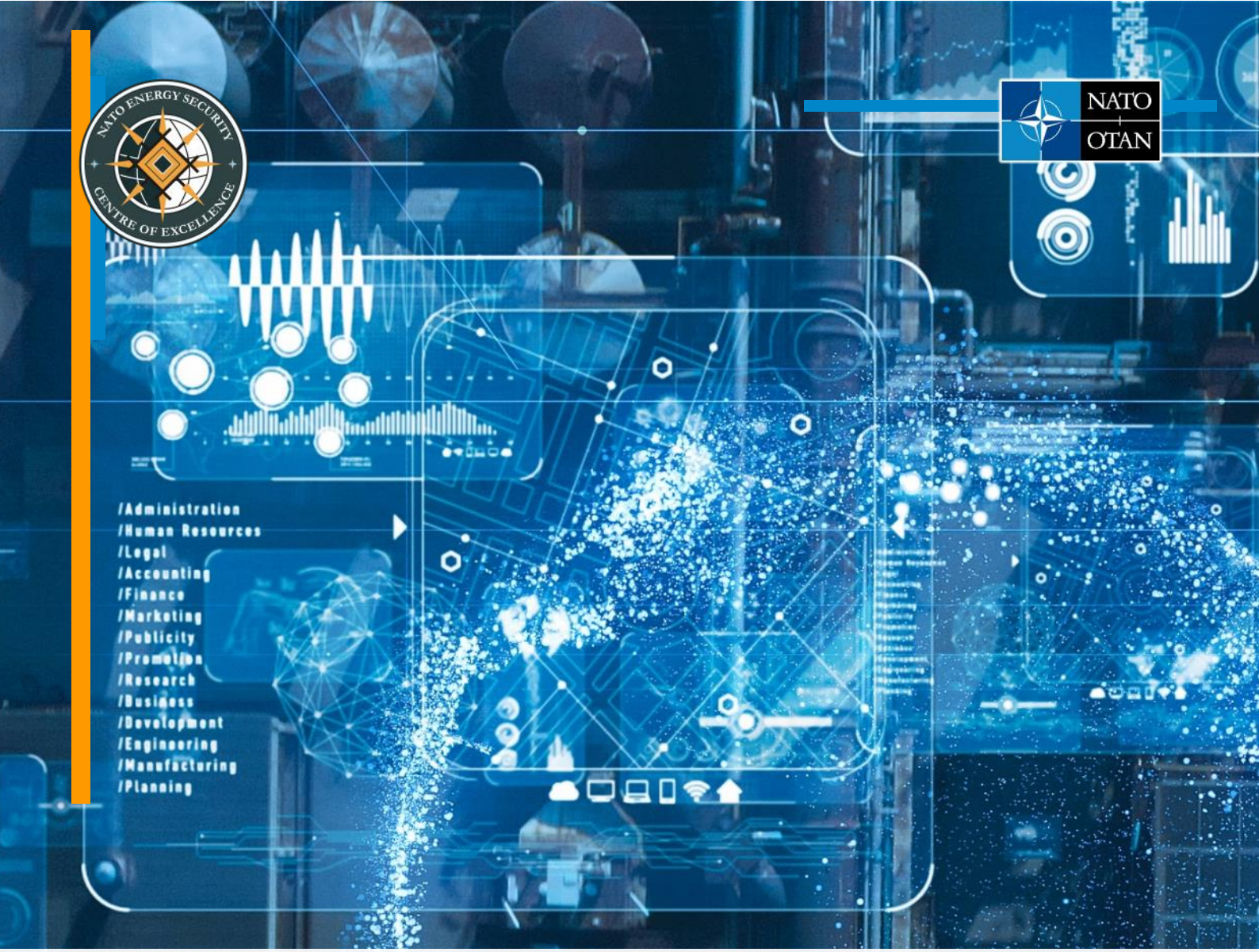

Towards a Fundamental Rethink: Analysing the Institutionalisation of Energy in NATO across the DOTMLPFI Spectrum

Research Report by dr. Justinas Juozaitis

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Analysing the Institutionalisation of Energy in NATO across the DOTMLPFI Spectrum

Research Report

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Content

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About the Author and Editorial Team

Justinas Juozaitis, PhD, is the head of the World Politics Research Group, General Jonas Žemaitis Military Academy of Lithuania. Previously, he was a lecturer at the Faculty of Political Science and Diplomacy, Vytautas Magnus University, where he defended his PhD thesis on Lithuanian foreign policy vis-à-vis Ostrovets NPP in Belarus, and a fellow at the NATO Energy Security Centre of Excellence (ENSEC COE). Justinas also worked as a policy analyst at the Centre for Defence Analysis of the General Jonas Žemaitis Military Academy of Lithuania, and as a junior researcher at the Energy Security Research Centre, a multidisciplinary research institute jointly established by the Vytautas Magnus University and Lithuanian Energy Institute. Justinas took part in a prestigious Future Energy Leaders (FEL-100) programme at the World Energy Council from 2016 to 2019, where he, among other things, contributed to the development of the World Energy Issues Monitor.

A recipient of scholarships for academic achievements from the Lithuanian Academy of Sciences and a winner of the best lecturer award of the Faculty of Political Science and Diplomacy, Justinas has written papers for the Atlantic Council, Royal United Services Institute, International Centre for Defence and Security, NATO ENSEC COE, and Centrum Balticum. Together with prof. Giedrius Česnakas, he recently published a collective monograph 'European Strategic Autonomy and Small States' Security. In the Shadow of Power', which is a part of a broader book series 'Routledge Studies in European Security and Strategy'. As part of his duties at the Lithuanian Military Academy, Justinas writes policy briefs for the Lithuanian MOD and coordinates modules on international security for the participants of Air Force Staff Officer Course and Vytautas Magnus Officer Course. In 2023, he also coordinated the course on International Politics and Diplomacy which is attended by senior Lithuanian officers, who are preparing for their duties as Lithuanian military attaches or other positions at NATO and EU structures. Justinas research interests include energy security, transatlantic security processes and German foreign and security policy. He also focuses on the dilemmas and opportunities for Lithuania navigating international politics. Justinas speaks English, German, Russian and Lithuanian.

Ms Jolanta Zapkuvienė, graduated from Vilnius Gediminas Technical University in 1999 with a bachelor's degree in engineering informatics, and in 2001 with a Master's degree in Applied Statistics, specializing in Statistical Methods in Finance and Economics. During her studies, she worked as a programmer, designing and programming databases. In 2001, she started working for the Ministry of National Defence (MoND) of the Republic of Lithuania in the field of activity planning and monitoring. In November 2019, she was seconded by the MoND to work as a subject matter expert in the Concept and Doctrine Development Division of the NATO Energy Security Centre of Excellence, where she has been working ever since. She is actively involved in the Centre's activities to broaden NATO's understanding of energy security and efficiency. Also, she is a member of the NATO Operational Energy Concept Development Team. Ms Jolanta Zapkuvienė has also completed a number of professional skills development

courses in the field of defence management, its activity & resource planning (Defense Resources Management Institute, Naval Postgraduate School, USA; NATO School Oberammergau), NATO energy security (Baltic Defence College), energy management, NATO standardization, Concept Development & Experimentation (NATO School Oberammergau), etc.

LTC Massimo Dacchille attended the 174th "Coraggio" Course at the Modena Military Academy from 1992–1994. In 2008, he was assigned to the Italian Army General Staff as Officer in Charge of the Armament, Munitions and NBC Materials Office of the 4th Logistics Department. In 2012, he was redeployed to the General Affairs Office of the 5th General Affairs Department of the EMS, and in 2014, he was redeployed as Head of the Logistics Coordination Office of the Central Logistic Group of the Army, reporting to the 5th General Affairs Department of the EMS. In 2015, he was appointed Commander of the 1st V-Shorad Group of the 17th Counter-Aircraft Artillery Regiment "Sforzesca", holding the position until 2016. In that same year, he was redeployed to the Logistics Organization Office of the 4th Logistics and Infrastructure Department of the Defence General Staff. In the meantime, he took part in the Resolute Support in Kabul mission as Military Assistant DCOS SPT. In 2019, he was reassigned to the General Office of the Secretary General of Defence and National Armaments Director with the post of Section Chief. Since 7 September 2020, he has held the position of Head of Division of the Doctrine and Concept Development Division at the NATO Energy Security Centre of Excellence in Vilnius, Lithuania, where he is leading the NATO Operational Energy Concept team as Project Leader.

Executive Summary

Energy is not a newcomer topic to NATO, but its structures and procedures remain predominantly focused on fuel, constraining its ability to implement the political goals set in the official documents and comprehensively address changes in the contemporary security environment. On the one hand, the political guidance articulated NATO's current Strategic Concept (and, to some extent, in the previous one) and in various Allied summit declarations over the last fifteen years call for a broader energy institutionalisation within NATO, also considering linkages between energy, hybrid threats, resilience, renewable generation, and climate change. On the other hand, rapid technological changes and deteriorating security environment provides a strong impetus for adapting NATO's fuel-centric approach to contemporary realities. With the ongoing automation, electrification and digitalization of the modern battlefield, NATO's structures and procedures must be better positioned to accommodate contemporary trends for achieving mission success. The Russian war of aggression against Ukraine adds more important factors to consider for NATO. Among other things, lessons learned reaffirms the vital importance of critical energy infrastructure (CEI) protection and societal resilience to NATO's ability to defend its territory from potential aggressors. At the same time, recent Russian energy blackmail against Europe yet again encourages NATO's decision-makers to think carefully before establishing energy and technological dependencies from other external suppliers, especially in the field of renewable energy generation and batteries.

Reacting to internal and external pressures to reassess the Allied approach to energy, NATO has already initiated a fundamental rethink on how it approaches energy. In close coordination with NATO Headquarters of Supreme Allied Command Transformation (HQ SACT), NATO Energy Security Centre of Excellence (NATO ENSEC COE) started developing NATO Operational Energy Concept (OEC) at the end of 2020, a document envisioned to provide guidance for NATO's deployed forces regarding energy-related issues. To facilitate the development of the concept and enhance its quality, the NATO ENSEC COE gathered a diverse group of experts (NATO OEC Writing Team (WT)) in 2021. In addition to providing numerous valuable insights on energy institutionalisation in NATO, the OEC WT suggested that the Alliance should approach energy from the perspective of a critical operational capability.

Against this backdrop, the study aims to support the efforts of the OEC WT in developing NATO OEC by accomplishing three interconnected objectives. First, this research report identifies gaps in NATO's contemporary approach to energy, with a special focus on finding such issue-areas where NATO has provided a political guidance but has not yet allocated sufficient resources for its implementation. Second, the study suggests how NATO OEC could add value in improving energy institutionalisation within the Alliance. Finally, it raises awareness by facilitating a transparent discussion on how NATO should adapt its approach to energy in order to increase its operational effectiveness for present and future operational requirements. The analysis is based on the NATO OEC WT discussion outcomes, NATO's official documents and academic literature.

The analysis is structured along the lines of DOTMLPFI (Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities and Interoperability) framework which provides necessary analytical tools for identifying gaps within NATO's approach to energy along its entire spectrum. The report consists of three parts. The first chapter briefly introduces the emergence of energy-related issues on NATO's political agenda and highlights how they have changed over time. The second part provides a short overview of DOTMLPFI research framework and advantages of its application, while the final section scrutinises the institutionalisation of energy within NATO across the DOTMLPFI spectrum. In the end, the study highlights the following findings:

1. Energy institutionalisation in NATO began with fuel. Petroleum-related issues have long been covered by the NATO Petroleum Committee; a successor of the Pipeline Committee established in 1956, and it took much time for NATO to discover other issue-areas within the energy domain. Most notable changes in NATO's energy institutionalisation began in the early 21st century. After the publication of Riga Summit Declaration which brought forward the term 'Energy Security' as an integral part of NATO's official language in 2006, NATO started broadening its institutional mandate within the field of energy. Notably, NATO established the Energy Security Section within the Emerging Security Challenges Division of NATO HQ, while Lithuania gathered a group of like-minded countries and successfully accredited its national Energy Security Centre as the NATO Energy Security Centre of Excellence. In 2014, the Wales Summit reacted to the illegal Russian annexation of Crimea and introduced hybrid warfare and hybrid threats to NATO's political vocabulary, where energy became one of the potential domains for hostile hybrid activities. As the time went by, the Allies have also focused on the subjects of resilience, efficiency, environmental sustainability, and climate change to NATO's political agenda, further enhancing the relevance of energy as these issue-areas are closely related with how the Alliance uses its energy resources. Despite the changes described above, most NATO's activities in the energy domain on tactical and operational levels remain focused on fuel, while the 'newcomer' energy issues rarely venture beyond the strategic level and, in certain instances, exist mostly as pats of NATO's political rhetoric. This leaves much room for further strengthening energy institutionalisation within NATO, whereas NATO OEC could provide the overarching guidance to facilitate the process.

2. The DOTMLPFI concept provides an analytical framework for considering how capability development in NATO might affect interdependent elements across its spectrum. Hence, it offers a holistic approach for capability development and helps the report to highlight potential changes required in NATO to better use energy for achieving mission success.

3. The NATO doctrine has accumulated a great depth of knowledge on numerous aspects of warfighting over the years, but it does not offer much-needed insights about energy applications for NATO's deployed forces. Instead, it covers some energy-related topics as part

of broader case-specific subjects, such as environmental protection, logistics and military engineering. For example, logisticians are primarily concerned with fuels, not focusing on other forms of energy or thinking about ways of applying technological solutions to reduce the logistical footprint in the first place. On the contrary, military engineers are not so concerned about fuels, while dealing with electricity already falls within their job description. Commanders are expected to achieve environmental protection to a certain degree by ensuring delicate use of energy sources/supplies under their control, not thinking about how green energy technologies could enhance their combat capabilities and protect the environment at the same time. As of a consequence, contemporary doctrinal publications provide a fragmented and incomprehensive approach to energy for the Allied Forces, which perceives energy as a commodity and does not conceptualise it as a capability. A capability that reduces logistical burden, enables mission success and saves the lives of men and women in the uniform.

4. The NATO OEC could facilitate the development of a unified and comprehensive energy doctrine by providing it with a conceptual foundation, which stems from research, experimentation, and standardized terminology. Speaking of research and experimentation, the NATO ENSEC COE is well placed to function as a custodian for doctrine, given its experience in the energy field and institutional focus on NATO OEC concept, energy- related training and exercise. While considering terminology, the members of the OEC WT has already proposed three potential definitions for energy security, operational energy and energy efficiency that could a become an integral part of NATO terminology and conceptual basis for its doctrinal publications:

   Energy security – *a stable and reliable supply of required energy forms and quantities, enabling NATO's capabilities, operational effectiveness and resilience.*

   Operational energy – *energy required to train, deploy and sustain Allied forces across NATO's missions and operations.*

   Energy efficiency – *the optimal use of energy to ensure a credible deterrence and defense posture with proper consideration of human and material costs, as well as logistical and environmental footprint.*

5. The current NATO's institutional arrangements do not allow for elevating energy to an operational capability as there is a lack of a joint energy management structure, unifying all levels of command. As things currently stand, energy remains a commander's concern and an interdisciplinary critical requirement, that does not fall under a specific NATO staff or section. NATO's organizational structure divides energy-related functions between different institutions, focusing on broader or narrower issue areas (the Petroleum Committee, Resilience Committee, Environmental Protection Working Group, etc.). Energy security is mainly addressed at the strategic level of NATO's structures (Emerging Security Challenges Division in the Climate and Energy Security Section of the NATO HQ).

Moreover, one observes a dispersion of authority in NATO, where military engineers perceive operational energy as an electrical utility while petroleum specialists focus on fuel and environmental specialists work on protecting the environment from the military activities. Fragmented institutionalization of energy constraints NATO's ability to implement its core tasks and achieve other important objectives such as promoting resilience, utilising clean energy technologies and increasing environmental sustainability.

6. The study echoes NATO OEC WT recommendations and suggests that changes in NATO's institutional structure should achieve at least three desired outcomes, which could be included in the upcoming NATO OEC. First, NATO's updated institutional arrangements should enhance energy security, secure operational energy and enable energy efficiency. Second, potential structural reforms should promote energy awareness and best practises at the operational and tactical levels. Finally, it should enable mission success through optimization of operational energy. In addition to the suggested outcomes, the proposed energy management system should also not forget critical energy infrastructure (CEI) protection. Here, it is important to strengthen NATO's ability to identify CEI, prioritise it in accordance to its importance to civil-military resilience and suggest appropriate measures for its protection.

7. To achieve these ambitions, NATO should consider creating an energy management system, while NATO OEC should provide guidance for such an affair. So far, the NATO OEC WT suggests two potential pathways for developing energy management system for a broader discussion. One the one hand, NATO could allocate energy management structure to the Joint Support and Enabling Command (JSEC) by establishing an Energy Management Cell within its structure. The JSEC collocates logistics, military engineering, and data analysis under one roof and spans the Supreme Allied Commander Europe's (SACEUR's) area of responsibility. Hence, the JSEC might be a good fit for energy management duties due to the natural connection between its tasks and energy management, as energy is crucial for moving and sustaining military capabilities. On the other hand, NATO energy management system could be gradually built from the top down by hiring strategic-level (ACT and ACO) energy advisors. Firstly, they would have to develop and promulgate strategic-level doctrine and guidance on energy management, which would serve as basis for establishing Energy Management Board or a Working Group responsible for developing a unit-level training curriculum, identifying unit-level energy advisors and assigning additional operational and tactical energy advisors' duties. The final phases of the energy management system would focus on unit-level energy advisor training and the development of reporting requirements, software and hardware.

8. The former point brings us to another important issue. NATO does not have a specialization exclusively focused on energy management, suggesting a need for introducing and training energy managers/advisors who could potentially bridge the gap between military engineers, environmental protection officers and logisticians. As things currently stand,

military engineers are responsible for deployed force infrastructure (camp design, set-up, construction, utilities, etc.). Environmental protection officers are concerned with protecting the environment from the military, not safeguarding military personnel from the environmental hazards. Logisticians are largely responsible for delivering fuel in the right amount and on time. Hence, NATO should consider adapting training of energy managers/advisers at different levels (strategic, operational, and tactical), to prepare them for deployment in NATO missions and operations.

9. At the same time, energy advisor/manager should be a specialist of CEI, capable of providing the commander with a complete and exhaustive picture of the energy infrastructure in the area of operation. In addition, he/she will have to prioritize certain energy infrastructure according to parameters such as their importance for mission accomplishment and impact on the non-military component. Such knowledge would enable the commander to draft a plan for the protection of energy infrastructures (air defense, MILENG, etc.) and decide whether to use them to sustain the mission. To fulfil such a function, energy advisors/managers must not merely know how to identify CEI or understand how it operates. They should also be able to differentiate its importance to the military, civilian and political domains and articulate implications for each domain if certain energy infrastructure becomes inoperable. To specialize its personnel in energy management, NATO would need to develop standardized individual and collective operational energy training.

10. NATO OEC could add value by demonstrating a strong need for developing a task description for energy manager/advisor, bridging the gap between different specializations. The task description would need to be further specialised along the levels of command and military branches. The NATO ENSEC COE could also contribute in training future energy managers/advisors. Given its experience in the field, it could even become the Head of the Department for this discipline and for respective coordination with other NATO institutions and organizations for developing energy manager/advisor training curriculum.

11. After the Cold War, there have been significant advances in technologies, facilitating the electrification of modern armed forces and discussions about material solutions related to the electricity generation, transmission, distribution and storage in an operational environment. As the electrification and digitalization will introduce new technologies to the military domain, NATO's standardization processes will have to catch-up with rapid technological advances. At the same time, the Allied forces will have to carefully plan the technological transition, finding ways to establish interface between modern and legacy technologies. The problem here is that NATO currently lacks data gathering capabilities to make data-driven decisions and the information exchange between commands are also lacking. To smoothen the technological transition, ensure interoperability among weapons platforms and Allied Forces, NATO will have to increase its data gathering capabilities.

12. NATO OEC could help mitigating the problem by offering procedures and identifying material solutions for energy metering and other data gathering techniques. NATO OEC WT suggests that there is a need to establish baseline requirements for technological applications, while metering and monitoring across all platforms is key for determining them. In here, NATO OEC WT suggests developing Minimum Military Requirements and Minimum Capability Requirements within NATO Defence Planning Process to guide the technological transition.

13. While planning and implementing its technological transition, NATO members must also ensure that its push towards military electrification would not establish other risky dependencies on third countries' technological solutions and equipment. For example, NATO Strategic Concept describes that Peoples' Republic of China's ambitions and coercive policies as challenges to NATO's interests, security and values. Simultaneously, China is an undisputed leader in production of solar modules, EV batteries and their components. Hence, potential dependencies on technologies, materials or other inputs should be considered by the Allied forces and NATO OEC could contribute to the process by highlight the dangers of dependencies on external supply chains.

14. Deployed forces infrastructure (DFI) should also be addressed by the NATO OEC. It could add value by offering criteria for leveraging energy for mission success. In here, one might consider objectives, duration and intensity of military operation, the location of the infrastructure, the quantity of personnel and the availability of energy sources. As the US Operational Energy Strategy suggests, decreasing energy demand for the most remote military bases by utilizing innovative technologies and local resources (including renewable generation and storage) has the potential to significantly reduce the logistical burden and risks for the supply convoys.

15. The transformation of energy from critical requirement to a crucial operational capability would be incomplete without ensuring interoperability among national armed forces conducting their assignments under the NATO banner. To achieve it, NATO needs to develop doctrine in the operational energy domain, agree on organizational reforms, personnel training procedures and standardization of material and facilities. One of the most important objectives in this regard should be the creation of a functional energy management system within NATO, resourced with well-trained personnel who are able to approach energy from a holistic standpoint. Put simply, energy institutionalisation in NATO should overcome the observed fragmentation and become more consolidated and comprehensive across the DOTMLPFI spectrum.

Introduction

Energy remains an essential factor in executing NATO's core tasks in deteriorating international security environment. From establishing the Pipeline Committee in 1956 to the most recent ambitions articulated in the new Strategic Concept[1], NATO continues to develop its role in the energy field. Despite immense experience in dealing with fuel-related issues, NATO must further embrace the ongoing strategic shifts (Russian war of aggression against Ukraine, remerging great power rivalry, competition for rare minerals, etc.) and technological changes (automation, digitalization, and electrification of the contemporary battlefield) to increase its operational effectiveness by optimising energy for current and future operational requirements.

NATO has already initiated a fundamental rethink on how it approaches energy. In close coordination with NATO HQ SACT, NATO ENSEC COE started developing NATO OEC at the end of 2020, a document envisioned to provide guidance for NATO's deployed forces regarding energy-related issues. To facilitate the development of the NATO OEC, the NATO ENSEC COE established NATO OEC WT in 2021, bringing together a diverse group of experts from various NATO countries and institutions.

After the initial working sessions, the OEC WT identified a clear necessity to venture beyond energy efficiency, interoperability, and fuel selection because moving forward in these areas requires a comprehensive reconstruction of energy institutionalisation within NATO. Looking from the holistic perspective, the team proposed to focus OEC on elevating energy from a critical quantitative requirement to a crucial operational capability, which allows for maximizing operational effectiveness, ensuring energy security and increasing energy efficiency. Hence, the NATO OEC could become an essential document for NATO's deployed forces, providing them with a blueprint for reducing energy consumption and logistical footprint, using innovative technologies, and, most importantly, saving lives in the process.

However, before NATO OEC becomes a guiding energy-related document for NATO's deployed forces, the Concept development must overcome a plethora of challenges and achieve many incremental objectives. A genuine NATO concept must build on standardized terminology, but there are many instances where the Alliance has not agreed on a common language in the energy domain. For example, such fundamental terms as energy security, operational energy and

[1] According to the NATO Strategic Concept, the Alliance aims to achieve the following objectives explicitly or implicitly related to energy: 1. To enhance energy security by investing "a stable and reliable energy supply, suppliers and sources."; 2. To ensure civil preparedness which provides continuity of government, delivery of essential services and continuous civil support for Allied Forces.; 3. To increase NATO's capacity "to prepare for, resist, respond to, and quickly recover from strategic shocks and disruptions, and ensure the continuity of the Alliance's activities."; 4. To invest in NATO's ability: "to prepare for, deter, and defend against the coercive use of political, economic, energy, information and other hybrid tactics by states and non-state actors."; 5. To increase awareness to the impact of climate change on security and prepare to adapt.; 6. To contribute to the international efforts combatting climate change "by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness and a credible deterrence and defence posture." Please see: NATO Strategic Concept, 2022, art. 26, 27, 46.

energy efficiency lack definitions on the NATO level, while its members define these terms differently, mostly anchoring them within civilian issues (especially – energy efficiency). Second, elevating energy to a crucial operational capability requires modifying ways on how NATO's structures and procedures approach energy. Currently, energy related discussions are generally dispersed on the strategic level, not reaching operational, let alone tactical, levels. Without institutionalizing energy across all levels of command and ensuring a bidirectional information flow (analysis and guidance from above – data and feedback from below), NATO OEC cannot become truly "Operational". Third, one also needs to consider organizing the training and education of military personnel specialized in energy applications to NATO's missions and operations, providing them with the necessary knowledge, equipment and technological solutions, and ensuring their interoperability.

To advance the development of NATO OEC, one must further identify gaps in NATO's approaches to energy across the DOTMLPFI (Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities, and Interoperability) spectrum. Against this backdrop, the study aims to highlight shortcomings in NATO's utilization of energy by employing the DOTMLPFI framework and suggest how NATO OEC could potentially add value in improving energy institutionalization within NATO. In doing so, the study supports the development of NATO OEC and attempts to raise awareness about energy-related issues by facilitating a transparent discussion on how NATO should adapt its approach to energy in order to increase its operational effectiveness for present and future operational requirements. The analysis is based on the academic literature, NATO's official documents and the outcomes of the NATO OEC WT discussions.

1. The Growing Importance of Energy in NATO

Energy is not a newcomer topic to NATO. Petroleum-related issues have long been covered by the NATO Petroleum Committee, a successor of the Pipeline Committee established in 1956. Thirteen years later, the NATO began broadening its scope and started addressing environmental challenges by establishing the Committee on the Challenges of Modern Society (CCMS). In the 1970s, the NATO started developing its environmental protection policy, which produced a number of standards and guidelines. In the 1990s, the NATO began preparing mechanisms dealing with civil preparedness and emergency response to environmental disasters and launched the Euro-Atlantic Disaster Response Coordination Centre (EADRCC).[2] However, a more direct and proactive attempt to address the energy domain and its linkages to the NATO's core tasks occurred in the 21st century.

Here, the Riga Summit Declaration carries historical significance as the phrase "Energy Security" first appeared on NATO's political agenda.[3] At that time, the Allies were becoming more aware of the risks of high energy dependence from one supplier and the nuances of maintaining large military formations deployed in out-of-area operations, such as the International Security Assistance Force in Afghanistan. With the subsequent establishment of the Energy Security Section within the Emerging Security Challenges Division of NATO HQ and the eventual accreditation of the Lithuanian Energy Security Centre to the NATO ENSEC COE, NATO slowly but surely expanded its activities in the field of energy, making it a common, albeit loosely defined, part of NATO language.

Deteriorating international security environment and efforts to mitigate climate change brought forward new linkages between NATO's activities and energy. Reacting to the illegal Russian annexation of Crimea in 2014 and its subsequent military deployments in and around Ukraine, NATO has refocused on collective defence and strengthened its forward presence on its eastern flank as part of its deterrence and defence posture. One of the first key takeaways from the initial stages of Russo-Ukrainian war the Kremlin's attempts to establish plausible deniability of its military operations in Ukraine. Thus, the Wales Summit of 2014 introduced hybrid warfare and hybrid threats to NATO's political vocabulary, where energy became a separate domain of potential hybrid activities, through which hostile actors might attempt applying political pressure and exerting influence. At the same time, the document suggested to curtail "Russian access to sensitive defence and energy sector technologies", establishing the linkage between energy and technology.[4] The Allies have also brought forward the subjects of resilience, environmental sustainability and climate change to NATO's political agenda, further enhancing the relevance of

[2] NATO (2022). Environment, Climate Change and Security.
Please see: https://www.nato.int/cps/en/natohq/topics_91048.htm

[3] In comparison, cyber also appears on NATO's agenda in 2006, but it has eventually evolved to a doctrinal publication (please see: NATO Standard AJP-3.20. Allied Joint Doctrine for Cyberspace Operations, Edition A, Version 1, 2020), while it was not the case for energy security.

[4] Wales Summit Declaration, 2014

energy as these issue-areas are closely related to how the Alliance uses its energy resources.

Critical linkages between energy, resilience, deterrence and defence became even more apparent when Russia began its full-scale war of aggression against Ukraine on the early morning of 24 February 2022.[5] At first, the Kremlin tried to paralyze the Western response to the self-proclaimed 'special military operation' by instigating an energy crisis in Europe, a move that followed many previous instances when Russia applied energy as an instrument of coercion to secure preferential political outcomes in the West.[6] Following consecutive losses to the Ukrainian Armed Forces near Kyiv, Kharkiv and Kherson, Russia started systematically targeting Ukrainian CEI. Russian military focused its bombing campaign on Ukrainian energy generation units, transformer stations, power lines and other installations with various missiles and Iranian UAVs, testing Ukrainian civilian-military resilience.[7]

The geopolitics of nuclear energy also played a part in the Russian strategy towards individual NATO members. As the Kremlin was not successful in halting the Western military support to Ukraine by reducing its energy supplies to European countries, Russia sought to instrumentalise nuclear energy in achieving this aim. On 4 March 2022, Russian Armed Forces have occupied the Ukrainian Zaporizhya nuclear power plant – the largest nuclear generation unit in Europe – and sought to use this situation to its advantage. Suriya Evans-Pritchard Jayanti argues that Russia sought to leave "Ukraine and Europe in a state of panic over a possible nuclear disaster certainly gave Russia additional leverage in the form of terror with which it could attempt to press its goals <…>."[8] She maintains that Russian nuclear energy blackmail was an element of broader attempt "to drive a wedge between Europe and Ukraine, presumably with an eye to getting Europe to help force Ukraine into concessions in exchange for nuclear security".[9] These issues were reflected in the Vilnius Summit Declaration, which noted that "Russia's war has had a profound impact on the environment, nuclear safety, energy and food security, the global economy, and the welfare of billions of people around the world."[10]

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[5] Six months, twenty-three lessons: What the world has learned from Russia's war in Ukraine. Washington: Atlantic Council, 2022.

[6] For further reference, please see the followin publications: Larsson, R. L. (2006). Russia's Energy Policy: Security Dimensions and Russia's Reliability as an Supplier. Stockholm: Swedish Defense Research Agency. Ghaleb, A. (2021). Natural Gas as an Instrument of Russian State Power. Carlisle, Strategic Studies Institute, U.S. Army War College. Hackenbroich, J. and Medunic, F. (2022). The Kremlin's Energy Warfare. European Council on Foreign Relations. Korteweg, R. (2018). Energy as a tool of foreign policy of authoritarian states, in particular Russia. Brussels: European Parliament's Committee on Foreign Affairs. Riley, A. (2022). Gazprom set the Russian invasion of Ukraine in motion. Washington: Atlantic Council. Trakimavičius, L. (2023). The Baltics — a Ship to Weather the Energy Storm. Washington: Center for European Policy Analysis.

[7] Lange, N. (2023). How to beat Russia. What armed forces in NATO should learn from Ukraine's homeland defense. Bratislava: GLOBSEC. Zabrodskyi, M. Watling, J. Danylyuk O. V. and Reynolds, N. (2022). Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022. London: Royal United Services Institute for Defence and Security Studies.

[8] Jayanti, S. E. P. (2022). The complex reality behind Vladimir Putin's nuclear blackmail in Ukraine. Washington: Atlantic Council.

[9] Ibid.

[10] NATO Vilnius Summit Declaration, 2023. Please see: https://www.nato.int/cps/en/natohq/official_texts_217320.htm

Hence, the Russian war of aggression against Ukraine offers essential lessons on how energy fits in modern conventional and hybrid warfare. In the article 5 scenario, it is plausible that a potential aggressor would also target CEI to instigate panic among the population and cripple vital public services. As the Ukrainian experience shows, such an attack might be supplemented with a strategic energy coercion campaign to weaken the Allied capability to deter, resist and defend. To counter the threats described above, establishing proper arrangements of CEI protection are vital. It would allow for enhancing civil preparedness and national resilience throughout the Alliance and strengthening the compliance of individual NATO members with the obligations enshrined in the article 3 of the North Atlantic Treaty (developing the capacity to resist any form of attack).

To a certain extent, the new NATO Strategic Concept reflects the issues described above. Having only four months to reflect on new strategic developments emerging after the full-scale Russian war of aggression against Ukraine, the Allies successfully updated the Strategic Concept during the Madrid Summit. Despite a relatively short time window, the strategic document shows that NATO recognizes the importance of energy in accomplishing its core tasks. Three passages articulated in NATO's new strategic document are especially relevant. The first passage describes the importance of energy in the current strategic environment: "Strategic competitors test our resilience and seek to exploit the openness, interconnectedness and digitalisation of our nations. <…> They conduct malicious activities in cyberspace and space, promote disinformation campaigns, instrumentalise migration, manipulate energy supplies and employ economic coercion" (article 7). The second passage advocates for increased resilience and preparedness: "We will invest in our ability to prepare for, deter, and defend against the coercive use of political, economic, energy, information and other hybrid tactics by states and nonstate actors <…> We will enhance our energy security and invest in a stable and reliable energy supply, suppliers and sources." (articles 26 and 27). Finally, the NATO 2022 Strategic Concept aims to contribute "to combating climate change by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness and a credible deterrence and defence posture." (article 46).[11] These notions were further emphasised in the most recent Vilnius Summit.[12]

Summarising the discussion above, NATO has expressed interests to increase its engagement in the energy domain explicitly (by enhancing energy security and efficiency) or implicitly (by strengthening its abilities to counter the hybrid threats, increasing resilience, combating climate change, etc.). However, to achieve the ambition articulated in the political guidance, a robust and consolidate institutional structure is necessary.

[11] NATO Strategic Concept, 2022.

[12] NATO Vilnius Summit, 2023.

2. Introducing the DOTMLPFI Concept

To better explain the DOTMLPFI framework, one should also consider the capability development processes and consider the terms of capability and components of capability. Even though various armed forces and ministries of defence use different wording for defining capability, it is generally understood as means for militaries to accomplish certain tasks or produce desired effects, overcoming temporal and physical constraints if necessary. In turn, components of capability, simply put, are the key building blocks or necessary elements, which constitutes capability.[13]

National approaches differ on the building blocks of capabilities. Australia, for example, employs the Fundamental Inputs to Capability framework, which puts emphasis on personnel, organization, collective training, major systems, facilities and training areas, supplies, support, command, and management. Canada, on the other hand, utilises the Functional Component of Capability system, which considers personnel, research and development/operations research, infrastructure and organization, concepts, doctrine and collective training, IT infrastructure, equipment, supplies and services. United Kingdom uses the Defence Lines of Development approach, considering training, equipment, personnel, information, concepts and doctrine, organisation, infrastructure and logistics. It also considers interoperability as an overarching theme.[14]

The DOTMLPFI framework applied in the research report mostly stems from the US DOTMLPF approach, where components of capability are broken down in the following way: Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities and Interoperability.

Doctrine. Professor Richard Holmes defines doctrine as "an approved set of principles and methods intended to provide large military organizations with a common outlook and a uniform basis for action".[15] Wing Commander Mark Attrill elaborates that doctrines express how military forces contribute to campaigns, operations, battles, and engagements. For him, a doctrine is a collection of authoritative statements explaining how military forces conduct operations.[16] NATO shares a similar understanding and defines doctrine as "The fundamental principles by which the military forces guide their actions in support of objectives. It is authoritative but requires judgment in application".[17] Put simply, doctrines are a set of guiding principles for the armed forces to achieve their objectives, explaining how capabilities should be used to

[13] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Defense Governance and Management: Improving the Defense Management Capabilities of Foreign Defense Institutions. A Guide to Capability-Based Planning (CBP). Alexandria: Institute for the Defence Analysis. P. 8-10.

[14] Ibid.

[15] Army Doctrine Primer (AC71954), 2011, p. 1.

[16] Attrill, M. NATO Doctrine and Joint Warfare Centre Role in its Development. The Three Swords Magazine 28, 2015. P. 13-17.

[17] Ministry of Defence of the United Kingdom (2013). Developing Joint Doctrine Handbook (4th edition), p. 1.

[18] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 7.

achieve mission success.[18] According to the US Manual for the Operation of the Joint Capabilities Integration and Development System, changes in doctrine are necessary if present doctrinal publications are not sufficient for a certain capability. In that case, one must identify why it is not sufficient and what changes might be required.[19]

Organization. In the US system, organization is defined as a structure "through which individuals cooperate systematically to accomplish a common mission and directly provide or support joint warfighting capabilities".[20] Changes to organizational structures might be recommended if they would enhance the efficiency or performance of a capability in question.

Training. In general terms, training prepares personnel to execute "their assigned tasks in accordance with doctrine."[21] The US defines training as processes through which "individuals, units, and staffs using joint doctrine or tactics, techniques, and procedures to prepare joint forces or joint staffs to respond to strategic, operational, or tactical requirements considered necessary by the CCMDs (Combatant Commands) to execute their assigned or anticipated missions."[22] Hence, it is important to outline required training procedures for effective implementation of the capability under development.

Materiel. It is the sum of gear necessary to "equip, operate, maintain and support military activities."[23] In the US practice, materiel is understood as "items, systems, or equipment needed to support the required capability".[24] For example, it may refer to ships, tanks, self-propelled weapons, aircraft, parts and support equipment, but does not include property, installations and utilities. If changes to the materiel section are considered, one should provide argumentation about how it enables certain capabilities if changes to the usage of materiel are proposed, or new material solutions are introduced.

Leadership (and Education). According to the Institute for Defence Analysis, education is "the articulation of approved learning objectives and curriculum and aits associated policies, procedures and standards. It is formal learning to prepare military leaders to develop and command armed forces."[25] The US associate leadership and education with the professional development of its leaders. The role of education is to complement training, experience and self-improvement with knowledge needed to produce competent leaders. Hence, the major difference between education and training is their purpose: the former prepares to lead armed forces, while the latter helps to master fundamentals of warfighting and designated specialization.[26]

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[19] Manual for the Operation of the Joint Capabilities Integration and Development System, 2018.
Please see: https://www.acq.osd.mil/asda/jrac/docs/2018-JCIDS.pdf

[20] Ibid.

[21] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 7.

[22] Ibid.

[23] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 7.

[24] Manual for the Operation of the Joint Capabilities Integration and Development System, 2018.
Please see: https://www.acq.osd.mil/asda/jrac/docs/2018-JCIDS.pdf

[25] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 8.

[26] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 8.

When one analyses the domain of leadership and education, the primary concern should be wherever current practises allows for using the capability to its fullest.[27]

Personnel. In simplest terms, personnel refer to military servicemen and civilians required to produce desired effects.[28] In the US practise, the personnel considerations are focused on finding qualified servicemen to support joint capability requirements. In here, it is important to make the distinction between personnel and organizational functions. The assigned quantity of the personnel belongs to the organizational section, while the quality and skills is a part of personnel element of the DOTMLPF.[29]

Facilities. Facilities refer to the real-estate "needed to produce and sustain military capability"[30]: buildings, structures, training grounds, and the land belonging to the compound. Considering changes to the facilities section, the US documents suggest considering wherever current infrastructural arrangements allow for capability to be used for its full potential.

Interoperability is not explicitly underlined in the US approach, but it is used in NATO given the collective nature of the Alliance and therefore considered in this research report. It refers to the ability of the Allied Forces to be interoperable with each other. Hence, the most important factor to consider in this section is wherever a capability in question could be interoperable across the Allied Forces.[31]

Hence, DOTMLPFI also provides an analytical framework for considering how capability development might affect interdependent elements across its spectrum.[32] For example, Silfverskiöld, Andersson, and Lundmark (2021) argue that the main advantage of the DOTMLPFI analysis lies in its systemic approach to capability development since the introduction of new capabilities instigates interdependent changes on many levels in each organization.[33] Hallett and Thorngren (2011) further elaborate on the utility of the DOTMLPFI concept as it ensures that:

"<...> people are not seduced, under the pressure of resource constraints, into thinking that changing one element, like writing a new doctrine, will result in the generation of the desired operational effects. Not only may a new doctrine (or subsidiary textual guidance) be nec-

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[27] Manual for the Operation of the Joint Capabilities Integration and Development System, 2018. Please see: https://www.acq.osd.mil/asda/jrac/docs/2018-JCIDS.pdf

[28] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 8.

[29] Manual for the Operation of the Joint Capabilities Integration and Development System, 2018. Please see: https://www.acq.osd.mil/asda/jrac/docs/2018-JCIDS.pdf

[30] Taliaferro, A. C. Gonzalez, L. M. Tillman, M. Ghosh, P. Clarke, P. Hinkle, W. (2019). Ibid, p. 8.

[31] Shalamanov, V. From Strategy to Capabilities: Transformation, Innovation and Interoperability. Bulgarian Academy of Science / Defense Staff College Please see: https://it4sec.org/system/files/gmc_cap_dev_6-6-18_vs.pdf?download=1

[32] Hallett, M. and Thorngren, O. (2011). Attempting a Comprehensive Approach Definition and Its Implications for Re-conceptualizing Capability Development. // Neal, D. J. And Wells II, L. (eds.) Capability Development in Support of Comprehensive Approaches. Transforming International Civil-Military Interactions. Washington: Institute for National Strategic Studies, p. 35-50.

[33] Silfverskiöld, S. Andersson, K. and Lundmark, M. Does the method for Military Utility Assessment of Future Technologies provide utility? Technology in Society 67, 2021. P. 1-10.

essary, but the organizations may need to be changed, and additional personnel required to perform new functions. This personnel must not only be trained, they may also need new equipment (materiel) to use and new buildings (facilities) in which to use them."[34]

All in all, the application of the DOTMLPFI analysis ensures a holistic approach for measuring changes required in the whole of organization when one alters one of its elements. It also allows for estimating the effort required for synchronising the adoption of new measures in the organization across the DOTMLPFI spectrum. Given the ambition of the NATO OEC WT to elevate energy from a critical requirement to a crucial capability, the DOTMLPFI provides a good analytical framework for identifying necessary changes in NATO in order to achieve such goal.

[34] Hallett and Thorngren op. cit., p. 41, 42.

3. Institutionalization of Energy in NATO across the DOTMLPFI Spectrum

Based on the analysis of official documents, academic literature and the comprehensive discussions during the NATO OEC WT meetings, the following section will prove the decision -makers with an analytical starting point for further discussion about the role of energy issues within NATO. It will identify potential impacts on NATO in terms of doctrine, organization, training, material, leadership, personnel, facilities and interoperability if energy is transformed to an operational capability. For example, what gaps across the DOTMLPFI spectrum does the NATO OEC might fill? What changes does it might facilitate in NATO's strategic thought and institutional structure if they would be implemented? Given the underlying political circumstances, institutional characteristics and technological developments, are these changes realistically feasible? If yes, how quickly should they be achieved? Is the level of ambition articulated in the NATO OEC proposal set too high, or is the bar too low?

3.1. Doctrine

Drawing from exhaustive and diverse experience in the field, NATO's doctrine is developed extensively, covering many subjects (nuclear deterrence, logistics, healthcare, etc.) that span land, air, maritime, cyberspace and space domains. Despite having accumulated a great depth of knowledge on numerous aspects of warfighting, NATO doctrine has little to say about energy in international missions and operations.[35]

It is not to say that NATO doctrinal thought completely omits energy. Indeed, NATO doctrine covers some energy-related issues as part of case-specific subjects, such as environmental protection, logistics and military engineering, but its approach to energy remains fragmented and incomprehensive. For example, logisticians are primarily concerned with fuels necessary to keep the motors running,[36] not focusing on other forms of energy or thinking about ways of applying technological solutions to reduce the logistical footprint in the first place. On the contrary, military engineers are not so concerned about fuels, while dealing with electricity already falls within their job description. In general, commanders are expected to achieve environmental protection to a certain degree by ensuring "careful use of all natural resources and energy sources/supplies under their control".[37] Hence, it is to say that NATO doctrine discusses energy here and there, but it does not provide a unified set of coherent principles and methods for uti-

[35] For the list of NATO doctrines, please see NATO Standartization Office: https://nso.nato.int/nso/nsdd/main/list-promulg

[36] NATO Standard AJP-4. Allied Joint Doctrine for Logistics, Edition B, Version 1, 2018

[37] NATO Standard AJEPP-4. Joint NATO Doctrine for Environmental Protection During NATO-Led Military Activities, Edition B,Version 1, 2018.

lizing energy in the most efficient way to achieve mission success and save the lives of men and women in the uniform.

Such a gap is somewhat surprising given that energy is not a newcomer topic to NATO. Given the political guidance provided by NATO's Strategic Concept and summit declarations and the relevance of the lessons-learned during Russian energy coercion campaigns and its war of aggression against Ukraine, a broader inclusion of energy in NATO's doctrine could benefit the Alliance. Against this backdrop, NATO OEC could contribute to its development by offering insights from a conventional war experience and providing definitions for key terms. For example, energy security is mentioned across various NATO documents, but it is only defined nationally (NATO has only agreed on its roles in the field of energy security without explicitly saying what it is). Different definitions formulated nationally confuse the Allies by depriving them of the benefits of a common language. Given the nature of a politico-military Alliance, the NATO OEC WT already suggests defining **energy security** as a *stable and reliable supply of required energy forms and quantities, enabling NATO's capabilities, operational effectiveness and resilience.*

Military deployments require defining operational energy wherever NATO enhances its forward presence or conducts out-of-area missions and operations. The concept is defined by some NATO allies engaged extensively in out-of-area operations (the US[38] and France,[39] for example) but not by the Alliance itself. The NATO OEC Writing Team suggests that **operational energy** could be understood as the *energy required to train, deploy and sustain Allied forces across NATO's missions and operations.*

Speaking of sustaining NATO deployed forces, one also needs to consider energy efficiency. In the civilian world, national energy policies usually perceive energy efficiency as something that could save money and fuel or be instrumental in achieving ambitious environmental targets. In the military context, environmental targets cannot be pursued at the expense of military capability to enhance energy efficiency. On the contrary, energy efficiency must enable the military to achieve its objectives by reducing the logistical footprint and lowering the risk for soldiers engaged in sustainment operations (the environmental benefits could also be reaped in the process of reducing the logistical footprint). Having such military particularities in mind, the NATO OEC WT suggests striking a compromise between environmental and operational needs by defining **energy efficiency** as follows: *the optimal use of energy to ensure a credible deterrence and defense posture with proper consideration of human and material costs, as well as logistical and environmental footprint.*

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[38] "Operational energy is the energy required for training, moving, and sustaining military forces and weapons platforms for military operations." Please see: Pellerin, C. (2016). Capability, Risk Drive Shift in DoD Operational Energy Strategy. Washington: US Department of Defence.

[39] "Operational energy is the energy that allows for the implementation of all of the means that meet the needs that support operational commitments. Achieving established military objectives and responding to tactical, operational, and strategic requirements are impacted by the availability and accessibility of operational energy." Please see: The Ministry for the Armed Forces of the Republic of France. (2020). Defence Energy Strategy. Energy Working Group Report 2020.

Even though such an overview is neither complete nor exhaustive, it shows that the NATO doctrine lacks a comprehensive approach to energy, which clearly articulates how energy should enable mission success. It is impossible to elevate energy to a critical operational capability without better explaining its role in achieving the objectives of NATO's missions and operations. At the same time, the political guidance provide by NATO's strategic documents and insights from the ongoing Russo-Ukrainian war encourages a broader integration of energy to NATO's doctrine. In this context, the NATO OEC could facilitate the development of the energy doctrine by providing a conceptual foundation. At the same time, the NATO ENSEC COE is well placed to function as a custodian for doctrine, advancing its development through research and exercise.

3.2. Organization

The institutionalization of energy in NATO does not allow for making it an operational capability as NATO lacks joint energy management structure, unifying all levels of command. As things currently stand, energy remains a commander's concern and an interdisciplinary critical requirement, that does not fall under a specific NATO staff or section. NATO's organizational structure divides energy-related functions between different institutions, focusing on broader or narrower issue areas (the Petroleum Committee, Resilience Committee, Environmental Protection Working Group, etc.). Energy security is mainly addressed at the strategic level of NATO's structures (Emerging Security Challenges Division in NATO HQ). One observes a dispersion of authority in NATO, where military engineers perceive operational energy as an electrical utility while petroleum specialists focus on fuel. Fragmented institutionalization of energy constraints NATO's ability to implement its core tasks, promote resilience, and increase environmental sustainability.

To improve the situation, the draft NATO OEC offers potential solutions on how energy might be institutionalized within the complex web of NATO structures and procedures. The NATO OEC WT suggests two potential ways for developing an energy management system[40] for further discussion. On the one hand, NATO could integrate energy management within the Joint Support and Enabling Command (JSEC) by establishing an Energy Management Cell within its structure. The JSEC might be a plausible option because it collocates logistics, military engineering, and data analysis in one organization and spans the Supreme Allied Commander Europe's (SACEUR's) area of responsibility. The JSEC might also be a good fit due to the natural connection between its tasks and energy management, as energy is crucial for moving and sustaining military capabilities.

[40] Energy management refers to reduction or redistribution of energy usage through organizational management, technological applications and behavioral change, without creating any shortage or negative effect to capabilities or operations. Energy management system is a system to establish an energy policy, objectives, energy targets, action plans and processes to achieve the objectives and energy targets. Please see: Kozłowski, C., Dacchille, M., Meyer, J. M. Bellot, L. Kegel, M. Doran, J. (2022). Energy Management Handbook: Energy Management for Military Deployed Force Infrastructure. Vilnius: NATO Energy Security Centre of Excellence. P. 44.

To establish a firm linkage between strategic, operational and tactical levels, energy managers/advisors should be appointed at all levels of command. On the strategic level, NATO could create a position of energy manager/advisor within the Strategic Enablement Directorate at the Supreme Headquarters Allied Powers Europe (SHAPE). On the operational level, at least one energy manager/advisor should be responsible for managing tactical-level managers/advisors.

On the other hand, NATO energy management system could be gradually built from the top down by hiring strategic-level (ACT and ACO) energy advisors. Their first assignment would be to develop and promulgate strategic-level doctrine and guidance on energy management. Based on the guidance, NATO could establish an Energy Management Board or a Working Group responsible for developing a unit-level training curriculum, identifying unit-level energy advisors and assigning additional operational and tactical energy advisors duties. The final phases of the energy management system would focus on unit-level energy advisor training and the development of reporting requirements, software and hardware. Given the personnel constraints, energy advisors might function as a billet (exclusively focusing on energy management – strategic level, and, where necessary – operational level) or as a duty (working on energy management among other things – operational/tactical levels). Building a structure from top to bottom would allow leaning on all of SHAPE visibility and influence instead of being restricted to one specific staff section. It would employ the direct nature of tasking authority on behalf of SACEUR and ensure the broadest access and understanding of supporting functions and components of energy management and optimization throughout NATO.

Irrespective of how institutionalisation of energy management within NATO structure might look like, the NATO OEC WT suggest that it should achieve at least three desired outcomes. First, it should enhance energy security, secure operational energy and enable energy efficiency. Second, potential structural reforms should promote energy awareness and best practices at the operational level. Finally, it should enable mission success through optimization of operational energy. In addition to the suggested outcomes, the proposed energy management system should also not forget CEI protection. Here, it is important to strengthen NATO's ability to identify CEI, prioritize it in accordance to its importance to civil-military resilience and suggest appropriate measures for its protection. As discussed in this section, organizational changes in NATO structures and procedures are needed to achieve these outcomes.

3.3. Training

NATO does not have a specialization exclusively focused on energy management, suggesting a need for introducing and training energy managers/advisors who could potentially bridge the gap between military engineers, environmental protection officers and logisticians. As things currently stand, military engineers are responsible for deployed force infrastructure (camp design, set-up, construction, utilities, etc.). Environmental protection officers are concerned with protecting the environment from the military, not safeguarding military personnel from the environmental hazards.[41] Logisticians are largely responsible for delivering fuel in the right amount and on time.[42]

The NATO OEC WT suggests adapting training of energy managers/advisers at different levels (strategic, operational, and tactical), to prepare for deployment in NATO missions and operations. At the same time, the energy advisor/manager must be able to provide the commander with a complete and exhaustive picture of the energy infrastructure in the area of operation. In addition, he/she will have to prioritize energy infrastructures according to parameters such as their importance for mission accomplishment and impact on the non-military component. In this way, the commander can, in agreement with the civil component, draw up a plan for the protection of energy infrastructures (air defense, MILENG, etc.) and decide whether to use them to sustain the mission.[43]

To fulfil such function, energy advisors/managers must not merely know how to identify CEI or understand how it operates. They should also be able to differentiate its importance to the military, civilian and political domains and articulate implications for each domain if certain energy infrastructure becomes inoperable. Simply put, energy managers/advisors should be able to provide answer for three different, albeit interconnected, questions. First, how and to what degree the operability of energy infrastructure might impact the military operation? One the one hand, the impact might be assessed from the logistical standpoint by analyzing to what degree the supply of the Allied Forces depends on CEI. On the other hand, the energy advisor/manager should also assess other alternative implications that energy infrastructure might have on Allied Forces, such as constraints on freedom of maneuver and health hazards. For example, if a hydroelectric dam is destroyed, what area would become inaccessible due to flooding and how it might impact the operation? Alternatively, it is important to understand how to deal with hazardous pollution as enemy might use scorched-earth tactics such as oil fires ignited by the retreating Iraqi military during the Gulf War.[44] The negligence of pollution might establish dire consequences as the Russian – Ukrainian war shows. During their unsuccessful attempt to

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[41] Ibid, 12,13.

[42] Carpenter, M. Sullivan, P. Nussbaum, D. Operational Energy—Essential Knowledge for Military Officers. Naval Postgraduate School.

[43] The author is most grateful to LTC Massimo Dacchille, Head of Doctrine and Concept Development Division, NATO Energy Security Centre of Excellence, for sharing this idea.

[44] NASA, Landsat Top Ten - Kuwait Oil Fires.
Please see: https://www.nasa.gov/mission_pages/landsat/news/40th-top10-kuwait.html

take Kiev in early 2022, Russian Armed Forces temporarily captured the Chernobyl NPP and entered its exclusion zone. Later, reports emerged that some units remained stationed in the contaminated zone during its brief occupation[45] and received radiation poisoning.[46]

Second, how the destruction of certain energy infrastructure might impact the civilian population and could such impact establish any constraints on military operations? To a certain extent, civilian and military domains are interconnected as significant civilian suffering might facilitate the need for the Allied Forces to intervene by providing a humanitarian relief effort, taking away resources from their primary mission. Alternatively, inoperable energy infrastructure might cause people to flee their homes, thus clogging the road traffic with refugee columns.

Finally, what are the political implications of inoperable CEI? Loss of power and district heating might not only negatively affect the well-being of civilian population, it might also weaken the position of political leadership. Since the leading elected officials ultimately decide on the use of military force, its intensity and allocation of resources, changes in political position might have direct implications on the continuation or the scope of military operations.

To specialize its personnel in energy management, NATO would need to develop standardized individual and collective operational energy training. The NATO ENSEC COE could add value in training future energy managers/advisors. The NATO ENSEC COE could become the Head of the Department for this discipline and for respective coordination with other NATO institutions and organizations for the organization and conduct of these courses.

To a certain extent, the NATO ENSEC COE is already contributing to advancing knowledge on energy management by preparing relevant literature and organizing courses and exercises. A recent notable example is a publication 'Energy Management Handbook: Energy Management for Military Deployed Force Infrastructure' which was prepared in collaboration between the NATO ENSEC COE, the Military Engineering Centre of Excellence (MILENG COE), Natural Resources Canada (the Department of the Government of Canada) and the Ministry of Defence (MOD) of the United Kingdom (UK). The Handbook explains the principles of energy management process during deployment of military forces. It is intended for personnel who are required to plan, deliver, evaluate, and support energy management measures to a force deployed on an expeditionary operation.[47]

With the support of NATO's HQ Emerging Security Challenges Division and the Naval Postgraduate School in Monterey (US), the NATO ENSEC COE has developed the Energy

[45] Brumfiel, G. (2022). Satellite photo shows Russian troops were stationed in Chernobyl's radioactive zone, NPR, Please see: https://www.npr.org/2022/04/07/1091396292/satellite-photo-shows-russian-troops-were-stationed-in-chernobyls-radioactive-zo

[46] Lewis, L. (2022). Russian soldiers at Chernobyl 'are being treated for radiation poisoning in Belarus' after power plant workers said the troops' lack of anti-radiation gear was 'suicidal', DalyMail, please see: https://www.dailymail.co.uk/news/article-10671373/Chernobyl-disaster-fears-Norway-tells-citizens-dust-Cold-War-bunkers.html

[47] Kozłowski, C., Dacchille, M., Meyer, J. M. Bellot, L. Kegel, M. Doran, J. (2022). Energy Management Handbook: Energy Management for Military Deployed Force Infrastructure. Vilnius: NATO Energy Security Centre of Excellence.

Security Strategic Awareness Course. It presents the students with current energy developments related to NATO security and its energy security agenda, thus providing a foundational knowledge on energy security.[48] The Baltic Defence College in cooperation with the specialists' network from the NATO ENSEC COE is also organising Operational level Energy Security Course which aims to apply energy security factors relevant to NATO by analyzing energy security developments in the current strategic environment and their potential impact on the NATO's security and its military operations.[49] Energy Efficiency in Military Operations Course (EEMOC) is another example. Developed by the NATO ENSEC COE and its international partners, the course shares best practices and innovations that enable students to develop smart energy solutions for in-garrison and deployed operations.[50] Finally, the NATO ENSEC COE and its partners conduct a thematical series of tabletop exercises (TTXs) "Coherent resilience" since 2014, focusing on "the resilience of energy infrastructure and energy supply in a range of regions, countries, and systems."[51]

Despite the efforts mentioned above, new courses will have to be developed for training energy managers/advisors in a more unified manner, bridging energy security, energy efficiency, energy management, operational energy, resilience and other interrelated subjects. A recent publication by Carpenter, Sullivan and Nussbaum on essential knowledge about operational energy provides some insights on how training of the proposed specialization could be organized given the overlapping ontology of operational energy and energy management. The authors suggest that to become an effective energy manager/advisor, one will have to gain knowledge on the following energy issues:

1. Types of energy sources or varieties primary energy (oil, natural gas, coal, nuclear and renewable sources: solar, wind, geothermal, biomass, etc.);

2. Energy generation and conversion: how the energy sources mentioned above become secondary energy (electricity, heat, petroleum products, etc.);

3. Energy transmission and distribution – how energy reaches its end-users (global and domestic supply chains) and what kind of infrastructure is required for transporting different energy sources and types;

4. Energy storage – how energy is 'stockpiled', what technological solutions are needed considering different types of energy;

5. Energy management: awareness, command and control of energy;

[48] NATO Energy Security Strategic Awareness Course, please see: https://enseccoe.org/en/standing-courses/211
[49] Operational Level Energy Security Course. Please see: https://www.baltdefcol.org/1525
[50] Energy Efficiency in Military Operations Course (EEMOC).
Please see: https://enseccoe.org/en/events-and-projects/268/energy-efficiency-in-military-operations-course-61/details
[51] Table Top Exercise Coherent Resilience 2022-CEPS (CORE 22-CEPS).
Please see: https://enseccoe.org/en/events-and-projects/268/table-top-exercise-coherent-resilience-2022-64/details

6. Analytical tools – knowledge on improving current energy systems and developing new capabilities;
7. Platforms – mobile vehicles of all domains and their energy demand;
8. Weapons and their relation to energy.[52]

It goes without saying that precise training curriculum will have to be synchronised with the task description of the proposed energy manager/advisor specialization and adapted to the different demands of levels of command. Hence, NATO OEC could add value by identifying the need for developing clear duties for an energy manager/advisor and its training curriculum.

3.4. Material

After the Cold War, there have been significant advances in technologies, facilitating the electrification of modern armed forces and discussions about material solutions related to the electricity generation, transmission, distribution and storage in an operational environment.[53] Even though fossil fuels remain the backbone of warfighting, the importance of electricity is growing rapidly, and NATO OEC could add value to the alliance by providing insights on the process.

One of the first push towards electrification in the military domain occurred due to logistical difficulties and inefficient usage of energy experienced during major out-of-area operations of the 21st century, especially the ones in Iraq and Afghanistan. For example, the Department of Defence (DoD) of the United States of America (US) uses roughly 85 percent of its total fuel consumption for operational energy applications annually, while significant inefficiencies emerge then large amounts of fuel are consumed for transporting the very same fuel to remote operational areas.[54]

In turn, moving fuel put the logisticians in harm's way as one in eight US casualties during the deployments in the Afghan and Iraq were sustained while transporting fuel.[55] To a certain extent, the US sought to reduce the dangers to fuel convoys by supplying fuel by air to the most problematic areas, but air supply was 10 more expensive than traditional land transport

[52] Carpenter, M. Sullivan, P. Nussbaum, D. Operational Energy—Essential Knowledge for Military Officers. Naval Posgraduate School.

[53] The British Army defines electryfication as "the process of replacing technologies that use primarily fossil fuels (coal, oil, and natural gas) with technologies that use electricity as a source of energy. Electricity still needs to be generated, but electrification increases the options for achieving that." This British Army Approach to Battlefield Electrification, please see: https://www.army.mod.uk/media/17010/british-army-approach-to-battlefield-electrification.pdf

[54] Department for the Defence of the United States of America. (2011). Energy for the Warfighter. Operational Energy Strategy.

[55] Carpenter, M. Sullivan, P. Nussbaum, D. Operational Energy—Essential Knowledge for Military Officers. Naval Posgraduate School.

based sustainment operations.[56] Increasing fuel bill and high risks to military personnel prompted the US explore ways to reduce fuel demand and source local electricity generation from renewable sources was proposed as one of the potential solutions. The idea articulated in the US Operational Energy Strategy more than 10 years ago: "The ability to produce even small amounts of energy at the most forward locations can take pressure off of the most dangerous and expensive fuel supply routes."[57] – remains relevant to this day.

The armed forces' demand for electricity was further increased by digitalization of the battlefield,[58] electrification of equipment and soldiers individual gear[59] and a political guidance to strengthen resilience. For example, armed forces are exploring ways to introduce microgrids, renewable energy and storage to improve resilience.[60] At the same time, electrification is driven by the ever-increasing sustainability requirements, coming from the civilian sector and slowly but surely permeating the capability development process.[61]

Finally, there is a growing recognition that military electrification will introduce an improvement in operational and tactical outcomes. For example, Blakemore and Nurkin argue that electrification of US military vehicle fleet "will deliver competitive advantages both on and off the battlefield. In terms of performance, electric vehicles (EVs) (and hybrid electric vehicles) are quieter, possess a reduced heat signature, handle better, and, over time, will simplify vehicle sustainment and reduce risks associated with fuel resupply."[62] They also add an important point that "EV batteries will accelerate the army's ability to operate on an increasingly electrified battlefield by powering the on- and off-board systems (such as uncrewed systems, sensors, soldier systems, and active protection systems) <…> many military EVs can serve as power generation and distribution hubs for other critical systems."[63] At the same time, the British Army expects that electrification will enhance lethality, survivability, situational awareness, mobility and sustainability.[64]

Even if one observes a push towards military electrification and digitalization, fundamental questions about localized energy generation, storage and optimization in operational environment will persist. As the electrification and digitalization will introduce new technologies to

[56] Department for the Defence of the United States of America. (2011). Energy for the Warfighter. Operational Energy Strategy.
[57] Ibid.
[58] Feldstein, S. (2022). Disentangling the Digital Battlefield: How the Internet has Changed War. War on the Rocks.
[59] Department for the Defence of the United States of America. (2011). Energy for the Warfighter. Operational Energy Strategy.
[60] Silverstein, K. (2022). Microgrids Are Becoming Essential for the Military. Environment + Energy Leader.
[61] This British Army Approach to Battlefield Electrification.
Please see: https://www.army.mod.uk/media/17010/british-army-approach-to-battlefield-electrification.pdf
[62] Blakemore, R. And Nurkin, T. (2022). Power Projection: Accelerating the Electrification of US Military Ground Vehicles. Washington: Atlantic Council.
[63] Ibid.
[64] The British Army Approach to Battlefield Electrification.
Please see: https://www.army.mod.uk/media/17010/british-army-approach-to-battlefield-electrification.pdf

the military domain, NATO's standardization processes will have to catch-up with rapid technological advances. At the same time, the Allied forces will have to carefully plan the technological transition, finding ways to establish interface between modern and legacy technologies. To smoothen the technological transition, ensure interoperability among weapons platforms and Allied Forces, NATO will have to increase its data gathering capabilities.

The problem here is that NATO currently lacks data gathering capabilities to make data-driven decisions and the information exchange between commands are also lacking. NATO OEC could help mitigating the problem by offering procedures and identifying material solutions for energy metering and other data gathering techniques. The NATO OEC WT suggests that there is a need to establish baseline requirements for technological applications, while metering and monitoring across all platforms is key for determining them. In here, the NATO OEC WT suggests developing Minimum Military Requirements and Minimum Capability Requirements within NATO Defence Planning Process to guide the technological transition.

While planning and implementing its technological transition, NATO members must also ensure that its push towards military electrification would not establish other risky dependencies on third countries' technological solutions and equipment. For example, NATO Strategic Concept describes that Peoples' Republic of China's ambitions and coercive policies as challenges to NATO's interests, security and values.[65] Simultaneously, China is an undisputed leader in production of solar modules, EV batteries and their components. For example, a recent report by the International Energy Agency concludes that China "dominates the entire downstream EV battery supply chain".[66] In its another report, International Energy Agency shows that China is also dominant in solar module production.[67] Hence, potential dependencies on technologies, materials or other inputs should be considered by the Allied forces.

At the same time, the NATO OEC WT proposed other key considerations while introducing technologies to the military domain:

- Technical capacity to take on new technologies;
- Risks of technology adoption without proper training and/or late introduction could lead to technology failures;

[65] "The People's Republic of China's (PRC) stated ambitions and coercive policies challenge our interests, security and values. The PRC employs a broad range of political, economic and military tools to increase its global footprint and project power, while remaining opaque about its strategy, intentions and military build-up. The PRC's malicious hybrid and cyber operations and its confrontational rhetoric and disinformation target Allies and harm Alliance security. The PRC seeks to control key technological and industrial sectors, critical infrastructure, and strategic materials and supply chains. It uses its economic leverage to create strategic dependencies and enhance its influence. It strives to subvert the rules-based international order, including in the space, cyber and maritime domains. The deepening strategic partnership between the People's Republic of China and the Russian Federation and their mutually reinforcing attempts to undercut the rules-based international order run counter to our values and interests." Please see: NATO Strategic Concept, 2022, art. 13.

[66] International Energy Agency. Global Supply Chains of EV Batteries, 2022. P. 5.

[67] International Energy Agency. Special Report on Solar PV Global Supply Chains, 2021. P. 18, 19.

- Tiers / Deployment duration;
- Geographic / Climate;
- Functional area: Energy Source, distribution and end-use;
- Reliance on raw materials;
- Interoperability, energy units/units of reporting;
- Standardization;
- Method, resupply;
- Timeframe: Short term / Medium term / Long term;
- Resilience;
- Redundancies;
- Vulnerability to disruptive technologies.

3.5. Leadership and Personnel

As it was mentioned in the previous passages, NATO's personnel are not specialized in energy management as energy-related functions dispersed among environmental protections officers, military engineers, and logisticians. NATO OEC could add value by highlighting the need for the potential development of a task description for energy manager/advisor, bridging the gap between different specializations. In here, one needs to mind that potential functions of the proposed specialization are dependent on the specific objectives that will be raised for the organizational structures responsible for energy management. At present, the NATO OEC WT suggests that energy manager/advisor could potentially assume the following functions:

- Implement opportunities to utilize NATO capabilities for existing and new energy sources and technologies to allow optimized use of joint assets,
- Monitor energy usage, analyse availability and forecast accessibility for current and future NATO missions and operations in an efficient and effective way,
- Develop and implement methods/recommendations to increase resilience of energy supply/sources and infrastructure to meet current and growing operational energy requirements,
- Conduct risk analysis and identify opportunities to reduce energy demand without reducing capabilities,
- Create, foster and increase the awareness of the importance of operational energy

availability and demand, opportunities and challenges within NATO, and promote behavior change.

The task description will need to be further specialised along the levels of command and military branches. To expand the pool of potential candidates for energy management duties and make their preparation more efficient, Carpenter, Sullivan and Nussbaum suggest including basic operational energy education as part of officer training programme. They propose a basic operational energy education programme that firstly introduces officers to the multidisciplinary considerations of energy (please see the bullet-points in the Training section) and shows how mastering operational energy "provides a strategic, operational, and tactical advantage over enemies, and <…> illustrates how failure to master operational energy presents an opportunity for enemy exploitation and friendly mission failure."[68] They believe that such a basic operational energy training programme must introduce the following five themes:

- Basic energy ontology (please see the list on the training section),
- Energy superiority,
- Energy sources, generation for tactical platforms and weapon systems,
- Exploitation and maneuverer of energy,
- Basic operational energy resourcing and logistics.[69]

According to the Carpenter, Sullivan and Nussbaum, more detailed operational energy courses should be offered to personnel performing functions related with operational energy, whereas the lack of competences in operational energy might negatively impact mission performance. In their vision, five learning outcomes are crucial for functional operational energy education:

- Knowing joint/coalition operational/theatre operational energy planning and execution,
- Understanding operational command and control systems and operational energy components,
- Conducting wargaming and field exercising that includes operational energy,
- Operationalizing advanced near to mid-term energy systems,
- Knowing adversary energy systems and interdicting them.[70]

[68] Carpenter, M. Sullivan, P. Nussbaum, D. Operational Energy—Essential Knowledge for Military Officers. Naval Posgraduate School.

[69] Ibid.

[70] Ibid.

The authors conclude that the final point in mastering operational energy is a strategic-level course for senior officers, where they should learn strategic considerations of operational energy. They maintain that four areas are crucial for senior operational energy education:

- National operational energy leadership and development,
- National energy resourcing and strategic stockpiling,
- Future operational energy systems, economics and funding,
- Global energy command and control systems.[71]

NATO OEC can add further value of national efforts in facilitating the development of transboundary operational energy education.

3.6. Facilities

In NATO, deployed forces infrastructure[72] (DFI) is divided into four tiers. The first tier (TIER 1) represents the infrastructure that personnel deployed to field operations can carry on their person or in their support vehicles. Hence, they operate in the field conditions that might span for several weeks or months. The second tier (TIER 2) provides basic support (austere working and living space) for the soldiers during the initial phase of operation. It spans between a period of one-two months to two years. The third tier (TIER 3) provides semi-permanent accommodation for the sustainment phase of an operation and will span the period of over six months to more than 10 years. The fourth tier (TIER 4) includes facilities with permanent infrastructure and installations.[73]

NATO OEC focuses on infrastructure involving Allied forces deployed in missions and operations, not necessarily focusing on the specific tier. In here, it aims to provide solutions on how to optimise energy use in facilities for reducing logistical footprint, increasing force protection, resilience, and enabling mission success. As it was briefly discussed in the section "Material", certain Allies have already considered microgrids and other technological applications making DFI more autonomous from centralised power grids and logistical resupply, but a more tailored approach to DFI according to NATO's operational needs is lacking (approaching energy as a capability, not as a commodity).

For example, Gogoreliani and Guemas (2023) provide a brief reflection on potential technological solutions in NATO DFI. They suggest that the TIER 1 should utilize portable microgrids with portable power generation and storages technologies. Discussing other tiers, they

[71] Ibid.

[72] "Deployed force infrastructure (DFI) comprises buildings, facilities and installations required to support military forces when deployed", STANAG 2632, ATP-3.12.1.4 "Deployed Force infrastructure".

[73] Kozłowski, C., Dacchille, M., Meyer, J. M. Bellot, L. Kegel, M. Doran, J. (2022). Energy Management Handbook: Energy Management for Military Deployed Force Infrastructure. Vilnius: NATO Energy Security Centre of Excellence.

suggest considering objectives, duration and intensity of military operation, the location of the infrastructure, the quantity of personnel and the availability of energy sources.[74] In general, the US Operational Energy Strategy encourages to find ways for reducing energy demand in facilities, especially the ones located in the remote areas.[75] NATO OEC could expand this discussion by proposing suggestions for the innovative energy applications in DFI to utilize energy for achieving mission success.

3.7. Interoperability

In NATO, interoperability is defined as "the ability for Allies to act together coherently, effectively and efficiently to achieve tactical, operational and strategic objectives."[76] Interoperability is crucial for efficiency as it reduces duplications through pooling resources and promoting synergies: the equipment should be able to share common facilities, interact, connect, communicate, exchange data and services.[77] Interoperability must be achieved across four dimensions: technical (hardware, equipment, armaments and systems), procedural (doctrine, standards, procedures), human (terminology and training) and information sharing.[78]

Gogoreliani and Guemas (2023) define the following benefits, which could be achieved by enhancing energy interoperability among NATO's deployed forces:

- Enhancing situational awareness: different allies can immediately share real-time information between different military systems.
- Increasing energy efficiency and reducing costs: allies can allocate resources and reduce energy waste more effectively by eliminating redundant tasks.
- Improving logistics: allies can share resources between different military units without technical constraints, allowing for better coordination and planning of logistics.
- Strengthening mobility: allies can reduce response times and increase operational effectiveness by integrating various energy applications.
- Enhanced security: allies can conduct military operations with less risks because of ability to share energy resources.[79]

[74] Gogoreliani, A. and Guemas, A. (2023). The Availability of Civilian Electrical Grids of NATO Host Countries for NATO Military Units and the Interoperability of Electrical Technologies among the Various NATO Armies. Vilnius: NATO Energy Centre of Exelence. P. 27.

[75] Department for the Defence of the United States of America. (2011). Energy for the Warfighter. Operational Energy Strategy.

[76] NATO (2023). Interoperability: connecting forces. Please see: https://www.nato.int/cps/en/natohq/topics_84112.htm

[77] Ibid.

[78] Ibid.

[79] Gogoreliani, A. and Guemas, A. (2023). Ibid, p. 6, 7.

At the same time, they summarize current challenges for enhancing energy interoperability in NATO:

- Lack of standardization: different military services and branches apply different energy systems and protocols, which complicates, delays and limits the establishment of energy interoperability.
- Data security: military systems must be protected from unauthorized access and malicious attack when aiming for enhanced energy interoperability and it is difficult to achieve.
- Cost: achieving energy interoperability can be costly as it requires the integration of multiple systems and technologies.
- Legacy systems: old and modern military platforms and equipment might be incompatible with each other.
- Complexity: integration of multiple systems and technologies is difficult to achieve in the energy domain.[80]

Given the opportunities and challenges described above, NATO OEC could provide a conceptual guidance for improving NATO's interoperability in the energy domain. In turn, the transformation of energy from critical requirement to a crucial operational capability would be incomplete without ensuring interoperability among national armed forces conducting their assignments under the NATO banner. To achieve it, NATO needs to develop doctrine in the operational energy domain, agree on organizational reforms, personnel training procedures and standardization of material and facilities.

[80] Ibid, p. 7.

Conclusion

The study revealed a fragmented NATO's approach to energy across the DOTMLPFI spectrum. Instead of having a unified energy doctrine, energy-issues are sparsely addressed across various doctrinal publications, addressing different aspects of warfighting. Rather than synchronising the efforts of logisticians, engineers and environmental specialists to achieve mission success, their functions in the energy domain remain independent from each other. At the same time, energy is approached from the perspective of commodity, not from the capability point-of-view.

The current structures and procedures in NATO are not sufficient for elevating the importance of energy to a critical operational capability. To make progress in this regard, NATO needs to develop a consolidated approach to energy, ideally creating a unified energy management system across all-levels of command. The system must establish a bidirectional information flow, where the units deployed in the field could expect data-driven guidance from above, while strategic structures receive input and feedback from below.

In turn, creating an energy management system requires changes not limited to NATO's organization. Energy management system should stem from NATO's doctrinal position on how energy enables its mission success which is not yet established so far. At the same time, a new specialisation of energy manager/advisor should become the backbone of such system. To fill the ranks of the proposed position, energy managers/advisors should be properly trained and sourced. Hence, new training curriculum and approaches to professional military education must be established, not to mention about procuring new material. Therefore, NATO OEC could add value in consolidating NATO's approach to energy by simultaneously addressing the shortcomings observed across the DOTMLPFI spectrum.

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