

# How do you become an expert in Energy Security?

A case study evaluating education requirements for a comprehensive approach



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by Ms. Antonia Quentin: Energy Security Internship 2024

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## Motivation, Mobility, Commitment

Embarking on her journey to become an Energy Security Intern, Ms. Antonia Quentin is in her final year of a Bachelor's degree at the National Institute of Oriental Languages and Civilisations (INALCO) in Paris, specializing in international relations. Her path has been marked by diverse experiences, including a military internship at the La Valbonne medical regiment in France, where she witnessed a demonstration maneuver to treat a patient suffering from Ebola as part of a field operation. She also pursued a course at the School of Economic Warfare (EGE) in Paris, earning MEDO-T (Operational Decision-Making Method - Military) certification. Seizing the opportunity of a university exchange in Vilnius, she interned at NATO's COE, gaining invaluable insights into the coalition's military environment and scientific research.



*Antonia QUENTIN (FRA), Intern NATO ENSEC CoE*

## Young academics and the State



Illustrating a compelling national example, the French government's strategic approach to attracting young academics to civil service and military institutions is a testament to the opportunities available. It is a well-crafted blend of tailored recruitment programs, financial incentives, a commitment to diversity, and robust professional development opportunities. By recognizing and valuing the unique skills and perspectives that academics bring and capitalizing on the first professional experience, the government ensures a vibrant and capable workforce serving the nation's interests. This approach underscores the importance of committed young specialists in the State's management, a need more evident than ever across various domains.

*Col Thierry SEGARD (FRA), Chief of Staff and Deputy Director NATO ENSEC CoE*

## Root cause and the search for the truth

In an era defined by global uncertainties and evolving threats, governments worldwide are placing an unprecedented emphasis on **energy security**. The quest for experts in this field has intensified, as they play a pivotal role in safeguarding nations against geopolitical uncertainties and ensuring a stable energy supply. Becoming an energy security expert is a personal career choice and a strategic imperative for governments seeking resilience and autonomy. Individuals equipped with comprehensive knowledge and innovative solutions become indispensable assets in fortifying national interests and addressing the challenges of an increasingly interconnected world.



*Wsewolod Rusow (DEU), Head of Research NATO ENSEC CoE*

## Introduction:

Nowadays, climate change is one of the most critical challenges of our time, affecting all countries and having a global impact. Since pre-industrial times, temperatures have increased [by 1.1°C](#), partly due to the use of fossil fuels. In 2015, the states met for the Paris Agreement and committed to reducing their greenhouse gas emissions to limit global warming to under 2.0°C and avoid exceeding 1.5°C above pre-industrial levels. Indeed, beyond this temperature, the impacts of climate change will be severe, affecting not only the environment but also economic stability, social equity, and security in the world, posing severe risks for humanity.

The rapid transition to renewable energies has become imperative in response to these global challenges. States must recognize energy as a vital factor, all critically dependent on its access. To face energy challenges and achieve self-sufficiency, some States have developed (at least to some extent) their concept of "energy security," an association between national security and the availability of natural resources for energy consumption. This concept is crucial today, as states seek to remain competent while finding ecological solutions to their needs.

Energy Security has also become a vital strategic factor in military considerations, increasing our common security. There is an apparent crucial link between energy security and defense, highlighting the role of military forces in safeguarding critical energy infrastructure and mitigating risks. The defense industries have a solid environmental impact but, in the meantime, are trying to adapt their defense strategies to align with climate objectives within the strategy of "[green defense](#)." For example, NATO, aware of energy security issues, was established and accredited in 2012 in Vilnius, Lithuania, as a Centre of Excellence dedicated to Energy Security ([NATO ENSEC COE](#)).

However, despite the increasing importance of research activities on energy security, the sector remains discreet and little known. This article provides a comprehensive overview of the nuanced facets of energy security, ranging from its definition and importance to its intersection with defense strategies and the practical aspects of working in this field.

In this context, the overriding question is: "How does one become an expert in energy security?" or, in other words, "Where are the competencies of energy security built?"

This article explores the professional paths of Energy Security experts from the NATO ENSEC COE and analyses the primary curricula they use to access this domain.

With this work, specific issues emerge, notably concerning access to this domain. Decision-makers must find solutions to overcome this problem, which this article proposes in the last part by exploring the challenges and the possible solutions.

The exploration encompasses the field's interdisciplinary nature, the evolution of defense's role in energy security, and the imperative to create an educational structure to meet organizations' growing demand for expertise.

## Definitions:

The International Energy Agency (IEA) defines the concept of energy security as "the uninterrupted process of securing the amount of energy that is needed to sustain people's lives and daily activities while ensuring its affordability." ([Energy Security: Definition and Importance | SafetyCulture](#)) Therefore, Energy security means having stable access to energy sources in a timely, sustainable, and affordable manner. Indeed, access to energy affects the provision and sustainability of humans' basic needs, such as food, water, or light, but is, above all, a prerequisite for economic growth, political stability, prosperity, and overall development and security of other sectors such as agriculture, manufacturing, or defense.

This definition can vary from country to country, depending on geographical location and natural resources, economic status, energy import and export activities, and vulnerability to energy supply disruptions. National governments must consider the functioning and stability of the local political system and international relations. These are crucial factors in the negotiation of energy goods and supranational cooperation.

Therefore, the meaning of energy security will always depend on the subject concerned and the energy threat. These can arise in several ways: for example, through human overexploitation leading to the depletion of resources (e.g., oil) or through a war threat (e.g., the question of gas supplies to Europe following the start of the Russian-Ukrainian war on February 24, 2022).

Securing energy can be seen as long-term or short-term to avoid these situations. In the long term, it concerns investments in energy supply and how they relate to economic developments and environmental needs on time. In the short term, it mainly affects the energy system's ability to respond rapidly to sudden changes in the energy supply and demand cycle.

A clear interest in the issue of energy security dates back to the 1970s when the oil crisis arose. (Article "Chapter 7 Strategic priorities of sustainable energy development" Sustainable Energy Management - Planning, Implementation, Control, and Security, Book • Second Edition • 2022, Mirjana Radovanović [Sustainable Energy Management | ScienceDirect](#)). As we are all concerned by climate change and its impacts, we must adapt our energy consumption. As part of this dynamic, the energy sector is evolving to become more sustainable, adjusting to growing energy demand and preparing for an increasingly interconnected digital world. ([Energy Security | OSCE](#)). Energy efficiency is being promoted worldwide as an essential measure to respond to growing energy demand and reduce the energy intensity of GDP and greenhouse gas emissions. The challenge for the energy sector is to achieve this goal by reducing the environmental footprint of energy use, production, and transport.

Transitioning to more sustainable energy use brings numerous employment and research opportunities and creates new safety challenges. For example, electricity grids are increasingly vulnerable to natural disasters and cyber-attacks, while a growing share of renewable energy needs to be integrated safely without threatening system stability. Energy transitions offer the chance to build a safer and more sustainable energy system that reduces exposure to price volatility. Therefore, supply

security is fundamental to a successful energy transition. The transition will remove the region's economic dependency on the export of commodities, and regional energy cooperation is essential for removing the insecurity of energy supply that periodically haunts the region's countries. ([Energy security in energy transitions – World Energy Outlook 2022 – Analysis - IEA](#))

However, new vulnerabilities have emerged as the world tries to build a new clean energy system. States must invest in flexibility, particularly for electricity security, guarantee diversified and resilient clean energy supply chains, and promote the climate resilience of energy infrastructures because the increasing frequency and intensity of extreme weather events pose significant risks to the security of energy supply. Governments need to anticipate risks and ensure that energy systems can absorb and recover from the harmful effects of climate.

Energy is a crucial element for defense and its industry. Preparing for military operations abroad requires a lot of resources, especially energy. General preparation includes everything from the fuel supply of the strategic lifts to the soldier's equipment to the electricity consumption of the base camp.

Then, the definition of energy security is more precise and serves a specific aim. To eliminate all possible "grey zones," NATO's Centre of Excellence specializing in energy security proposes the following one: Energy Security is a stable and reliable supply of required energy forms and quantities, enabling NATO's capabilities, operational effectiveness, and resilience. Following this definition, NATO countries must collaborate to exchange knowledge and energy goods to develop an adequate Operational Energy (OE) strategy. Addressing this strategy means having the necessary energy to train, deploy, and support Allied forces in all NATO missions and operations.

Military forces embody international status and global strength and are a factor in guaranteeing national energy security. They are an essential factor affecting energy security and effectively assist against risks. For example, critical maritime energy infrastructures such as underwater pipelines, offshore wind farms, and electrical cables are progressively becoming more susceptible to threats from adversaries and terrorists.

So the military forces might prevent the use of M-IEDs to target energy shipping and critical underwater energy infrastructures because, in addition to causing significant damage and a considerable loss of energy, it affects the armies that also use these infrastructures ([Maritime Improvised Explosive Device \(M-IED\) Threat to Energy Security - NATO ENSEC COE](#))

Defense is also concerned with energy security because, not least, the defense industries emit many emissions. 50% of the UK central Government's emissions come from the defense sector ([Ministry of Defence Climate Change and Sustainability Strategic Approach \(publishing.service.gov.uk\)](#)), and in 2022, worldwide militaries represent about 5.5% of global greenhouse gas emissions.



Interestingly, states are not obligated to report their carbon footprint. Because data on energy consumption by the armed forces could compromise national security, military emissions abroad were left out of the 1997 Kyoto Protocol on reducing greenhouse gases and the 2015 Paris Accords ([MEPs call for militaries to be more transparent in reporting emissions | Euronews](#)). But now the European Parliament is asking the forces to be more transparent about their energy consumption, especially in the context of the war in Eastern Europe and the preparation of European troops so that they are ready in case they have to intervene against Russia.

Furthermore, each country drives its defense strategic ambition. For example, the French Ministry of the Armed Forces has developed a global strategy, "Climate & Defence," to prepare the defense tool for the climate challenge. The objective is to promote an understanding of the energy landscape to anticipate the strategic challenges of climate change better. Among other things, the plan contains the continuation of the Ministry's contribution to collective efforts for mitigation and the energy transition (with the Eco-camp project, taking part in innovative projects such as hybrid power plants, a reduction of the CO2 emissions of the Ministry to be approximately 37,000 tonnes by 2030...) and an intensification of cooperation on the defense issues of climate change at the international levels ([Climate Adaptation Plan \(defense.gov\)](#)).

In the report, we can notice the term "green defense," which covers measures that contribute to controlling and reducing the impact of defense institutions on the environment and, for some of them, to combating climate change through mitigation measures. This new defense objective is not specific to France because it has become the latest objective of Western countries and NATO members.

NATO (North Atlantic Treaty Organization) is a political and military alliance of 32 members. The objective is to guarantee the freedom and security of its members by political and military means.

In terms of politics, NATO promotes democratic values. It enables its members to consult and cooperate on defense and security issues to solve problems, build confidence, and prevent conflict in the long term. In terms of the military, NATO is committed to peacefully resolving disputes. It has the military power to undertake crisis management operations if diplomatic efforts fail. These are carried out in application of the collective defense clause of the founding treaty, Article 5 of the Washington Treaty, or under a mandate from the United Nations, by NATO alone or in cooperation with non-member countries or other international organizations. ([Qu'est-ce que l'OTAN? \(nato.int\)](#))

As we have seen above, NATO is concerned with energy security issues. The importance of the topic was considered during the Russian-Ukrainian conflict in 2022. In the "2010 NATO Strategic Concept", the question of energy security is asked only once under the term "climate change," while in the 2022 version, the occurrence is 10.

## NATO Centre of Excellence on Energy Security (NATO ENSEC COE)

The NATO Centre of Excellence on Energy Security (NATO ENSEC COE) was inaugurated in Vilnius in 2012 to focus on energy security research.

Centers of Excellence (COEs) are nationally or multi-nationally funded institutions that offer recognized expertise and experience to benefit the Alliance. COEs support the NATO transformation while avoiding the duplication of assets, resources, and capabilities already present within NATO Command. ([LR Krašto apsaugos ministerija \(kam.lt\)](#))

The NATO ENSEC COE currently operates as a widely recognized international military organization that provides qualified and appropriate expert advice on questions related to operational energy security. However, it is not a part of the NATO Command Structure, although it is accredited by NATO Allied Command Transformation (ACT). This situation allows the experts to independently express an overall view on the topic of energy security that is not affected or influenced by any conditioning (Interview with Commander Andrea Manfredini, "The Paradox of NATO's Inefficiency in the Field of Energy Efficiency for the Armed Forces" P.60-64 energy\_highlights\_no.13-2020, [Energy Highlights No.13 - NATO ENSEC COE](#)).

Its role is to develop doctrines and propose new concepts, conduct research, analyze and experiment, provide training, and educate military forces on energy security-related objectives.

NATO has made the energy-environment theme an axis of cooperation within the allies. It has developed a new strategic concept with an approach to energy across the DOTMLPFI spectrum (Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities, and Interoperability) ([Article towards a Fundamental Rethink: Analysing the Institutionalisation of Energy in NATO across the DOTMLPFI Spectrum](#)). The ENSEC COE follows this doctrinal approach and intends to sensitize the alliance countries on the theme of energy so that they can implement the concepts as needed.

For example, the interoperability issue is paramount for the "fuel supply chain" with the single fuel policy, which aims to facilitate refueling chains or the development of smart grids.

Concerned about reducing GHG emissions in operation, the NATO ENSEC COE experimented to evaluate the coordination and effectiveness of the means adopted in energy production, processing, and storage. The objective was to find new hybrid means to limit energy consumption or to improve the "logistics footprint" (material, equipment, support). During an experiment, experts found that it was possible to reduce the overall energy consumption of a deployed military camp by 20 to 30%.

### **Working in the Energy Security field:**

The field of energy security offers many work opportunities now that the "green defense" policy has become one of the most urgent priorities. Opportunities are available internationally, nationally, and in energy-related private companies.

At the international level, the most important are:

- The International Energy Agency (IEA)

The International Energy Agency (IEA) is the focal point for global discussions on energy. The IEA plays a central role by offering authoritative analyses, data, policy suggestions, and practical solutions to assist nations in achieving secure and sustainable energy for everyone. The IEA establishes the foundation for global public and private research collaborations through its technology program. Notably, the IEA contributes to international cooperation by conducting worldwide training on energy statistics, modeling, technology, energy efficiency, and renewable policies. [Mission IEA](#)

- OSCE Economic and Environmental Activities (OCEEA)

OCEEA works closely with OSCE field operations, the private sector, leading international bodies, and research organizations to promote dialogue and increase the capacity of participating States to protect their energy networks, mitigate risks, and reduce the environmental footprint of their energy-related activities. It conducts feasibility studies, organizes study visits, and implements projects to raise awareness of the benefits of green technologies and digitalization and promote sustainable connectivity in the OSCE area. In addition, OCEEA promotes an inclusive dialogue between producer, consumer, and transit countries and fosters public-private cooperation on energy security issues. [Energy Security | OSCE](#)

- NATO Centres of Excellence

- o on Energy Security (NATO ENSEC COE), Vilnius, LITHUANIA

As presented above, this COE is a place of research and development that is essential for energy security. Although the beneficiary of the NATO flag, the COE goes beyond the defense sector and has a certain independence in developing projects.

*It should be noted that to work in a NATO Centre of Excellence, the structures that decide which experts are sent there are pretty disparate. Depending on the country, the task is assigned first and foremost to the Ministry of Defence, which sets military experts. In contrast, in some other countries, it is shared with the Ministry of Foreign Affairs or the Ministry of Energy or Industry. COE are constituting a silo of the local Ministry of Defence, and the directors are often high-ranking military officers. However, these centers might hire civilian experts to have a global vision of the subject and not only the defense aspect.*

- o on Climate Change and Security (CCAS COE), Montréal, CANADA

This COE will open in Montréal and will be a platform through which military actors and civilians will develop, enhance, and share knowledge on the security impacts of climate change. This is so that Allies can acquire the capabilities that will be required in the future security environment and establish best practices to reduce the climate impact of military activities. [NATO Climate Change and Security Centre of Excellence \(international.gc.ca\)](#)



- on Maritime Security (MARSEC COE), Istanbul, TURKIYE

We must also mention the NATO Maritime Security COE in Istanbul because it actively supports NATO in maritime security matters, energy flows, protection of marine resources, and environmental safety as essential components of the security interests of Allies. NATO's naval forces are prepared to contribute to energy security, including protecting critical energy infrastructure and sea lines of communication. ([Maritime Improvised Explosive Device \(M-IED\) Threat to Energy Security - NATO ENSEC COE](#))

- NATO Environmental Protection Working Group (EPWG)

The EPWG is subordinated to the Military Committee Joint Standardization Board and supported by the NATO Standardization Office. Its purpose is to establish standards to minimize the environmental impact of armed forces while ensuring operational efficiency and readiness. This initiative is a platform for exchanging expertise among Allied and Partner Nations.

- NATO Science and Technology Organization (STO)

The STO is the largest collaborative research platform in the world in the field of defense and security. Its primary mission is to strengthen the Alliance's and its partners' defense and security capabilities by conducting scientific and technological research within the Collaborative Programme of Work (CPoW).

- European Defence Agency (EDA)

The European Defence Agency was established in 2004 "to support the Member States and the Council in their effort to improve European defense capabilities in crisis management and to sustain the European Security and Defence Policy as it stands now and develops in the future." [Mission \(Europa. eu\)](#)

The EDA has created the Permanent Structured Cooperation (PESCO), which is working on the Energy Operational Function (EOF) project within the framework of other projects. Involving the lessons learned from recent military operations, the "Operational Energy Function" project has a dual objective: to jointly develop new energy supply systems for camps deployed as part of joint operations and for soldiers' connected devices and equipment and to ensure that energy issues are taken into account from the design of combat systems to the implementation of operational support, including as part of operational planning.

Of course, many other independent organizations are working on the topic, such as the International Institute for Sustainable Development (IISD). Still, we must remember that if the Western countries are interested in working in coalition, they mostly perceive energy security as their own. That is why every State has different structures specialized in Energy Security to advise and keep control of the national energy policy, such as the US Office of Energy Efficiency and Renewable Energy for the USA, or companies specialized in specific fields related to energy, such as EDF (Electricité de France) that the French government nationalized in June 2023. [Énergie : l'État français renationalise EDF à 100 % et aborde une nouvelle ère nucléaire \(france24.com\)](#)

a) Who are experts nowadays?

This small social study was conducted within the NATO ENSEC COE to understand what kind of profile works in the energy security sector. We interviewed eleven experts from the NATO ENSEC COE on the following subjects. They had to answer four questions about their education, professional experience before joining the COE, legitimacy to be called an "EnSec expert," and impact on NATO security.

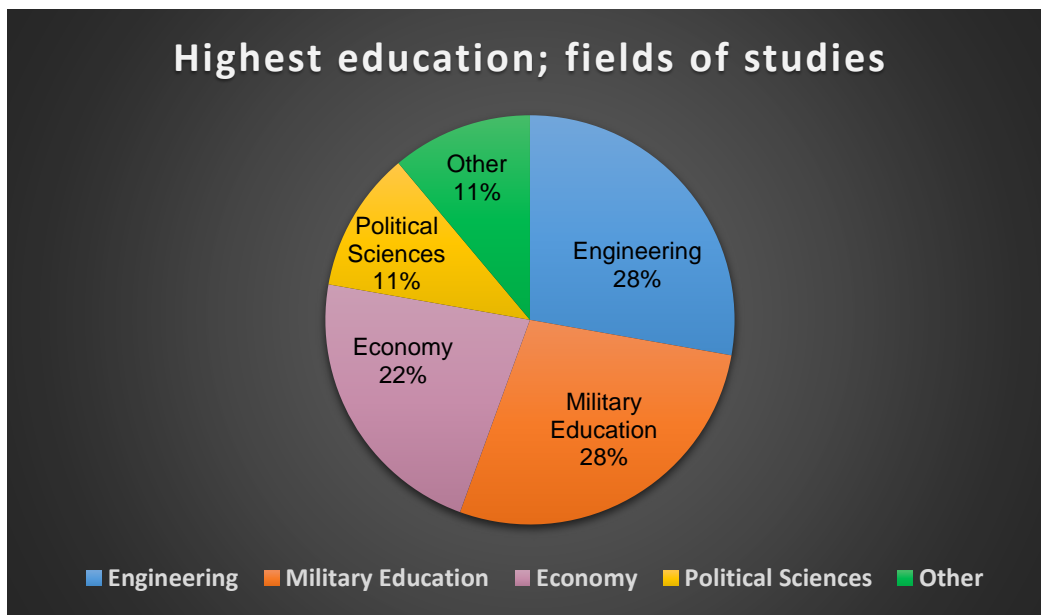


Figure 1: Highest Education

In this first chart, people came from different backgrounds.

Out of the 11 subjects interviewed:

- 4 have a master's degree in engineering (28%), and 1 has a bachelor's degree in IT. Within them, 2 have expertise in a specific field: aeronautics and explosive devices.
- 5 out of the 11 have a military education. 2 out of these 4 completed their military education with a master's degree in engineering, and 1 out of these 4 with a master's degree in economics.
- Two of the 11 completed a master's degree in engineering and a master's degree in economics. One completed a master's degree in political sciences with a master's degree in strategic analysis, and one achieved a military education with a master's degree in economics. Still, this one was more oriented towards logistics.
- Two out of the 11 studied philology, after which one joined the army and the other did a master's degree in political science, specializing in international relations.

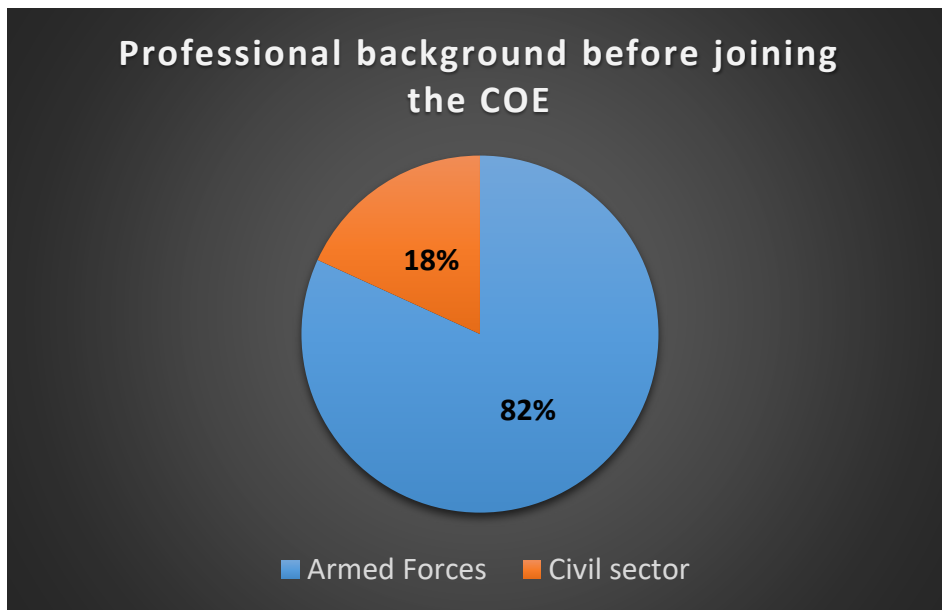


Figure 2: Professional Background

This second graph shows that the vast majority worked in the military forces after graduating. More than 80% of the Centre’s energy security experts have received a military education. Only 2 out of 11 worked in the civilian sector, but both were for a ministry: one worked at the Ministry of Defence and the second at the Ministry of Foreign Affairs.

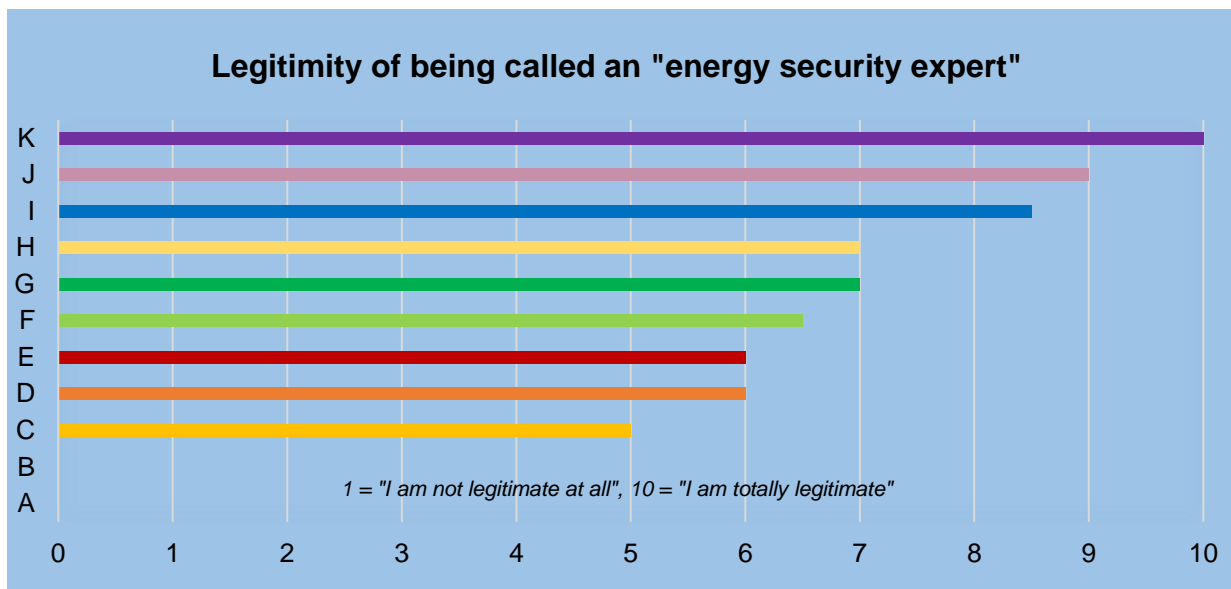


Figure 3: Legitimacy for expertise

This third chart indicates how these subjects consider themselves "EnSec experts."

- Two subjects (A & B) consider themselves unqualified to be called "EnSec experts." One thinks that to be an expert in EnSec, you have to be an expert on a specific subject that you master perfectly, and the second considers that the central part of the work is administrative (nearly 80% of the time).
- The four subjects who gave grades from 5 to 6.5 (D, E, F) argued that their legitimacy came from their experience in this field for a few years. One did not put more because it considers that the military is not directly concerned by the EnSec and was sent there thanks to the engineering training carried out. The other three participate in NATO training and the creation of courses and are involved in delicate tasks; they have a general understanding of EnSec. Still, they need to engage more in projects requiring in-depth EnSec knowledge. Plus, the area is vast, and their division is more concentrated on the EnSec concept and energy efficiency.
- The three subjects who gave grades from 7 to 9 (G, H, I, J) argued that their legitimacy came from their professional experience acquired during a military engagement or thanks to work that dealt with different aspects of the EnSec field (For example, one worked in petroleum management in the army).
- Subject K considers the legitimacy complete (10/10) because it aligns with the curriculum. The work is rewarding, enjoyable, and not very technical, but it is a real help in having coherent research approaches on critical points for NATO. This expert considers academic training indispensable and believes that a military background in the field is better for all the questions about defense.

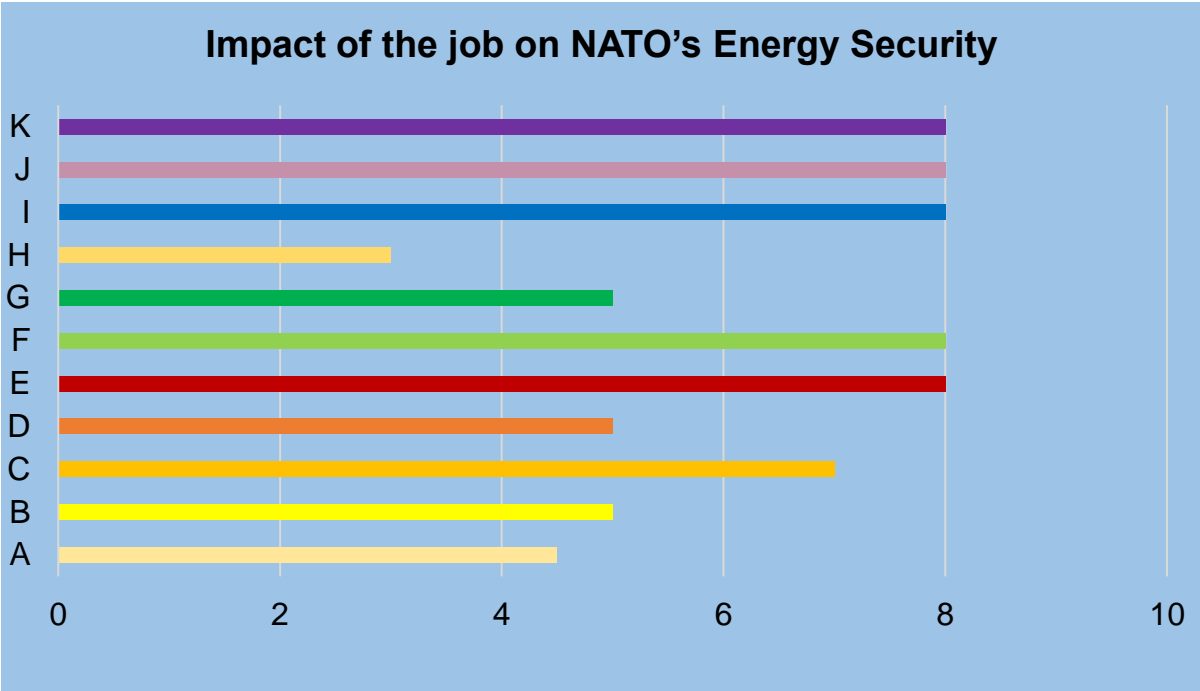


Figure 4: Impact on NATO's Energy Security

For this fourth diagram, these subjects were asked what they thought would impact NATO's energy security, given their position in the COE and work.

- Out of the five subjects who gave a grade of 8/10 (E, F, I, J, K):  
One expert justified the impact by the fact by belonging to a research group that works on several topics, has a lot of personal experience in "green defense," and is also a member of the NATO Science and Technology Organization. 2 subjects justified by the fact that they organize specific events to spread knowledge favorable for NATO. One is an expert in a particular field, so the job is to show what can be done in this field and give specific advice and recommendations to NATO.  
One stressed that this job has many positive effects but also harmful effects: as you work in coalition, you must know how to be a diplomat, but there is no preparation for this even if you already have experience managing large army units because it was within the framework of your national army, so there is no conflict of national interests, no need to adapt to foreign mentalities. You have to make other nations understand your point of view, which could be more apparent.
- Subject C, assigned a score of 7, justified that the job is to develop projects that help develop and adapt NATO's operational efficiency. However, according to this expert, the impact of the work is due to teamwork with experts from all over the world.
- The three subjects that gave a grade of 5/10 (B, D, G) and the one that put a 3/10 (K) all consider that their impact is mainly related to the function of the COE. Since the COE is not in the NATO chain of command, its independence for projects and freedom of maneuvers is advantageous. However, as none of its work is mandatory, it has no real influence; it is more of a window of opportunity. One underlined that the main objective is to create a committee of interests.
- Subject A scored 4.5 because, as a manager, his/her job is administrative 80% of the time, and he/she has to focus on the COE's mission.

b) Remarks and challenges

First, people have different backgrounds, but many have several degrees to be knowledgeable on various topics. The majority have an engineering or military education, where they have acquired technical skills. But even if they come from different backgrounds, nine of the 11 have had a military career, and the last two have worked at the Ministry of Defence or the Ministry of Foreign Affairs.

Secondly, we must not forget many military profiles because this study was conducted in a NATO COE, a structure linked to the defense field.

Regarding the third graph, which indicates how these people consider themselves experts in energy security, we notice that the answers have varied a lot because they go from a minimum of 0/10 to a maximum of 10/10. We could not elaborate on the reasons for such a broad spectrum through this work, but they are significant for overall understanding.

Surprisingly, within the same COE division, some consider themselves experts in the field. In contrast, others do not consider themselves as such – while working on the same mission and probably on similar projects. The issue could be the lack of



consensus or alignment among individuals regarding their expertise in the field. The global meaning of being an “energy security expert” is unclear, and the means to get there are not obvious. Establishing clear expectations and standards for expertise within energy security structures seems necessary to mitigate the problem and find a solution.

The reasons are, therefore, more personal, and for many, this legitimacy comes from the professional experience acquired in various fields of energy security for several years and the university curriculum that followed.

In addition, one of them raised the question of the legitimacy of his position from the point of view of his nation. When a country claims a position, it undertakes to give itself the means to equip itself with an adequate level of competence as long as the position exists: the legitimacy is therefore also found in the commitment made to defend the relevance of the COE.

From the point of view of a Nation, it is interesting to discover where the latter's interests are and what means it implements to obtain them.

For the question on their personal impact on NATO's energy security, even if each gave different grades, almost all mentioned that the work's effect is more on the scale of the Centre thanks to their teamwork and commitment than thanks to their personal performance. Also, it depends on the division to which they are assigned within the COE and the type of work carried out, which has more or less impact.

In short, the NATO ENSEC COE admitted to mainly hiring (seconding) people with technical backgrounds and who have gained experience in the world of work. Engineering degrees (with a specialty in a specific subject or not) and military experience are the most recommended. However, as EnSec requires a lot of expertise on different topics, profiles in economic and political sciences are also welcomed.

Given the places where we find the experts (see Part 2) a), we note that energy security is a strategic task intended to satisfy customers, who are none other than the States and governments. However, as the interest increases, there is real difficulty in hiring experts on the issue, especially regarding the military field. Today, it represents a challenge for some countries to provide experts in organizations working in coalition, and human resources' maneuvers are somewhat limited.

Then, it was noticed during the interviews that today's EnSec experts are mostly self-made: they were trained on the job. They were not EnSec experts at all when they were hired (transferred to the COE), and it was thanks to the training provided by the COE and the work done within the center that they acquired the necessary knowledge. This situation could be more optimal because more is needed to ensure stable and continuous human resource flow and improvement. Indeed, it takes several years of professional experience before an employee has the skills required to be an expert in energy security in those cases, and the field is so vast that it is unlikely that he/she has skills in all parts of the field.

Moreover, staff competition between several centers may occur, for instance, between the Vilnius and Montreal COEs, which work on environmental and energy issues. However, although energy security is a tiny part of climate change, NATO accepts that each COE has expertise on the necessary conditions so that the missions do not

overlap with other COEs. In addition to the problems related to the lack of training and self-taught knowledge, we can also encounter a problem with the location of the COEs, which can affect the attractiveness of jobs and, therefore, of the candidates who are few.

Recruiting energy security experts is complicated because there are several challenges to overcome.

### **Considering a specific curriculum for energy security:**

As the demand for experts increases, it would be ideal to create a structure dedicated to a process tailored to studying energy security as a specified subject matter.

Although more engineering courses offer courses related to environmental and energy issues, a specialized curriculum in energy security still needs to be developed. At the same time, many economists or even diplomats are assigned to energy domains, which sometimes require more basic scientific understanding.

Elaborating on a stable curriculum is an initiative that national governments should incorporate and support because, as we have seen above, it is in their best interest. Indeed, the end-user of energy security is the public (it is a public good), so it should be the government's duty to find a solution and promote it because no one else will do it, as there will be otherwise no external commercial requirement train the future energy security experts.

If we take the example of NATO, the current recruitment within the COEs is mainly at the military level, even if there is a tendency to recruit civilian experts today. Military applicants have usually undergone a specific role-based education during their military career (logistics, combat support, military engineering, etc.) and have been chosen for this expertise. However, their academic background is only sometimes a key figure, and they often must attend training courses at the COE and internships to be more comfortable with the subject. Since the topic is complex, it would be wiser to focus on already qualified staff who are proficient in the subject and have been trained on it.

The objective would be to introduce a place that regularly produces EnSec experts because only in this way can the end user (States) influence the skills and abilities of these experts to solve their problems. There should be a generic entity to train future energy security experts with a generalist vision of the problem while having precise technical skills to be able not only to conduct specific projects but also to approach certain complex energy issues from multi-domain perspectives.

That is why it would be recommended to create a master's type of course (subject of study) for energy security. As we have seen with the diagrams (see part 2 b)), the subject is very multi-domain (engineering, defense, economics, political science, etc.), and there should be a higher education solution merging all these needs. Establishing a master's degree allowing students from different horizons to come together to bring everyone to the same reference base but to deepen the specificities would be great to be able to reply to future challenges.

### *Fields of Studies*

The vast subject makes establishing an exact program (curriculum) difficult. Of course, this education should include courses focused on all technical aspects of energy, such as courses on new technologies, energy storage, and renewable sources, but knowledge of energy policies, economics, governmental objectives, management, and even respective laws are also essentials to be able to develop concrete and sustainable solutions, as learning to advocate for policies that improve the reliability, affordability, and sustainability of energy.

Also, the ability to express oneself in English is a benefit. It may seem trivial, but as an international communication language, mastering the English language at a professional level can be a real challenge for some. It is essential regarding expertise because it allows experts to work in coalitions.

The defense aspect should also be included in the EnSec portfolio because forces are (can quickly become) energy customers and providers of energy security. This question becomes more critical as the threats of wars and conflicts increase. Even if the expert is not directly assigned to the defense sector, mastering EnSec means cooperating with the forces, which would require basic knowledge of the partner's procedures and capabilities.

It is, therefore, essential to acquire knowledge about this unique environment to evaluate threats and/or support the overall process.

In general, the armed forces provide (or will do in the future) increasing support to the civilian and industrial energy sectors and collaborate with them, such as sharing intelligence data that civilian companies cannot access. Generating regular experts who could bridge these different sectors would make it possible to gain efficiency in research and development projects.

In addition, in some countries like Canada, which are mainly affected by the effects of climate change, the military has a mandate allowing them to act in the event of an environmental crisis. That is why developing "green military" training is currently being considered to form experts who can operate correctly. It is an exciting idea to train military personnel to be informed about environmental problems and be able to collaborate with civilian institutions.

Thus, creating structures and entities that will provide appropriate education considering contemporary energy security issues is a project that must be launched as soon as possible to grow the energy security experts of tomorrow.

## Conclusions:

Establishing a dedicated field of studies for Energy Security at the university level, with an interdisciplinary approach merging engineering, economic, political, environmental, and military skills, and qualifications, is imperative for addressing the complex challenges that the world faces in the realm of energy.

Firstly, the global energy landscape is undergoing rapid and transformative changes, with increasing concerns about the security, sustainability, and accessibility of energy resources. A dedicated field of studies will equip individuals with a comprehensive understanding of the technical aspects of energy production and distribution, ensuring a reliable and resilient energy infrastructure.

Secondly, energy security is intrinsically linked to economic stability and growth. By integrating economic principles into the curriculum, students will gain insights into the intricate relationship between energy availability, pricing mechanisms, and overall financial well-being. This interdisciplinary approach will produce professionals capable of devising strategies that balance energy needs with economic considerations.

Moreover, decision-makers must consider the political dimension of energy security. Geopolitical tensions often revolve around access to and control over energy resources. A thorough education in political science will enable graduates to navigate the intricate web of international relations, fostering collaboration and diplomacy to ensure a stable global energy environment.

Furthermore, environmental sustainability is a critical factor in energy security. By incorporating environmental studies into the curriculum, students will be aware of the impact of energy activities on the environment. This knowledge will be pivotal in formulating eco-friendly energy solutions and mitigating the adverse effects of energy production.

Lastly, recognizing the strategic importance of energy security, including military aspects and qualifications, is essential. Graduates must prepare to address potential threats to energy infrastructure and devise security measures to safeguard critical energy assets.

In conclusion, establishing a multidisciplinary field of studies for energy security at the university level is a proactive step governments should take to prepare the next generation of professionals. Even if not directly involved in university curricula development, the governments can and should announce the needs and requirements. By merging engineering, economic, political, environmental, and military knowledge, this approach will produce well-rounded individuals capable of navigating the complex challenges of the evolving energy landscape, contributing to global energy security and sustainable development.