACCOUNTABILITY, REDUCING DEMAND, SECURING SUPPLY

DRAFT REPORT*

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* Until this document has been approved by the Science and Technology Committee, it only represents the views of the General Rapporteur.
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I. INTRODUCTION

1. Since the arrival of the internal combustion engine in the 1850s, energy has played an important role in military planning in one way or another. However, over the last 60 years, the energy consumption of militaries has reached unprecedented levels. The advent of jet-powered aircraft in the 1950s led to a quantum leap in the amounts of fossil fuels militaries use. Likewise, the growing energy requirements of a modern soldier’s combat gear and of the sophisticated electronic devices deployed on military bases have resulted in a significant increase in the amount of electricity required. Not surprisingly, US soldiers serving in the recently concluded Iraq mission consumed roughly 103 litres of fuel per day, compared to only 6.3 litres during World War II (Molis, 2012). The increasing need for fuel and electricity to power modern warfare has also created the need for expensive logistics and supply lines, for example in the form of aerial refuelling tankers or fuel tanker trucks.

2. Not least due to the use of considerable amounts of energy, NATO forces have reached unprecedented levels of effectiveness. Indeed, until recently, the NATO militaries paid little attention to increasing energy efficiency and effectiveness and establishing new sources of energy and fuels. Plentiful, inexpensive supplies of petroleum products and electricity prompted defence planners to focus their attention on building weapons platforms that were bigger, faster, and more powerful – no matter how energy intensive. However, in recent years, it has become increasingly obvious that energy is no longer an inconsequential expense.

3. This draft report evaluates the risks of inefficient and ineffective energy use by militaries and discusses what is done both at the level of certain individual NATO member states and collectively at the NATO and European Union (EU) level to address these risks. In light of the economic, environmental, and security risks of ever-growing military energy dependence, this draft report undertakes to examine what new ideas have been developed across the Alliance to increase the energy efficiency and effectiveness of militaries. Towards this end, it provides snapshots of some of the main activities Allied militaries have carried out in recent years. Specifically, activities in three areas are examined, namely the building of energy accountability, the reduction of energy demand, and the securing of energy supplies.

II. THE IMPERATIVE OF NEW ENERGY IDEAS FOR NATO MILITARIES

4. The proposition that Allies need to formulate and implement new ideas to strengthen the energy efficiency and effectiveness of their militaries has been challenged on various accounts. It has been argued that the steady increase in the amount of energy militaries use has been a vital prerequisite for making NATO’s armed forces as effective as they are today. In this line of reasoning, the effectiveness of military equipment and ultimately the achievement of strategic objectives are crucially dependent on the availability of unrestricted supplies of energy, particularly fossil fuels. Critical voices thus express concern about energy usage trumping sound strategic considerations.

5. Another argument put forward more recently is that the availability of substantive amounts of new fossil energy resources in the form of unconventional gas and oil diminishes the need for strategies that reduce military energy demands and diversify military energy supplies. Indeed, in the United States, some military strategists have argued that unconventional gas and oil will provide the military with cleaner energy at lower prices on a sustained basis for decades to come. While such unconventional energy sources are still seen with some suspicion in Europe, similar arguments might soon emerge among European military strategists.

6. Last but not least, some experts have argued that the financial and environmental costs of changing established energy demand patterns and diversifying energy supplies are too high. The main line of reasoning is that alternative fuels have lower energy densities than petroleum and that
therefore more fuel would have to be used to achieve the same power output. The bottom line is that alternative fuels cannot promise any performance advantages, which might ultimately make them more expensive than petroleum. Finally, doubts have been expressed about the possibility of producing biofuels in quantities that would be sufficient to replace petroleum in military energy planning.

7. While some of these arguments may have internal validity, they disregard the wider negative effects that high levels of military energy consumption can have on the fiscal health of Allies in times of austerity, on environmental sustainability, and on the security of NATO soldiers and military installations. Indeed, the generation and implementation of new energy ideas for NATO’s militaries are a political, economic, and strategic imperative.

A. AUSTERITY

8. The costs of powering NATO militaries, both in operational theatres and at home, have increased vastly ever since the first oil crisis in the 1973 and particularly over the last decade. The main reason for soaring costs has been the increasing price of energy itself, and particularly petroleum. Thus, for example, during fiscal year (FY) 2005, the US Department of Defense (DoD) spent US$ 8.8 billion for 130 million barrels of petroleum supplies. During FY 2008, the DoD spent US$ 17.9 billion for 134 million barrels. In other words, for almost the same amount of petroleum purchased in 2005 the DoD paid almost twice the price in 2008 (Reichert et al.). Significantly, in contrast to oil prices, the cost of renewable energy has been declining rapidly in recent years.

9. Another reason for the increase in military expenditure for energy has been a steady growth in the amounts of energy which militaries have required to power their operations. This is a result of the increasing mechanisation of the armed forces as well as a rise in the number of expeditionary missions conducted in recent years. Thus, in 2010, the DOD spent more than US$ 15 billion on energy to conduct military operations (Rougehead, Carl & Hernandez, p. 2). US armed forces consumed nearly 5 billion gallons of petroleum in military operations at a total cost of US$ 13.2 billion, representing a 255% increase over the amount paid in 1997 (Rougehead, Carl & Hernandez, p. 3).

10. A third reason for the growing price of military energy supplies, which is often neglected, is the significant external cost of consuming energy in conflict theatres, with transport, storage, and human resources generating the highest costs. Indeed, a substantial amount of the costs associated with energy consumption in conflict theatres arises from transportation, which itself requires considerable amounts of energy. Additionally, in out-of-area operations, thousands of troops are put at risk protecting energy convoys and storage spaces. These troops cannot be deployed in operations, thus raising overall manpower needs. Moreover, the protection of energy convoys often results in casualties. Taking all these factors into consideration, the DOD, for example, has estimated that the cost of petroleum consumed in theatres easily amounts to US$ 40 per gallon and in some cases even more (Reichert et al.).

11. In the future, high levels of fossil energy consumption by militaries could become even more expensive because of tightening environmental regulations. In September 2012, the EU, for example, adopted an overarching concept on Environmental Protection and Energy Efficiency in EU-led military operations, which contains in large parts language and standards from existing NATO documents. As early as 2003, NATO’s Military Committee adopted the overarching NATO Military Principles and Policies for Environmental Protection under which several standards, called STANAGs, as well as guidelines and best practices have been developed and agreed upon. STANAG 7141 (Joint NATO Doctrine for Environmental Protection During NATO-Led Activities), for example, provides guidance for environmental management during NATO-led military activities. Currently, NATO militaries – like most military forces around the globe – are largely exempted from meeting the costs of producing CO₂ emissions. However, as the international community and
individual states formulate and implement ever stricter environmental legislation for civilian as well as military activities, the indirect costs for using oil and other carbon energy resources excessively could also increase for militaries.

12. Finally, some more indirect costs are also associated with high levels of military energy consumption. Thus, the development and procurement of more efficient and effective military energy capabilities can provide a crucial economic stimulus to civil sector industries, creating new jobs and capital. Indeed, in recent decades, technological developments in the military sector have often provided the basis for even more ambitious commercial developments, for example computers, the Internet, the Global Positioning System (GPS), and semiconductors. Existing research suggests that US military investments in new energy technologies might reach US$ 10 billion a year by 2030. Abandoning military energy efforts in the future would put an end to this potential economic and innovation stimulus, which could potentially provide added value to the substantial amount of civilian investment in new energy technologies already available.

B. SUSTAINABILITY

13. In most cases, the human and economic costs of military operations are so high that the environmental costs are never really taken into consideration. However, the environmental costs of high levels of military energy consumption are considerable and unsustainable in the long-term. Indeed, NATO militaries produce enormous amounts of carbon emissions both at home and abroad, the impact of which has crucial global repercussions.

14. While the carbon footprint of large organisations is always difficult, if not impossible, to fully establish, some basic estimates of Allied carbon footprints have been provided in the past (The Guardian, 4 June 2010). Thus, at the end of the last decade, the UK Ministry of Defence (MOD) estimated that it produced approximately 5.5 million tonnes of CO$_2$ emissions each year, with almost two million tonnes from non-operational energy use across its fixed installations in the UK (RUSI; UK Ministry of Defence, 2009). An even more worrying picture emerges when examining the carbon footprint of the military operation in Iraq. The newspaper The Guardian has estimated that, between 2003 and 2010, all military operations in the country taken together released about 250-600 million tonnes of CO$_2$ per year (The Guardian, 8 July 2010). To put this into perspective, an EU citizen produces on average around 8.9 tonnes of carbon dioxide per year, for close to 4.5 billion tonnes EU-wide (Eurostat).

C. SECURITY

15. NATO militaries’ dependence on stable energy supplies has several security implications. First of all, steady energy supplies are a crucial prerequisite for militaries’ ability to ensure national security and the security of soldiers in the field. Military installations in NATO member states host a multitude of critical systems, which must be operational 24 hours a day, 365 days a year. In operational theatres, shortage of fuel and electricity would therefore halt combat operations and disrupt support functions.

16. Another security dimension is inherent in the transport of energy. The need for large amount of fossil fuels can only be met by a large number of fuel convoys, the protection of which puts soldiers’ lives at considerable risk. In 2010, there were 1,100 attacks on ISAF fuel convoys in Afghanistan, and it has been estimated recently that one in 46 convoys results in a casualty. Official records show that between 2003 and 2007 the protection of fuel convoys resulted in more than 3,000 military and contractor casualties. Yet, a NATO mission can hardly be accomplished without these fuel convoys. In 2011, for example, Pakistan closed the border with Afghanistan three times, which held down 4,000 fuel trucks at the border for almost one month, causing considerable disruptions to the ISAF mission and higher energy costs, as fuel had to be shipped in from other sources.
17. The considerable number of convoys necessary for providing energy and the need to protect these convoys often divert forces from combat operations and war fighting. However, the need for steady energy supplies even affects those soldiers who are engaged in combat operations. Thus, it is estimated that up to 20% of a NATO soldier’s combat gear which has a total weight of 30-40 kg) consists of batteries. NATO soldiers must carry more than 3 kg of batteries for each day on mission. Naturally, this negatively affects mobility and ultimately survivability. Thus, even when energy needs are met, dependence on energy supplies might still pose a risk to soldiers’ lives.

III. NEW ENERGY IDEAS AND THE CURRENT STATE OF POLICY-MAKING IN THE ALLIANCE

18. While all Allies have pursued a proactive approach in recent years with regard to developing new energy ideas, this draft report focuses on the activities of three NATO member states – the United States, the United Kingdom, and Turkey – as well as one crucial supra-national NATO partner, the EU. This selection has been made on the basis of the relative expenditures and sizes of militaries, with the United States being the largest NATO military contributor, the United Kingdom being the biggest military spender in Europe, and Turkey being the European NATO member state with the largest number of active military personnel. Moreover, the selection of countries for this study makes for a rather interesting comparison, as the United States and the United Kingdom have a long-standing track record in improving the energy efficiency of their militaries, while Turkey has only recently begun to invest in this area but is eager to make swift progress. The EU is NATO’s most important multi-lateral partner and one that tries to play an active role in increasing the energy efficiency and effectiveness of its member states. NATO's own military energy efforts are reviewed in section IV.

A. BUILDING ACCOUNTABILITY

19. Building energy accountability means first and foremost fostering energy awareness. Leadership on energy efficiency and effectiveness plays a key role in formulating overarching policy change, while energy awareness training at the individual level is at the heart of behavioural change and ultimately the successful implementation of new policies. Often neglected, reliable benchmarking tools for energy usage are just as important when it comes to effective implementation. Data-logging and monitoring of energy consumption and energy performance are prerequisites for changing the mind-set and identifying effective and feasible solutions. All of these aspects feature in one way or another in the energy accountability activities of the Allies under review here.

1. United States

20. In recent years, the US armed forces have formulated detailed energy strategies, which outline a wide range of energy awareness activities. The 2009 Army Energy Security Implementation Strategy, for example, highlights the strengthening of energy leadership, ownership, and accountability (US Army). Thus, the US Army has mandated senior officials to nourish an energy efficiency culture by promoting the implementation of new energy efficiency proposals into existing and future strategies, projects, and efforts. The Army also regularly conducts energy training courses. Today, new Army recruits receive energy efficiency training from the first day. Moreover, Army commands, offices, and personnel are increasingly accountable for their energy usage, and incentives are provided for developing and implementing innovative energy solutions.

21. To make energy a consideration in all activities carried out in the US Air Force, it has set up a dedicated Culture Change Working Group (CCWG). The overarching aim of the CCWG is to instil an energy efficient management culture and to promote personal responsibility. To this end, the CCWG pursues activities in three principle areas, namely leadership, individual training, and
benchmarking (US Air Force). Thus, the CCWG encourages Air Force leaders to regularly initiate personal communications with subordinates on energy management and to demonstrate their commitment through personal actions. At the same time, a system is in place that rewards leaders for energy efficient management practices. To promote energy awareness at the individual level, the CCWG has launched awareness campaigns and developed new training courses. The CCWG is also currently developing a set of incentives aimed at encouraging energy efficiency among Air Force personnel, such as specific energy awards. In order to provide an energy efficiency benchmark, the CCWG is aiming at regularly measuring workforce motivations, alignments, and actions. In addition, surveys will be used to measure how well energy awareness and personal responsibility for energy efficiency has penetrated different segments of the work force.

22. The 2010 Navy Energy Vision for the 21st Century puts general policy change, coherent leadership, and individual training at the heart of the Navy’s efforts to raise energy awareness (US Navy, 2010). Policy change for energy efficiency first and foremost denotes the development and adoption of technologies that help to monitor energy consumption directly or that provide data on factors that influence consumption, such as observed or forecast weather and ocean currents. The Navy is also adapting policy to support the effective use of new technologies. To ensure a coherent approach to changing its energy policy, the Navy has appointed a Director of Operational Energy responsible for overall leadership. Reporting to a Senior Energy Council, the Director works with all stakeholders to ensure that energy considerations are seamlessly incorporated into decision-making processes. At the individual level, the Navy has introduced energy awareness training courses and developed several incentives for energy conscious behaviour.

2. United Kingdom

23. In 2011, the MoD adopted a sustainable development strategy, which defines the promotion of energy awareness as a crucial objective for all military branches (UK Ministry of Defence, 2011). Recognising that overarching organisational values are the key, the MOD has committed itself to integrating energy efficiency considerations into all future strategic documents.

24. The MoD’s sustainable development strategy also highlights the commitment of defence leaders as a crucial driver of energy efficiency. Accordingly, the MOD encourages senior defence officials to personally lead by example and to demand that their staff do the same. In addition, the MOD has appointed ‘sustainable development champions’ who act as ambassadors for energy efficiency.

25. On the individual level, the MoD has identified training and engagement as essential prerequisites for changing behaviour. Over the last years, defence training courses have therefore regularly been adapted to include modules on energy efficiency and effectiveness. Furthermore, engagement strategies and plans are used to engage different stakeholders, and mechanisms are currently being developed to allocate clear responsibility and accountability to individuals on their energy usage.

26. In recent years, the MoD has been at the forefront of developing reliable benchmarking tools for measuring energy consumption. Recognising that it is difficult to manage energy consumption if the latter cannot be measured effectively, work is undertaken to improve the quality and coverage of data. In this respect, the MoD draws on a so-called Fully Burdened Cost of Energy (FBCE) model, which BAE Systems has developed to help defence organisations understand their current and future demands for energy in a holistic perspective. The FBCE model provides insights into the full costs of energy at the point of usage, taking into account, among other factors, the logistics effort required to transport the energy, the infrastructure to store and generate it, the cost of protecting it, and the costs produced by CO₂ emissions. The FBCE model has already generated some valuable insights. For example, although providing forward bases with electricity typically accounts for only 3% of the fuel usage in deployed scenarios, the generation of
this electricity easily accounts for 20-30% of the fully burdened energy costs when factoring in the energy costs of the supporting infrastructure and other crucial supply chain elements.

27. The FBCE model also helps to identify where investment in energy technologies can lead to cost savings, not only with regard to the use of energy but also with regard to infrastructure and logistics support. Considering the fully burdened costs of fuel saved may provide a more compelling case for investing in more efficient infrastructure and transport technologies than simply considering the raw costs of the energy saved. In the future, the fully burdened approach could even be used to identify opportunities to increase the security of energy supplies.

3. Turkey

28. The energy budget of Turkey's armed forces amounts to about US$ 900 million annually, with about 20% being earmarked for electricity, 25% for heating and the remaining 55% for fossil fuels, which are primarily used to power aircrafts and vehicles. In view of the considerable resources spent on energy, the Turkish armed forces have recently intensified their efforts to build greater energy usage accountability. Thus, a committee has been set up, which will co-ordinate energy efficiency activities.

29. The Turkish Ministry of National Defence has also established a special Energy Efficiency and Environmental Management Unit, which has been tasked with providing analyses and reports on increasing military energy efficiency in a wide range of areas across all military branches. The Unit also designs and implements projects that aim at promoting a more systematic evaluation of strategic decisions and the development of action plans in line with energy efficiency objectives. The Turkish Ministry of National Defence has also appointed a number of energy managers who are mandated to raise energy awareness among the different stakeholders across the military branches.

30. In addition to these efforts, the Turkish armed forces, in co-operation with the Scientific and Technological Research Council (TUBITAK) and under the auspices of the West European Armament Group (WEAG), currently execute the Molten Carbonate Fuel Cell (MCFC) project. The results of these efforts and the infrastructure built in the context of this project are also used in the 'Full Electrical Ship' project.

4. European Union

31. Since its launch in 2004, the European Defence Agency (EDA) has been at the helm of EU efforts to promote and co-ordinate common European projects on increasing the energy efficiency and effectiveness of EU militaries. However, given its firm focus on the technical side of multi-national defence capability development, the EDA has only engaged in a limited amount of awareness raising activities to date. These include two workshops focusing on sustainable energy supplies in crisis management operations that were conducted in 2011 and 2012 respectively (European Defence Agency, 5 May 2011; European Defence Agency, 6 February 2012).

32. Since its launch in 2011, the European External Action Service (EEAS) has become increasingly involved in raising military energy awareness among EU militaries. Thus, in September 2012, the EU Military Staff, which is part of the EEAS, presented a European Union Military Concept on Environmental Protection and Energy Efficiency for EU-led military operations, calling for organisational, behavioural, and technological changes (Council of the EU). Organisational changes primarily refer to increasing the interoperability of military resources and promoting the standardisation of equipment in line with higher energy efficiency requirements. To promote behavioural changes, the concept calls for a pragmatic incorporation of awareness training and education into existing programmes. In terms of technological changes, the modification of energy supplies is defined as a key priority. This includes the introduction of new energy generation technologies alongside conventional ones as well as efficient storage and
distribution architectures. The EU’s concept also calls for the reduction of energy consumption by introducing automated energy management systems and structural improvements, such as better thermal insulation. As the concept has only been adopted recently, its impact on the energy culture in EU militaries remains to be seen.

B. REDUCING DEMAND

33. Reducing the energy demand of NATO militaries has two dimensions, the fixed installations dimension and the operational dimension. Taking the example of the United States to illustrate the first dimension, reducing energy consumption at fixed installations means reducing the energy consumption of more than 500,000 buildings and structures at 500 major bases around the world. All of these buildings require energy for electronics, lighting, and heating and cooling. While there is substantial potential for reducing energy consumption at such large facilities, it is also a challenging task with considerable timelines.

34. In addition to energy consumption at fixed installations, militaries also require operational energy. Operational energy means the energy required for training, moving, and sustaining military forces, and weapons platforms for military operations. It usually constitutes a much bigger share of the energy militaries consume than powering bases does. Reducing military energy consumption must therefore start with mobile assets deployed abroad. Indeed, improving energy efficiency and effectiveness of NATO aircraft, ships, and ground vehicles arguably represents the cheapest and fastest way of reducing overall energy consumption.

1. United States

35. The DoD has pursued initiatives to increase energy efficiency at bases for more than a decade. As a result, between FY 2003 and FY 2010, overall energy usage at both fixed and at forward operating Army bases was reduced by 11.4% (Reichert et al.). Nevertheless, among all US government agencies, the Army still has the highest levels of facility energy consumption. US$ 1.2 billion were spent on powering bases at home and in operational theatres during FY 2010 alone (Roughead, Carl & Hernandez). In response, the DOD has established one of the most ambitious energy efficiency programmes in the Alliance. Since 2009, the Installation Energy Test Bed programme has examined a wide range of energy saving approaches (Strategic Environmental Research and Development Program). While still underway, the initiative has already yielded more than 45 demonstration projects, which have the potential to collectively reduce energy demand by 50% in existing Army buildings and by 70% in new constructions. The programme is focused on developing and testing new energy technologies in five specific areas: lighting, heating, and cooling; energy management and control; smart grid and energy storage; energy assessment and design; and alternative energy generation.

36. During FY 2010, the Army spent US$ 2.5 billion on fuel purchases for combat and non-combat vehicles deployed in operational theatres (Roughead, Carl & Hernandez). A prime objective in reducing the Army’s overall operational energy consumption has therefore been to reduce the consumption of fossil fuels. To this end, the Army has focused on promoting the development of medium- and heavy-duty electric vehicles that could replace the current fleet of 190,000 non-combat vehicles. Accordingly, in June 2011, the DoD released a call for proposals to electric vehicle manufacturers and other stakeholders for an electric vehicle that could be deployed at a cost that is competitive with internal combustion engine non-combat vehicles.

37. The Army has also conducted work on improving the energy efficiency of current and future combat vehicles. In mid-2012, the Fuel Efficient Ground Vehicle Demonstrator (FED) demonstrated the feasibility and affordability of achieving significant reductions in combat vehicle fuel consumption without sacrificing performance or capability (US Army Tank Automotive Research, Development and Engineering Center). While the FED itself will not go into production, some of its components and technologies may be incorporated into the current fleet as well as in
future designs. However, despite these advances, future generations of US Army ground vehicles are projected to weigh more and will therefore also burn more fuel than current models (Sarewitz et al.).

38. Similarly, the future equipment of US soldiers deployed in combat theatres is likely to consume more energy. Indeed, in the past, the Army has made few efforts to cut the amount of power consumed by electronic equipment, such as radios, even though it is widely recognised that well-known off-the-shelf commercial practices could significantly reduce the energy needs of combat gear (Sarewitz et al.). Indeed, as battery-powered systems and equipment are proliferating, US soldiers could end up carrying even more batteries in the future.

39. Like the Army, the Air Force has focused its efforts on reducing fossil fuel consumption. Thus, the US Air Force has been investing in a Versatile Affordable Advanced Turbine Engine programme, which seeks to improve fuel consumption by 25% compared with other state-of-the-art engines. Moreover, the Air Force is taking steps to optimise fuel consumption by implementing energy management and operational initiatives, such as modifying routes, improving aircraft centres of gravity, increasing the use of flight simulators, and adjusting aircraft-to-crew ratios. Taken together, all of these activities generated energy savings of US$ 494 million during FY 2012 (Reichert et al.).

40. To date, the Navy has arguably accomplished the greatest tangible achievements in the battle for lower energy consumption. By installing so-called stern flaps, which reduce drag and therefore the energy required to propel a ship, the Navy has already generated annual savings of up to US$ 450,000 per ship over the last few years. Recently, the Navy has also begun to introduce hybrid energy systems on board of some of its ships. Commissioned in 2009, the USS Makin Island was equipped with a hybrid electric propulsion system, which combines diesel, gas, and electric propulsion and is expected to save more than US$ 250 million in fuel costs over the course of its lifecycle. In the near future, a similar hybrid electric drive system will also be tested and installed as a proof of concept on the USS Truxtun. The Navy has also invested US$ 91 million during FY 2012 into developing more advanced materials for propellers and water jets as well as systems that allow ship hulls to eliminate biological growth, e.g. algae, which contributes to reduced energy efficiency.

2. United Kingdom

41. In recent years, UK armed forces have undertaken a wide range of efforts to reduce energy consumption. Indeed, the British Army has built a particularly sound track record when it comes to making its forward operating bases more energy efficient. Thus, in 2009, the MoD set an ambitious 50% reduction target for fuel consumption at its military bases in Afghanistan (Fielding; Stein). To meet this target, activities have been underway to reduce fossil fuel consumption by 30% at Camp Bastion with the help of more efficient fuel management. The remaining 20% are to be achieved by improving insulation and capturing waste energy through combined electricity and heat generation at other British-run bases. Moreover, in 2011, the MoD’s Defence Equipment and Support Division presented the findings of a research project on saving energy in forward operating bases (Desideri). The Power Forward Operating Base project demonstrated the ability of a wide range of commercially available technologies to reduce energy costs without the need for any major investments.

42. Achievements with regard to reducing the fuel consumption of Army vehicles deployed in operations have been more modest so far. However, in July 2012, the MOD’s Centre for Defence Enterprise launched an ambitious call for proposals on optimising the energy efficiency and effectiveness of existing Army combat and non-combat vehicle platforms (Centre for Defence Enterprise). While the evaluation is still on-going, various ideas on technology insertion, such as tools that utilise waste energy, and on systems optimisation, such as tools that enable better utilisation of power systems, appear promising.
43. Over the last years, the Royal Air Force (RAF) has primarily explored operational and training improvements as a basis for reducing energy consumption (Fielding). For example, a 2009 International Air Transport Association study gave impetus to several operational adjustments, after revealing that changes to flight planning, more efficient operation of jets, and improved maintenance procedures could produce savings of £6.9 million (Stein). The RAF has also examined the possibility of more frequent use of simulator-based air training to reduce the amount of fuel consumed in exercises. On the technical side, recently signed procurement contracts for energy efficient navigation aids and more fuel-efficient aircraft for radar flight checking are expected to save more than £5 million and 1,600 tonnes of CO₂ until 2015 (Dixon).

44. The Royal Navy has arguably achieved some of the most tangible results in recent years. In this respect, the installation of electric transmission gearboxes on board of its ships has been of particular importance (Hodge). Today, most warships use mechanical transmission whereby a diesel or gas turbine engine drives a gearbox which in turn powers the shaft and propeller. Such systems are most energy efficient at full power and at full load. Since warships need to be able to vary their speeds constantly and thus to be fuel-efficient at all speeds, the Royal Navy has promoted the electrification of vessel transmission systems. The result is a flexible system that can handle a range of speeds and loads without losing efficiency to the extent a traditional mechanical equivalent would. The first warship with a modern electric drive, the HMS Daring, was formally handed over in December 2008. Recognising the advantages of electric propulsion, the MOD has adopted as its default position that future warships should incorporate electric propulsion. Current Royal Navy plans also envisage the extension of electric drive technologies to most aircraft carriers and submarines.

3. Turkey

45. In the past, most of the Turkish armed forces’ efforts to reduce energy consumption have revolved around improvements at fixed installations. In this respect, a first step was taken when energy managers were appointed to monitor developments at all installations that consume more than 260 MWh annually and/or that cover more than 10,000 m². As a result, calorimeters at all military buildings have been replaced and more energy efficient light systems have been installed. Furthermore, the insulation of buildings has been improved. A Committee for the Coordination of Energy Productivity also constantly reviews all technological innovations in the private sector that may help to increase the energy efficiency of military installations, focusing in particular on solar energy technologies.

46. More recently, the Turkish Ministry of National Defence has also begun to explore the possibility of introducing hybrid electric propulsion technologies as a means to reduce the energy consumption of combat and non-combat vehicles. In addition, solar energy solutions to powering vehicles are being reviewed.

47. Other bodies of the Turkish Ministry of National Defence (MSB), such as the Under-secretariat of Defence Industry and the Research & Development Department, administer projects on the development of Direct Methanol Fuel Cells (DMFC) for Portable Communication Systems as well as synthetic jet fuels. Additionally, the Turkish armed forces now use thermal cells for missiles and smart munitions as much as possible as a consequence of a successful TUBITAK project.

4. European Union

48. To date, only one major EDA effort has been concerned with the development of technologies that could contribute to reducing military energy consumption. Thus, in 2009, the EDA completed an Overall Platform Energy Efficiency Study, which sought to identify the most effective means of reducing energy consumption on board naval ships (BMT Defence Services, 2009). The study aimed at identifying new technologies, which could improve the energy efficiency
of naval platforms on a whole-ship basis, exploring for example, the efficiency of the hull/water interface, hydrodynamic design, prime movers and propulsion mechanisms, electrical transmission, and reuse of waste heat.

49. After reviewing over 100 candidate technologies, 16 were earmarked as warranting further consideration. Detailed analyses were subsequently carried out with reference to four ship types: small and large surface combat ships, a large amphibious assault ship, and a fleet tanker auxiliary. Technology roadmaps were created for the most promising technologies. The study also defined the activities necessary for the full development of some of the shortlisted technologies. Eventually, high temperature fuel cells and iso-engines were identified as the most promising technologies with regard to conducting further research and development (BMT Defence Services, 28 August 2009).

C. SECURING SUPPLY

50. Securing military energy supplies easily translates into diversifying military energy supplies. Indeed, some argue that the greatest challenge for NATO forces in overcoming energy dependence is to find a viable substitute for fossil fuels. In this respect, two overlapping types of energy are of primary interest, namely alternative energy and renewable energy.

51. Alternative energy describes all energy derived from sources other than fossil fuels. One form of alternative energy is alternative fuels, such as biofuels and synthetic fuels. The biofuels being currently pursued by military and commercial interests include hydro-treated renewable jet fuel and hydro-processed renewable diesel fuel, both of which can be made from the same materials or feedstocks, such as camelina, jatropha, rapeseed, soybeans, babassu, animal fats, or plant and cellulosic materials, such as crop residue, wood scraps, and switchgrass. Other emerging feedstocks include algae, seaweed, and electrofuels. Most renewable fuels being pursued by the military and commercial transportation industries are ‘drop-in’ substitutes for petroleum fuels, i.e. no costly additional engineering is required because the fuels must be chemically equivalent and perform to the standards of the petroleum-based fuels they are replacing.

52. Falling under the label of alternative energies, renewable energies are those energies that are derived from wind, the sun, water, thermal energy, and biomass. As the following sections show, renewable energies have become increasingly important in powering military efforts. Similarly, alternative means of converting and storing energy, such as fuel cells and novel batteries, are becoming increasingly important.

53. However, renewable energies face at least three considerable challenges. First, currently available technologies are often inefficient. Second, the availability of energy generated from renewable sources fluctuates greatly. Finally, and related to the foregoing point, more efficient and less bulky energy storage devices need to be developed.

1. United States

54. The last decade has seen a steady diversification of energy supplies at US military installations. Indeed, in mid-2010, the US military was implementing more than 450 renewable energy projects at bases at home and abroad. Arguably the most prestigious US Army renewable energy project at a fixed installation has been a 500 MW concentrated solar power project at Fort Irwin in California (Wall Street Journal). The most ambitious US Navy project has been the creation of a 30+ MW geothermal plant at Fallon Naval Air Station in Nevada, while the 14 MW solar array at Nellis Air Force Base constitutes one of the largest projects of its kind in the United States. Other large-scale Air Force projects in the 250 to 1,000 MW energy production range are currently under development (Deloitte).
55. With regard to renewable energies on forward operating bases, the US Marine Corps has arguably conducted the most ambitious research projects. In 2010, the Marine Corps initiated the Experimental Forward Operating Base (ExFOB) programme which tested the use of alternative energy technologies, inviting private firms to demonstrate new technologies for renewable energy generation, heating and cooling, shelters, as well as water purification. Over the course of the programme, Marines were, for example, able to incorporate flexible solar technology into the roofs of their tents, generating enough power for radios or laptops. In the autumn of 2010, a group of Marines was deployed to Afghanistan to test ExFOB programme technologies, enabling, for example, the operation of two patrol bases on renewable energy. The energy savings achieved during the trial period in Afghanistan have prompted the Marine Corps to invest US$ 25 million to provide the same capabilities to all of its units in the Helmand Province.

56. In addition to the activities pursued at fixed installations, the US Army has also made several efforts to diversify the power supplies of combat and non-combat vehicles and soldiers in various theatres. Thus, the Army has increasingly embraced the usage of ‘drop-in' biofuels, aiming at an increase of non-petroleum fuel use in non-combat vehicles by 10% annually.

57. The Army has also made great efforts to diversify the energy supplies of dismounted soldiers. Thus, the US Army Communications-Electronics Research, Development and Engineering Center (CERDEC) is currently developing two alternative technologies to power combat gear. The first technology is based on photovoltaic energy generation (Buil). Photovoltaic technology has featured most prominently in CERDEC’s Rucksack Enhanced Portable Power System (REPPS), which includes a flexible solar panel that is capable of recharging batteries and/or acting as a continuous power source. Due to its high procurement costs, its relatively heavy weight of about 4.5 kg, and its rather low solar panel efficiency, REPPS has not been made available for wider Army use so far. However, CERDEC is currently exploring the use of novel photovoltaic material, production processes, and coating techniques, and the Center expects that this could translate into making REPPS standard equipment in the near to medium term.

58. The second technology CERDEC is developing is alternative energy fuel cell technology. The benefits of fuel cell systems are portability, continuous power, and lighter weight than batteries for extended missions, the potential to reduce life-cycle costs, and the use of a renewable energy source. Indeed, a fuel cell outperforms traditional batteries by up to sevenfold. Weight savings over batteries become highly apparent after the first 24 hours of usage, making fuel cell systems particularly attractive for multi-day missions. CERDEC currently develops two different alternative energy fuel cells for portable applications.

59. The Air Force is the biggest operational energy consumer. Therefore, the Air Force has been particularly eager to use alternative aviation fuels for 50% of its domestic aviation needs by 2016. To this end, the Air Force successfully conducted the first flight test of an aircraft powered by a 50-50 camelina-based biofuel blend in March 2010. Since late-2012, the entire Air Force fleet has been certified to fly on biofuel blends and currently several strategies are under examination to generate a steady supply of sufficient quantities of biofuels.

60. In 2012, the US Navy adopted a ‘Great Green Fleet' concept, which envisages alternative energy sources to meet 50% of all operational Navy energy requirements by 2020 (US Navy, n.d.). In one of the first steps towards achieving this goal, the Navy demonstrated an F/A-18 Super Hornet (the ‘Green Hornet') on a 50-50 blend of traditional Navy jet fuel (JP-5) and camelina-based HR-J in April 2010. In 2012, the Navy demonstrated a carrier strike group powered solely by alternative fuels. In August 2011, President Barack Obama announced that the US Navy, along with the Departments of Energy and Agriculture, would invest up to US$ 510 million until 2014 to co-finance the construction or retrofit plants and refineries capable of producing significant quantities of advanced biofuels. In this context, the Navy issued a call for industry proposals for ideas on how to establish a commercially viable “drop-in” biofuels industry. This initiative is expected to help reduce the cost of advanced biofuels, ensure that supplies of these new fuels are
available for military testing and use, and to spur job creation and economic opportunities in rural parts of the United States.

2. United Kingdom

61. In recent years, the MoD has pursued various alternative and renewable energy activities to diversify the energy supplies on bases at home and in theatres. A case in point has been the £280 million investment in Catterick Garrison, which has enabled the installation of new heat pumps, the introduction of solar thermal water heating, which now produces 75% of all hot water, and the super-insulation of buildings. Another example are the reforms carried out at Portsmouth naval base, which has been the largest energy consumer of all fixed UK military installations (Team Portsmouth). The base received solar powered street lamps and its own bio-mass power station in 2012. In conflict theatres, portable solar panels have been issued to British personnel at smaller bases to power electronic devices. In 2011, the MOD's Defence Equipment and Support Agency invited contractors to put forward ideas on how forward operating bases could switch to renewable energy sources. The evaluation of proposals is ongoing.

62. In order to provide alternative power for vehicles, the UK Army has worked closely with the US Army on the development of ‘drop-in’ solutions. Moreover, the UK Army is undertaking specific research on algae-based biofuels. Since 2011, Army soldiers in Afghanistan have been equipped with solar panels, which replace batteries and thus reduce the overall weight of combat gear. Another alternative to batteries which the Royal Army is currently exploring are microbial fuel cells. However, research is still at an early stage, and the same applies to ongoing research on H2 storage capabilities.

63. Among NATO Allies, the United Kingdom was one of the first countries that had its Air Force certified to fly entirely on bio-fuels when available. Currently, defence firms are examining the viability of producing both manned and unmanned solar-powered aircraft for the Royal Air Force.

64. The MOD's Defence Technology and Invocation Centre is exploring several opportunities to broaden the range of energy supplies available for powering Navy ships. One research programme explores the possibility of fitting nuclear plants into ships (Fielding). Another research project examines whether it is practical to convert and run existing ships on biofuels and whether sufficient quantities of biofuels could be produced to power all Navy ships. Last but not least, several hybrid electric propulsion technologies are currently being explored and calls for proposals for advanced concepts have been issued.

3. Turkey

65. The Turkish armed forces carefully monitor the use of new energy sources that could contribute to increasing their energy security. They also participate in all NATO projects, which are executed by the NATO Petrol Committee and other sub-committees. In this respect the Turkish armed forces also support the definition of new NATO STANAGs and the evaluation of current STANAGs.

66. The Turkish armed forces are also aware, like other armed forces, that fossil energy sources are limited and that they should initiate projects for new and renewable energy sources. Therefore, the Turkish Navy started to test the use of bio-fuels in their ships in the last quarter of 2012. Moreover, tests on land for damage detection, power loss detection, and evaluation of effects are still going on.

67. In addition to these efforts, the Turkish Air Force is conducting several projects on new sources of jet fuel; the Under-secretariat of Defence Industry pays more attention to their efforts on Filter Smoke Number (FSN) -0.6 domestic motor, which consumes less energy and has lower emissions.
4. European Union

68. The EDA has promoted two major research initiatives on diversifying the energy supplies of EU militaries, both of which have focused on energy generation from renewable resources. Launched in 2006, the first initiative aims at developing alternative and renewable energy sources for powering the equipment of deployed soldiers, as part of a wider EDA research project on soldier equipment (European Defence Agency, 13 August 2012). Thus, the nine EDA member states participating in the project have agreed to jointly develop combat equipment from 2015 onwards. To date, the EDA has hosted two workshops on the energy supply diversification aspects of new combat gear.

69. Since mid-2012, the EDA and seven participating states have also pursued the so-called GO GREEN project. The project is based on the assumption that EU militaries are ideal sponsors of the land necessary for erecting large-scale, energy-generating photovoltaic plants (European Defence Agency, 6 August 2012). Indeed, taken collectively, EU militaries are among the largest owners of land and infrastructure of all public sector institutions, possessing roughly 1% of the EU’s total land surface. The GO GREEN project is supposed to provide a framework for pooling the ownership rights of military land possession across EU borders and to offer them in bulk to Europe’s solar energy development and exploitation industry. The ultimate goal is to enable Europe’s militaries to produce the electricity they need for powering their bases at home and to generate additional revenue by feeding surplus electricity into the general electricity network.

IV. THE EMERGENCE OF A NATO ‘SMART ENERGY’ AGENDA

70. Ever since its creation, NATO has shaped the energy supplies of its forces. During the Cold War, the Alliance had a prime responsibility for ensuring the security of fuel supplies of military forces in Europe. To this end, an extensive NATO Pipeline System (NPS) was built, which today runs through 13 NATO countries and connects ten distinct fuel storage and distribution systems. Since the mid-1990s, the NPS has been increasingly used as an ‘energy backbone’ for operations in theatres outside of Europe. In the post-Cold War era, NATO has increasingly sought a role for itself as a credible actor in energy security. However, rather than focusing on military energy security, discussions have mostly revolved around the energy security of the Alliance as a whole. As the first major NATO strategic document to touch upon the issue of energy security, the 1999 Strategic Concept stresses that the disruption of “vital resources” — a term which first and foremost refers to energy — could have severe negative effects on transatlantic security. More importantly, the 2008 Bucharest Summit saw Allies identifying specific principles governing NATO’s role in energy security. Thus, NATO received a mandate to develop a range of activities that would contribute to securing the energy supplies of Allies.

71. While the current Strategic Concept, agreed by Allies in 2010 at the NATO Summit in Lisbon, reaffirms NATO’s role in ensuring the security of energy supplies, the Alliance’s growing concern in recent years with military energy efficiency and effectiveness has become increasingly visible in other documents. The 2010 Lisbon Summit Declaration stresses that the stability and reliability of energy supplies and the diversification of supply routes, suppliers, and energy resources are of critical importance to attaining the military objectives. Following a number of key events initiated by NATO that gave experts from academia, industry, and the military an opportunity to raise awareness of energy and environmental issues in the military, Allies agreed in the 2012 Chicago Summit Declaration to “work towards significantly improving the energy efficiency of our military forces”, effectively calling for the emergence of a NATO Smart Energy agenda.
A. SMART INSTITUTIONAL INITIATIVES

72. In addition to the advocacy work of several Allies, a range of NATO bodies has driven the emergence of NATO’s Smart Energy agenda. Over the last decade, NATO’s Allied Command Transformation (ACT) has repeatedly hosted events, which have highlighted the importance of energy efficiency in achieving military goals and raising levels of awareness (ACT). The launch of NATO’s Emerging Security Challenges Division (NATO/ESCD) in 2010, which has a dedicated Energy Security Section, also raised awareness about the intersections between military energy efficiency and effectiveness, on the one hand, and security, environmental sustainability, and financial austerity, on the other hand.

73. In November 2011, NATO/ESCD initiated a conference on Innovative Energy Solutions for Military Applications which took place in Vilnius, Lithuania. The conference brought together over 200 experts from academia, industry, and the military and was supported by the NATO Science for Peace and Security (SPS) Programme and organised together with the then national Energy Security Centre in Vilnius, which has since become the NATO Energy Security Centre of Excellence (ENSEC COE). Following the success of this event, the Centre has enhanced its focus to include energy efficiency in the military, while NATO/ESCD followed-up with national briefings and developed the Smart Energy Team (SENT) concept. In the years to come, the NATO/ESCD with the support of the ENSEC COE and all other relevant NATO stakeholders will be key drivers of NATO’s emerging Smart Energy agenda.

74. As the most recent addition to NATO’s initiatives, SENT was established in late 2012 as a two-year project supported under the SPS Programme. SENT is composed of subject matter experts from eight nations, of which six are Allies (Canada, Germany, Lithuania, Netherlands, the United Kingdom, and the United States) and two are force contributing partner countries (Australia and Sweden). The combination of SENT cannot be changed until the end of the project in 2014, when Allies will decide on future initiatives.

75. SENT’s overarching mandate is to steer national smart energy projects towards interoperability. SENT draws together the various ongoing national and NATO activities that otherwise risk remaining disconnected and provides a platform for sharing information and best practices among all stakeholders. SENT aims to eventually recommend and initiate multi-national Smart Energy projects under NATO’s Smart Defence framework.

76. One of SENT’s first deliverables is an Internet platform for pooling scientific knowledge and relevant data, including national strategies and results of R&D activities, that is hosted on the NATO server (www.natolibguides.info/smartenergy).

77. Based on requests from its member nations and NATO bodies, the ENSEC COE has developed a rather ambitious work programme, which includes the conduct of strategic analysis and research projects on lessons learned by other NATO bodies, member states, other international organisations, as well as third states with regard to increasing military energy efficiency; the development of new methodological and theoretical approaches to identifying and assessing energy security risks; the adaptation of civil sector energy innovations for military needs; and the latest R&D on increasing operational energy security. Moreover, ENSEC COE is aiming at assuming an implementing role in education and training by developing and delivering courses, integrating energy security aspects into other NATO-accredited courses, and conducting conferences, seminars, and workshops. So far, the work of the ENSEC COE has focused on analysis, the organisation of conferences and workshops, the conduct of exercises (such as ENERGEX 2012, which simulated a disruption ISAF’s energy supplies), and concept development and experimentation (see below).
B. SMART ACCOUNTABILITY

78. As mentioned earlier, even before the launch of Smart Energy and the creation of ENSEC COE and SENT, NATO was involved in raising awareness about military energy efficiency and effectiveness. From the mid-2000s onwards, ACT launched several projects to contribute to ‘culture change’ among NATO’s military leaders. Specifically, ACT organised regular training courses. At the same time, ACT has been rather active with regard to documenting energy efficiency best practices in the ISAF mission (see below).

79. NATO’s SPS Programme has also hosted a range of workshops on transatlantic energy security. In this context, the cross-cutting topics of environmental protection, energy efficiency and sustainability of NATO forces were also frequently discussed, and the SPS Programme continues to support research activities on innovative energy solutions for the military and renewable energy solutions with military application. The SPS Programme also continues to support SENT.

80. Since its official launch in 2012, the ENSEC COE has supported NATO’s effort in raising awareness about the need for military energy efficiency and effectiveness. The ENSEC COE’s mission statement explicitly outlines a future role for the Centre in the development of NATO energy efficiency doctrines, standards, and procedures as well as a visible contribution to the development, validation, and improvement of NATO member states’ energy consumption standards and procedures.

81. However, to date, the major thrust of ENSEC COE activities with regard to building energy accountability has focused on organising and hosting training courses for NATO military commands and staff members. Over the next few years, these training courses will further increase in number and frequency and cover a wide range of topics. In addition, ENSEC COE will also contribute to strengthening the quality of training within NATO member states. On the analytical side, ENSEC COE has recently launched a research project on energy management in expeditionary NATO missions.

C. SMART DEMAND

82. If Allies have, in the past, fallen short in adequately promoting military energy efficiency and effectiveness on an individual level, their collective track record in NATO has often been even more problematic. Pooling and sharing of military equipment in NATO missions has repeatedly resulted in lower levels of energy efficiency and effectiveness and thus higher levels of energy consumption. A case in point is the fuel consumption of militaries within the framework of the ISAF mission in Afghanistan. To simplify the logistic efforts, ISAF forces operate under a ‘one fuel for all capabilities’ policy. In essence, this policy prescribes that every fuel-powered system, such as aircraft, combat vehicles, or electricity generators, have to run on ‘Jet Propellant 8’, even though many of these systems were not designed to run on this type of jet fuel. Consequently, many ISAF combat vehicles are currently 10-20% less efficient than they could be. At the same time, the vehicles are more likely to experience mechanical problems and therefore to require spare parts, which adds to the operation’s overall logistic requirement and thus the amounts of energy necessary for meeting these requirements.

83. Unnecessarily high energy demand in NATO missions is not only a result of operational inefficiencies but also of inefficiencies in forward and main operating bases. Up to 70% of the fuel delivered to Afghanistan is required for cooling and heating bases. The main reason for this high fuel demand is that many ISAF forces are housed in tents, which are cooled with air conditioning units powered by highly inefficient inter-linked generators. The tents are poorly insulated and air-conditioning is often left on all day, regardless of whether troops are present or not. On top of that, energy generators are often controlled centrally, meaning that all of them are used at all times.
As already noted, over the last five years, US and UK forces have increasingly recognised that the way tents are cooled and heated is not sustainable. Several surveys have been conducted to establish ISAF’s energy consumption in Afghanistan and to explore avenues for improvements. The latter include the introduction of spray-on foam insulation, low energy air-conditioning solutions, and alternative electricity generation.

Despite these improvements, the ISAF mission has made it clear that in future operations NATO must take a much more active approach to developing energy efficiency measures from the outset. Indeed, the countries that have provided members to SENT have begun to explore more effective energy solutions with regard to cooling and heating tents, including load-adjustable generators, heat exchange pumps, floor-heating, heat/energy storage insulation material for tents, and solar power generation and smart grids. Some of these technologies will be demonstrated at the Smart Energy camp that will be set-up at the military exercise ‘Capable Logistician 2013’ to take place in June 2013 in Slovakia. The four nations that will contribute large and small equipment to the Smart Energy camp are Germany, the Netherlands, the United Kingdom and the United States. The purpose of the Smart Energy camp is to raise awareness, demonstrate solutions, and test interoperability.

D. SMART SUPPLY

While implementation is still in its infancy, recent years have seen NATO develop what might be labelled a “Smart Supply” energy strategy. However, the three principle areas of NATO activity outlined in the strategy are also of direct relevance to securing the energy supplies for NATO militaries. First, the strategy foresees NATO establishing itself as a dialogue broker and hub for information and intelligence sharing among Allies, partner countries, and the private sector on the security of critical energy infrastructure in energy producing and transit countries, the security of transport routes, and the analysis of terrorist threats. Moreover, NATO aims to co-ordinate analyses of potential risks to energy transits to NATO forces in operational theatres.

Second, NATO could become a more visible actor in promoting the protection of critical civilian and military energy infrastructure in member countries. Thus, at an Ally’s request, NATO can contribute to the protection of energy delivery routes which are crucial for transatlantic security, such as sea lanes or pipelines, either through civilian experts or military means. Moreover, NATO’s civil emergency planning capabilities can be employed in case of a man-made or natural disaster to restore a steady energy supply of military facilities and other key civilian institutions.

A third and arguably less explicit area of NATO activities geared towards securing civilian and military energy supplies is the shaping of political and socio-economic reform processes in NATO’s broader strategic environment. NATO’s aim is thus to further strengthen political relations and military co-operation with partner countries, and in fact, most of these are either energy producers or transit countries. It is therefore not surprising that energy security issues have featured more frequently in recent years in NATO co-operation programmes with partner countries.

Notably, to date, NATO’s Smart Supply strategy is very much focused on securing the supply of energies traditionally used in military operations, specifically fossil fuels. In contrast, NATO scientific work on diversifying energy supplies for military purposes has remained limited. If NATO wants to play a more visible role in future debates about the energy supplies of its members’ militaries, ACT, ESCD, ENSEC COE, and particularly SENT should make even greater efforts to put energy diversification on the Alliance’s agenda. In this respect, initial steps could include fostering improvement of data collection on energy performance, and diffusing knowledge on micro grids and alternative power generation. However, NATO’s ability to promote new energy ideas among Allies will ultimately require the support and collaboration of member states. As the
summary of activities pursued by the United States, the United Kingdom, Turkey, and the EU shows, the energy record of the Alliance is ultimately defined by its constituting members.

V. SMART ENERGY AND THE ALLIANCE: THE WAY FORWARD

90. This draft report has examined the rationale for new energy ideas for NATO militaries. It has argued that the generation and implementation of such new ideas are a political, economic, and strategic imperative because of economic, environmental and security considerations. Indeed, the draft report has presented a range of new ideas that have been developed across the Alliance to increase the energy efficiency and effectiveness of militaries, looking in particular at the activities of the United States, the United Kingdom, and Turkey, the EU, and NATO as a whole.

91. To make the report even more comprehensive, the Rapporteur encourages parliamentarians from all NATO member states to provide additional comments and information at the NATO Parliamentary Assembly Spring Session in Luxembourg from 17 to 20 May 2013 on how their relevant bodies in their countries approach the promotion of military energy efficiency and effectiveness. For example, during its 2011 visit to Madrid, Spain, the Science and Technology Committee learned about the Spanish efforts to bring down the energy consumption of the roughly 170,000 employees under the Ministry of Defence (Science and Technology Committee) and there are doubtlessly many more examples within NATO member states.

92. Even though the report has shown that there is a compelling logic to invest money into increasing NATO militaries’ energy efficiency and effectiveness, there is a risk that, as defence budgets continue to stagnate or decrease, military energy programmes will be cut in an attempt to save money. This would be short-sighted, as there are clear economic benefits to be gained in the long run. The Rapporteur therefore urges NATO member states to examine new energy ideas, not only with regard to their short-term merits, but to also analyse them with regard to their long-term benefits.

93. Military energy efficiency and interoperability is an area where NATO as an organisation can provide significant added value in encouraging nations to agree on standards, education, and training and integrated technologies. Given that new energy technologies and approaches are still at an early stage of their implementation in military settings, few established interests play a role – a fact that often hinders co-operation on other potential Smart Defence projects. Moreover, many technologies that could bolster military energy efficiency, such as mobile energy storage devices or improved tent insulations, are already available in the private sector and could therefore be bought off-the-shelf at a relatively low price. Indeed, NATO military authorities could consider identifying NATO’s shortfalls and requirements in this regard, and Smart Energy projects could be developed to mitigate these shortfalls. These projects should be relatively easy to initiate under NATO’s Smart Defence initiative, especially if the first steps concentrate on quick wins. Furthermore, if the current Smart Energy initiatives prove themselves to be effective tools of transformation, they should be firmly institutionalised. In conclusion, the Alliance would do well to pick these low-hanging fruits and thus to increase energy accountability and interoperability, to reduce energy consumption, and to diversify energy resources of its militaries.
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