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Editorial

“Biofuels would give the military an alternative to volatile global oil prices” (*The US Navy Secretary R. Mabus*). “Too often, military planners are afflicted with petroleum anxiety” (*J. Bartis, senior policy researcher at RAND Corp.*). “We need to drop the unicorn-dreams of magical biofuels, and ensure that our military has access to the fuels it actually needs” (*K. Green, resident scholar at the American Enterprise Institute*). These are only a few recent quotes from the ongoing debate whether defence planners should take into account energy aspects (supply dependency, security, safety, costs, etc.) and consider fuel diversification and saving possibilities. Opinions differ, arguments of both sides sound reasonable, but the intersection between energy and military is undisputed.

In the light of the ongoing debate, it must be recognized that new energy technologies take time to develop, to reach their maximum market share and to increase the effectiveness of human activity, including military activity. One may predict that over the horizon of ten years, the inertia of the energy consumption system will leave little room for change. On the other hand, over longer periods, the future will almost certainly look different than the present. Therefore, analysis which uses the method of scenario construction and testing in exercises, must take a similarly long-term view – looking at least twenty years ahead. In this context, the crucial question persists: what decisions must be taken in order to make defence goals compatible with energy production, supply and consumption possibilities, taking into account price of various energy resources and use available technological options?

In the fifth edition of “Energy Security Forum,” we asked several distinguished persons to share their point of view on the possibility to integrate energy scenarios into military ones. In other words, we asked for their opinion about the possibility to include operational energy concerns into national and international military planning, exercises, acquisitions, etc. Did the time for this already come or should the commanders of the Armed Forces concentrate on something else?

Dr. Arno Behrens, Head of Energy and Research Fellow and Philipp Böhler, Research Assistant, both from the Centre for European Policy Studies (Brussels, Belgium) look at the given question from the EU perspective and first of all notice that “potential militarisation of energy security tasks ... runs directly counter to the objectives of the internal market”. Therefore, according to them, if NATO were to play a bigger role in energy security, the question of how to accommodate internal and external energy security aspects within the EU will have to be answered. On the other hand, experts from CEPS recognise, that even the EU “has an interest in NATO’s role in protecting critical infrastructure and transport routes” as well as Member States’ decision to increase the Armed Forces’ energy efficiency and the use of renewable energy sources.

John Kelley, a retired US Army officer working at the Joint Force Trainer Division of NATO Allied Command Transformation (Norfolk, USA) noticed that any military activity that conserves energy and increases budgetary savings triggers the discussion centering on “how” rather than “why”. Nevertheless, NATO’s fledgling efforts to develop an Energy Security programme are somewhat hampered by a lack of intellectual stimulation on the part of leaders and planners. In this regard, he concentrates on a few positive and already-implemented smaller scale

initiatives and proposes to concentrate first of all on education and training as “proven vehicles to stimulate deliberation and contemplation of complex issues, both for current as well as future operations”.

According to **Dr. Alessandra Colli, Assistant Scientist at Brookhaven National Laboratory (New York, USA)**, “the US DoD has already set its commitment concerning renewable energy use, and the technical capabilities on the market to transform this target into real applications exist”. Now the availability of supply and affordability of prices should determine whether the photovoltaic systems and biomass will be introduced en masse for electricity production both inside the US as well as on mission, where fuel transport not only becomes more and more expensive but also represent a possible target for attacks. In this regard, Dr. Colli concludes that despite being quite fresh in the energy scenario compared to other traditional sources, renewable energies are already competitive enough to start entering the routine of the DoD and military operations.



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A EUROPEAN TAKE ON NATO'S EMERGING ROLE IN SECURING ENERGY SUPPLIES

An assessment of NATO's actual and potential role in securing the energy supply of the Allies requires a common understanding of the concept. The literature is divided between those who interpret energy security from an economic perspective and those who stress its political and strategic side. The former argue that free markets are the primary means to maintain a stable supply of energy, calling for government interaction only where markets fail. The latter believe that the increasing nationalisation of energy resources and the politicisation of energy management by resource-rich countries have made energy security a matter of national security. According to them, the market alone is not able to deal with the mounting and multi-faceted challenges that energy-consuming countries have to face in a globalised world. Energy security therefore requires international cooperation, government intervention and military control. Neither of these two interpretations can capture the whole picture of security of supply. In fact, the economic and the so-called political interpretations are two sides of the same coin; they complement each other and both are necessary to explain the challenges as well as the solutions to dealing with the internal and external security of energy supplies in Europe.

Although Title V of the revised Treaty on European Union (TEU) enumerates the safeguarding of security, independence and integrity as objectives of the EU's Common Foreign and Security Policy (CFSP), the EU is still far from being an integrated entity with respect to external security agendas. 22 of the 27 EU member states are currently NATO members and the TEU fully respects the obligations of these Member States towards NATO. This makes developments within NATO possible despite the ongoing integration of the EU27.

However, from an EU perspective, a fully integrated and liberalised European internal market for electricity and gas to be completed by the year 2014 plays a key role in external energy security. The internal market is meant to increase the resilience of the EU's energy system to (temporary) supply shocks and to increase the EU's geopolitical weight in relation to major energy producers and consumers around the world. One of the principal aims of the EU is thus to widen EU energy markets by exporting internal market norms with a view to improving the functioning of world markets in energy. The Energy Community and the European Economic Area are two examples. The dialogue in NATO, however, has a different nuance. The potential militarisation of energy security tasks will entail at least the possibility of stronger sovereign intervention in market activities. This runs directly counter to the objectives of the internal market.

Even more so, such a collision of interests in the energy market will put on the table more deep-going questions of a constitutional dimension within the EU. In the legal construction of the EU, both the CFSP and the internal market enjoy equal importance (Art 40 TEU). If NATO were to play a bigger role in energy security, the question of how to

accommodate both aspects of energy security - internal and external - within the EU will have to be answered to allow for a comprehensive and efficient approach.

Another issue to be raised from the EU perspective is Russia, which continues to be the largest exporter of energy to Europe. The EU needs to be clear on whether it would be in its interest if NATO took a stronger role in the energy security agenda. Such an undertaking could seriously disturb Russia-NATO relations, including with the 22 EU-NATO members. Historically, NATO's purpose was to provide security against the military threat of the Soviet Union. Russia might thus see it as an affront, if the redefinition of NATO's tasks involved a project directly overlapping with its own national interests and economic backbone.

And yet, there is an interest within the EU in a raised profile of NATO in energy security, especially in view of potential conflicts over increasingly scarce resources, terrorist threats, piracy and new security challenges such as cyber threats to energy infrastructures. In particular, the EU has an interest in NATO's role in protecting critical infrastructure and transport routes. Indeed, Europe already benefits from current activities of the Alliance at the Horn of Africa and in the Mediterranean, which prove that NATO can contribute militarily to protecting energy (mainly oil) shipments. Protecting critical sea-lanes and territorial waters to ensure the functioning of the global oil and other energy markets is likely to constitute the key focus of NATO's application of traditional military capabilities in the field of energy. As regards land based energy infrastructure, such as pipelines, NATO's role is more likely to be bound to "soft" measures, such as providing information and intelligence based on satellite surveillance. An exception could be NATO's potentially increasing role in addressing humanitarian needs following an emergency or natural disaster such as an oil spill or nuclear accident.

Another highly relevant task for NATO and its Member States will be to increase the energy efficiency of its Armed Forces and to increase the use of renewable energy sources. The prime objective of such measures is to increase operational security by reducing the vulnerability of fuel logistics. However, given that the military is a major consumer of fossil fuels (particularly oil), reducing its environmental footprint can make a direct contribution to climate change mitigation while taking pressure off defence budgets.

Developing NATO's agenda in energy security will require continued and strengthened strategic political dialogue with members, partners, other international organisations and the private sector. A critical assessment of the energy dimension of existing (e.g. terrorism, piracy etc.) and rising security challenges (e.g. cyber threats) will need to form the basis of this dialogue. This dialogue will also allow the EU to define its relation with NATO in the area of energy security. However, given EU and NATO Member States' diverging energy challenges and interests and due to the crowded institutional landscape dealing with energy security as well as regional political implications, NATO's potential role is likely to remain limited and should focus on areas that are complementary to existing efforts.



John Kelley

A retired US Army officer working at the Joint Force Trainer Division of NATO Allied Command Transformation in Norfolk, USA.

ENERGY SECURITY IN MILITARY SCENARIOS: A METHODOLOGY TO SPUR INTELLECTUAL THOUGHT

Energy Security, as a topic of discourse, is on the rise in numerous nations throughout the world. This is certainly true for NATO over the last five years as well. At the Bucharest Summit in 2008, the Lisbon Summit of 2010 and again at the Chicago Summit of 2012, the Heads of State and Government of NATO's nations expressed energy security as a topic of concern to all by placing it within their summit declaration. NATO's fledgling efforts to develop an Energy Security programme in which NATO's role is clearly defined are somewhat hampered by a lack of intellectual stimulation on the part of leaders and planners. Only through further debate and discussion, can NATO's



Photo courtesy of the Joint Warfare Centre Public Affairs Office

role, and subsequent policy decisions, be formulated. Without stimulating thought over such complex issues as NATO versus national responsibilities, consequence management planning and critical energy infrastructure protection, NATO will never be able to develop a coherent strategy to deal with the labyrinth of issues involved in this most important topic. Stimulating the debate becomes a key enabler for the necessary follow-on work to develop a coherent Energy Security strategy and programme.

Notwithstanding the Heads of State and Government directive to develop this topic into an actionable capability, there are present and demonstrable needs as well. It is no secret that energy costs have sky-rocketed and the budgetary expenditures to keep national forces supplied with energy, particularly petroleum and petroleum-based products, is staggering. Large portions of NATO and national budgets are now expended in this regard. In the current austere economic environment in which most nations find themselves, there is a real need to conserve funds as much as possible and NATO is no exception. Any military activity that conserves energy, however mundane and routine, increases budgetary savings and thereby provides additional funding for other requirements. This idea is agreed by all with discussion centring on "how" rather than "why". NATO's Smart Defence programme becomes an ideal vehicle to generate solutions and share and pool resources in this regard.

There is a clear operational effect within the Energy Security topic as best evidenced by the Pakistani refusal to allow fuel convoys to cross their border and resupply numerous NATO bases in Afghanistan in 2011. This had an immediate effect on the operating bases of NATO personnel and highlighted the need to achieve more petroleum-based energy independence in military operations and focus on renewable sources of energy for lighting, communications and heating/cooling.

With the need to stimulate debate in mind, the logical question of how to do so in NATO arises. As with any topic, there are two ways to approach the answer: do nothing and hope that thought is stimulated via "water-cooler"

conversations, or, more preferably, take active measures to get the NATO and national communities to debate, cooperate and collaborate on solutions *before* they emerge as crises.

Education and training are proven vehicles to stimulate deliberation and contemplation of complex issues, both for current as well as future operations. As educational and training events provide not only the best practices and most current doctrinal discussion infusion points, their inherent feedback mechanisms (After Action Reviews, course critiques, etc.) spur the individual to be reflective and examine perceived shortfalls in the conceptual aspects of a topic. This is true of energy security, particularly since there are quite a few unknowns and numerous vague ideas about NATO's role therein.



Fortunately, there is good news in this sector. Two years ago, the Joint Warfare Centre in Stavanger, Norway began work on the development of a new scenario for use in exercising the NATO Response Force (NRF). The new scenario, nicknamed SKOLKAN, is placed in northern Europe in the vicinity of the North and the Baltic Seas. Obviously, there are a plethora of energy security issues in this area in real life, so the geographical location of the scenario lends itself to the development of energy security themes and injects in future operations training. More information is available about the new scenario in *The Three Swords* magazine of the Joint Warfare Centre (available at: <http://www.jwc.nato.int/article.php?articleID=308>). In addition, the annual Crisis Management Exercise (CMX), in 2011, featured some injections in the exercise also dealing with energy security, namely consequence management, and in the same relative geographical location.

Photo courtesy of the Joint Warfare Centre Public Affairs Office

Because the new NRF scenario, as well as the CMX scenario, drives the capstone exercises, they are also used in *preparation* for these events. Of note for the NRF, there are a series of education and training events encompassing no less than six months of preparatory training including Commander's Conceptual Training, Battle Staff Training, Key Leader Training, Communications Exercises, and single-service Live Exercises to prepare for the Joint operating environment. The scenario used for the major joint exercise, typically known as a STEADFAST exercise, is also used for the preparatory events as well. In this fashion, energy security considerations, as developed within the country books and associated scenario datum, are found useful in these foundational training events. Because exercises tend to drive the need to instil concepts and doctrine within the educational environments to prepare for the collective environment, these scenarios also find themselves used in courses, including both the traditional classroom-based courses as well as e-Learning courseware. In this way, scenarios for use in NATO exercises affect the entirety of the education and training landscape and spur the debate and discussion over ambiguity in concept and doctrine.

Military scenarios have served the purpose of preparing for the next operation by examining and integrating the lessons of the past. Energy Security is a good example of how the debate can be lengthened and strengthened to move NATO forward and create successful conditions for its future, particularly in the aspect of energy security.



Dr. Alessandra Colli

Assistant scientist at Brookhaven National Laboratory

RENEWABLE ENERGIES TO ENHANCE SECURITY IN THE USA MILITARY ENVIRONMENT: SOLAR PHOTOVOLTAIC AND BIOMASS

The US Department of Defense (DoD) accounts for approximately 80% of all federal energy consumption. In 2010 DoD spent about 15.2 billion dollars on energy, among which 74% can be attributed to operations, while the remaining 26% was consumed by the Department's facilities [1]. To mitigate the high energy consumption, DoD is working to reduce its demand for traditional energy and diversify its energy supplies investing in emerging technologies. This approach will decrease consumption and associated emissions, increase the supply of renewable energy, enhance energy security, and improve energy efficiency in military buildings. The main military purposes to improve the use of renewable energies are the reduction of the environmental impact and the minimization of the risk from potential disruptions, becoming more resilient, along with cost reduction, and technology improvement.

The National Defense Authorization Act for Fiscal Year 2010, section 2846 requires *"the Department of Defense in achieving its renewable energy goal by 2025, as specified in section 2911(e) of title 10, United States Code"* [2], which means *"to produce or procure not less than 25 percent of the total quantity of electric energy it consumes within its facilities and in its activities during fiscal year 2025 and each fiscal year thereafter from renewable energy sources"*. Always in [2], section 2842 lists the renewable energy sources as solar, wind, biomass, landfill gas, ocean, geothermal, municipal solid waste, new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project, and thermal energy generated by any of the preceding sources. Among these sources, solar photovoltaic (PV) and biomass can play a significant role.

It seems that the US DoD has already set its commitment concerning renewable energy use, and the technical capabilities on the market to transform this target into real applications exist. From the technical point of view, electricity generation both using solar or biomass is reaching good levels of reliability, which could give more confidence in using them in situations requiring a high level of reliability and availability of the source.

The USA counts centers of high-level capability to bring the photovoltaic technology to a next level of efficiency and overall improvement. Among them the well-known National Renewable Energy Laboratory (NREL), the Photovoltaic Manufacturing Consortium (PVMC), but also the Brookhaven National Laboratory (BNL), where research is focused in particular on reliability issues and network integration studies to smooth the connection of PV with the electricity grid.

Defining security of energy supply

One of the main aspects of using renewable energies in military environments is thus security of supply. Security aspects are very important for every country, but they are even more fundamental at military level. In [3] thirty-eight definitions of security of supply have been collected. Anyhow, the list is not exhaustive, but it clearly indicates on the lack of a strong and unique definition to approach security of energy supply. The topic is often treated as country-specific, highlighting also different directions in the political line. Looking into the large variety of definitions for security of energy supply, it is noticed that two elements are widely repeated: availability of supply and affordability of prices. According to those definitions, to deliver a secure supply an energy system should be able to answer positively to the following two questions:

1) Is the system available (thus, reliable)?

2) Is the system economically affordable?

Looking more carefully, to answer the two previous questions we could work in the overlapping zone of safety and sustainability, thus there is no need to introduce the concept of security. Actually, to talk about security, a third question should be added:

3) Is the system sufficiently protected from intentional threats?

Security adds also the intentional aspect, which is normally excluded from the safety and sustainability investigations. Practically, when we are evaluating the security of energy supply we actually work considering the combination of three areas: safety, security, and sustainability - the 3S area. It is clear that there is an interdependency and mutual affectability of the three zones in the 3-S system. Thus, the three identified areas of safety, security and sustainability are not just stand-alone, but they have mutual relevance and they interact with each other introducing additional elements of information to each zone. Overlapping zones can be identified, as shown in Figure 1.

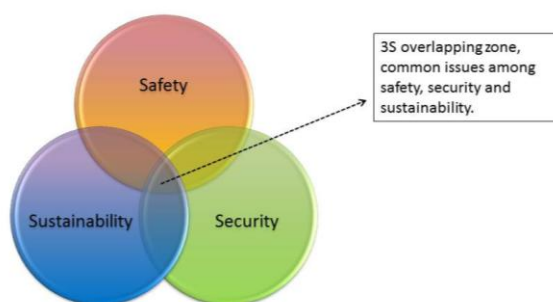


Figure 1: The 3-S system for energy, given by the three multidimensional constructs of safety, security and sustainability, respectively connected to the concepts of risk management, security of supply and sustainable development. Possible overlapping zones between the three parts are identified, including also a possible common area among the three of them.

Using renewable energies: some benefits of solar photovoltaic and biomass

In recent years, the average price of PV systems has continuously decreased, as recent statistics show. Photovoltaic systems has become more and more affordable in price, while, on the other side, the price of oil, despite some variations around 2008-09, has maintained a growing trend, still verifiable.

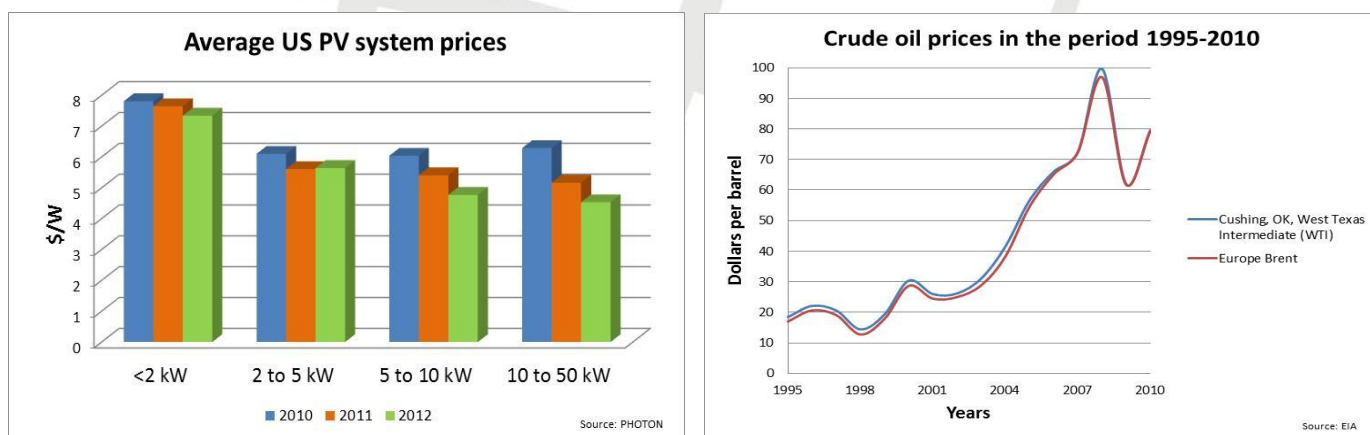


Figure 2: Average US PV system prices in 2010, 2011 and 2012 (left), and crude oil prices from 1995 to 2010 (right).

The reliability of PV systems, along with their energy performance, has increased, making them competitive systems in a context of diverse energy solutions. Though PV plants could be subject to thefts and possible intentional damages if isolated and not sufficiently protected, they have a higher level of security than oil, as generally their production does not depend on sensitive countries or geopolitically unstable regions. The use of PV and biomass to produce electricity could definitely increase the independence of the military, both inside the US, where they rely on the national electric grid with the risk to remain isolated in case of disruption, as well as on mission, where fuel transport could become expensive and represent a possible target for attacks. Local biomass production can be considered in different location, and reduce the need of oil-based fuels. In [4] biofuels are addressed as “*a behind-the-scenes game changer for the Air Force*”. Their value is not only to substitute oil, reduce foreign dependency and decrease the use of taxpayer’s money, but also to induce a technical benefit in running engines at a lower temperature increasing their lifetime and reducing maintenance interventions.

Conclusions

The importance of depending on a variety of sources and small production systems instead of a central, unique, traditional installation would definitely act as a contingency plan, increasing security by providing more flexibility to the generation system under attack.

Though still quite fresh in the energy scenario compared to other traditional sources, renewable energies are now competitive enough to start entering the routine of the DoD and the military operations, and this is what they actually have already done. It is clear that an improvement is still needed and is definitely under way through various research initiatives. The high standard level required by the military context could push the renewable energy development beyond the present limitations and originate products that could improve military, as well as civil applications.

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