

Guidance on Advancing Sustainable Energy in Defence



CF SEDSS III

GUIDANCE ON ADVANCING SUSTAINABLE
ENERGY IN DEFENCE

Topic: Third Phase of the Consultation Forum for Sustainable
Energy in the Defence and Security Sector (CF SEDSS III)

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List of Acronyms

CF SEDSS III Consultation Forum for Sustainable Energy in the Defence and Security Sector (Phase III)

ECI	European Critical Infrastructure
EED	Energy Efficiency Directive
EMS	Energy Management System
EnMS	Environmental Management System
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Contracting
MoD	Ministry of Defence
MS	Member States
PCEI	Protection of Critical Energy Infrastructure
RED	Renewable Energy Directive
RES	Renewable Energy Sources

Preface

Since the Lisbon Treaty of 2009, the European Council's focus on defence has significantly evolved. Initially overlooked, defence energy transition and climate adaptation have moved to the forefront. Almost a decade later, in June 2019, the Council of the EU recognised the need to "...develop concrete solutions within the defence sector for safe and sustainable energy models..." and called for "strengthening cooperation in tackling energy security challenges, including through energy efficiency, renewable energy solutions, and the protection of critical energy infrastructure." Progress made since 2015 within the Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS) was acknowledged by the Council, setting the stage for further advancements. Capitalising on these calls and the accomplishments of the forum's first two phases, the European Defence Agency, with support from the European Commission, initiated the third phase in October 2019.

Subsequent challenges, such as the 2019 pandemic and the 2022 Russian war on Ukraine, have dramatically reshaped the security and energy landscape. In response, the EU introduced measures such as the European Green Deal, targeting a 55% reduction in greenhouse gas emissions by 2030, and REPowerEU, decreasing external EU energy dependency. These initiatives were part of a broader effort to enhance energy security, including promoting the defence energy transition and climate change adaptation, featuring the launch of the first EU Climate Change and Defence Roadmap and the Joint Communication on the Climate-Security Nexus, detailing 28 actions to mitigate the impact of climate change on peace, security, and defence.

The Consultation Forum for Sustainable Energy in the Defence and Security Sector has emerged as one of the EDA's flagship initiatives and Europe's largest defence energy community, involving over 30 countries. This initiative has secured nearly €10 million in funding defence energy-related initiatives, through both the Horizon 2020 and Horizon Europe programmes, and has spurred over 50 innovative project ideas and 15 research studies, driving the defence energy transformation. It has been instrumental in shaping policies, practices, and funding, promoting collaborative project ideas like behavioural changes among military personnel, the use of artificial intelligence for optimising energy use, and electrification projects within defence facilities. Notably, the Symbiosis project, conceptualised within the Consultation Forum, has pioneered, under the Horizon Europe, the promotion of the coexistence of defence activities and offshore renewable energy initiatives.

This Guidance on Advancing Sustainable Energy in Defence captures the extensive achievements of Phase III. It represents a crucial advancement towards sustainable energy practices within the defence sector, offering clear roadmaps and best practices for implementation. These strategies enable the ministries of defence to significantly enhance energy efficiency, adopt renewable energy solutions, and strengthen the protection of defence-related critical energy infrastructures. Additionally, the Guidance addresses cross-cutting energy management and policy themes, showcases innovative energy technologies, and outlines applicable funding and financing mechanisms for defence-related energy topics. It emphasises the critical need for aligning defence energy strategies with broader EU energy policies and regulations, contributing to the EU's goals of achieving climate neutrality.

Overall, the CF SEDSS Phase III Guidance Document is a testament to the collaboration of EU institutions, bodies, defence experts, industry, and academia. It embodies a collective commitment to a sustainable and resilient energy future for the European defence sector, effectively preparing it to meet the challenges of the post-2030 transformative energy and security landscape.

This comprehensive work is the result of dedicated efforts of the CF SEDSS members, particularly the management team, whom I would like to commend. The European Defence Agency deeply appreciates their contributions and encourages them to intensify further their efforts in advancing defence energy transition and climate adaptation.

Nathalie Guichard
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Abstract

The Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS) Phase III Guidance Document on Advancing Sustainable Energy in Defence outlines the strategic direction and key achievements of the Forum's third phase, spanning from 2019 to 2024. Funded under the European Union's Horizon 2020 programme, this European Commission initiative focuses on advancing sustainable energy practices within the defence sector across the EU and its strategic partners while contributing to the implementation of the European Green Deal.

The document highlights the efforts of the three core working groups, each dedicated to critical areas: Energy Efficiency and Buildings Performance, Renewable Energy Sources (RES), and Protection of Critical Energy Infrastructure (PCEI). These groups have developed comprehensive roadmaps and guidance to assist ministries of defence (MoDs) across Europe in integrating sustainable energy practices into their operations, thereby enhancing energy efficiency, resilience, and security. To address cross-cutting themes, Phase III also established the Transversal Working Group (TWG), which explores commonalities across these areas and focuses on energy management and policy, human factors, upskilling, and innovative energy technologies. Additionally, the TWG has been instrumental in identifying funding and financing instruments for defence energy-related initiatives, facilitating the transformation of project ideas developed in Phase III into tangible projects through collaboration and financial support.

The Guidance Document also reviews the alignment of defence sector strategies with the EU's energy policy and legislation framework, including the Energy Efficiency Directive (EED), Renewable Energy Directive (RED), Energy Performance of Buildings Directive (EPBD), and the Critical Entities Resilience (CER) Directive, along with the Regulations on Security of Gas Supply and Risk Preparedness in the Electricity Sector. It provides recommendations to ensure that defence-related energy policies and projects contribute to the EU's broader energy security, sustainability, and resilience goals, in line with the European Green Deal and RePowerEU.

Building on the extensive work of the four working groups during Phase III—encompassing over 30 project ideas, 15 research studies, and more than 50 events sharing best practices and expertise—this Guidance Document offers specific recommendations for MoDs. It focuses on integrating energy efficiency into building renovation strategies, increasing RES, and protecting critical energy infrastructure while emphasising cross-cutting themes such as financing opportunities, innovation, and policy alignment with broader EU energy goals. The document concludes by urging continued collaboration and innovation within the defence sector to meet the EU's ambitious energy and climate targets, ensuring a sustainable and secure future for European defence.

This Guidance Document should be regarded by the ministries of defence and relevant stakeholders as a vital tool for identifying gaps and addressing them through concrete steps and roadmaps, whether at the national level, through multinational collaboration, or with the support of the EU. By doing so, MoDs will enhance their energy efficiency and resilience and contribute significantly to national and EU efforts toward climate neutrality.

Executive Summary

Under the European Green Deal, the EU has launched its Fit-for-55 package, which rehauls energy legislation and introduces more ambitious targets for 2030, aiming to reach climate neutrality by 2050. This comprehensive policy framework encompasses all sectors of society, including defence, which plays a critical role. Leading to an unprecedented political momentum where energy efficiency and resilience in defence have taken a prominent role. This is particularly relevant in view of the ongoing Russia-Ukraine conflict, which highlights the urgent need for the European Union to decrease reliance on external sources of energy. Armed forces are large energy consumers, heavily relying on fossil fuels to power their daily activities and operations. Also, like other public or private sectors, defence has experienced the repercussions of finance, climate change and energy considerations on its mission, and consequently, its operational effectiveness.

To help achieve the EU energy and climate objectives, it is necessary to prioritise energy efficiency, shift towards renewable energy sources and diversify energy supply routes. These measures will not only enhance the Union's energy security, resilience and autonomy, but progressively safeguard the readiness and sustainability of the armed forces, allowing investments in other essential areas.

This Guidance on Advancing Sustainable Energy in Defence is the product of the work of CF SEDSS III, bringing together experts from 30 different European ministries of defence working together with the industry, academia and partners to support the defence sector in moving towards resilient, efficient and renewable energy models. It focuses on exploring the impact on defence of energy-related legislation, such as the Energy Efficiency Directive, Energy Performance of Buildings Directive, Renewable Energy Directive and Critical Entities Resilience Directive. The members of the Forum jointly seek to identify obstacles but also opportunities to implement this legislation and produce guidance on improving sustainable energy models in MoDs.

Based on the analysis of the energy policy framework, the relevant directives and regulations, the Guidance Document develops roadmaps for MoDs to address defence energy-related considerations and improve their energy sustainability and resilience in energy efficiency and buildings performance, renewable energy sources and the protection of critical energy infrastructure. Likewise, it identifies cross-cutting themes (TWG) such as financing and funding opportunities, innovative energy technologies, energy management and policy, cyber-security, hybrid threats, artificial intelligence, smart energy consumers, digitalisation, sensors, circular economy in defence, threats to the security situation arising from global climate change, etc., and the resulting guidance on how to improve their performance to benefit the defence sector, while improving EU energy security.

In addition to offering new ideas and concisely presenting roadmaps, CF SEDSS has strived to fill the knowledge gaps in relation to CF SEDSS Phase II and identify the way ahead for sustainable energy in defence. This ongoing effort by the Energy Consultation Forum is continuously updated based on the newest developments. The analysis and proposed roadmaps developed in this document by the CF SEDSS III working groups offer a clear and actionable framework for advancing sustainable energy within the defence sector. Each working group has focused on a specific theme, ensuring that all critical aspects of sustainable energy and climate resilience are comprehensively addressed. Overall, the working groups recommend the following timeline for roadmap implementation:

- Preparation Phase to be completed by 2025;
- Rollout Phase from 2025 to 2030, and
- Implementation Phase extending from 2030 to 2050.

An outline of the key contributions and objectives of each working group is presented.

Working Group 1 "Energy Efficiency and Buildings Performance" (WG1) developed their roadmaps along the following main strategic axes

- The active involvement of MoDs in implementing national energy and climate plans (NECP) goals;
- The establishment of effective long-term renovation strategies;
- The promotion of the massive implementation of existing and emerging technological solutions in these strategies;
- The adoption of green public procurement (GPP) principles and guidelines for their procurement procedures;
- The conduct of suitable supporting evidence for applying e-mobility programmes of the defence conventional (internal combustion engine) fleet;
- The establishment of permanent mechanisms which ensure effective management of energy and climate-related considerations and MoDs access to national and EU funding schemes;
- The application of suitable energy efficiency policy instruments such as energy performance contracting and energy performance certificates and
- The continuing application of adequate training and educative programmes of the armed forces' personnel.

Working Group 2 "Renewable Energy Sources" (WG2) has identified the following roadmaps

- Introduce a strong renewable energy component in the national defence energy strategy/policy;
- Increase resilience of the defence sector and contribute to European and national energy security by reducing dependence on fossil fuels;
- Increase RES awareness and skills within armed forces at all relevant levels to maximise resilience and enhance operational effectiveness;
- Examine the feasibility of applying existing and emerging RES technologies across national defence sectors;
- Adopt a lifecycle cost approach to energy procurement;
- Make the defence sector an 'exemplar' for national and EU RES efforts;
- Stimulate cooperation with the civilian sector to boost the RES related economy, accelerate roll-out of RES in armed forces and accommodate military concerns;
- Exploit frameworks for delivery of renewable energy projects in both national and EU contexts.

Working Group 3 "Protection of Critical Energy Infrastructure" (WG3) has identified six different subdomains for MoDs to strengthen and develop their level of awareness and resilience regarding the protection of defence-related CEI

- Reduce asymmetry of information;
- Structural mapping and metering;
- Prioritisation and strengthening;
- Raising awareness and training for security conscious energy;
- Tracking and investing in new technologies for resilience;
- Adaptability to structural changes in energy systems.
- Also, in their roadmap, WG3 has addressed the following cross-cutting issues: cybersecurity, foresight analysis on energy issues, quick response mechanism on acute events affecting energy-related issues, geopolitical influence on financial and economic growth issues, and protecting offshore critical energy infrastructures.

Transversal Working Group (TWG)

The Transversal Working Group (TWG) has identified and addressed cross-cutting issues of the above working groups, ensuring the integration of their findings and proposals across all areas of defence energy transition. In this respect, the TWG identified the cross-cutting domains, as below, on which MoDs should place particular emphasis:

- Developing policies that align defence operations and practices with national and EU climate targets, ensuring leadership in energy management.
- Identifying and promoting access to EU and national funding to support the implementation of defence energy projects.
- Advocating for adopting cutting-edge technologies like artificial intelligence, digitalisation, and smart energy systems to enhance efficiency and resilience.
- Strengthening the protection of critical energy infrastructure against physical and cyber threats through coordinated national-level policies.
- Fostering partnerships between military and civilian sectors to accelerate the adoption of sustainable energy practices.

Introduction

The EU has chartered its course on the path to climate neutrality by 2050. To meet its ambitious climate targets, it needs to primarily address the energy sector, which contributes to more than 75% of greenhouse gas emissions¹, and involve all sectors of society. As the largest public owner of free land and infrastructure in the EU, the armed forces are a key player in this energy transition. By improving its energy efficiency and diversifying the energy supply to enhance its resilience to the energy security challenges, the defence sector will also reduce their energy footprint and costs. The defence sector has demonstrated its willingness to embrace cleaner, safer and more sustainable energy models, and is already reaping the benefits in the form of less costs, more resilience and energy autonomy as well as the contribution to the European Union's strategic long-term vision for a prosperous, modern, competitive and climate neutral economy by 2050.

Guidance document: scope and objectives

This Guidance Document supports the ongoing efforts of the MoDs to examine further how energy efficiency measures, renewable energy sources and technologies, as well as protection of critical energy infrastructure considerations might be better implemented or applied within the European defence and security sector. In addition, the cross-cutting aspects, introduced in Phase III, focus on the cross-sectorial topics of interest of all working groups and highlight how the proposed roadmaps may be implemented better, from the standpoint of policy and management, innovative energy technologies and funding or financing.

In line with this scope, the **objectives** of the Guidance Document are to:

- Provide an analysis of the defence energy-related directives and identify implications, including barriers and opportunities, on the defence and security sector;
- Propose roadmaps for MoDs to address defence energy-related considerations and improve their energy sustainability and resilience in energy efficiency and buildings performance, renewable energy sources and the protection of critical energy infrastructure, taking into account specific objectives of each working group in its related domain;
- Describe how to implement the proposed roadmaps, through a micro-level analysis and explanation of the defined steps/milestones and exemplifying good practice and case studies;
- Identify recommendations targeting the eu mods and relevant defence stakeholders which, building upon identified results and the know-how gathered, will further support the transition towards sustainable and resilient energy models, while also setting future directions.

To address the above scope, the Guidance Document is structured as follows:

- Chapter 2 focuses on the implications of energy legislation on defence, as follows:
 - › **For WG1:** Energy Efficiency Directive (EED), Energy Performance of Buildings Directive (EPBD) and the Regulation on the Governance of the Energy Union and Climate Action, as well as the EU Green Deal/ Renovation Wave Strategy, 2030 Climate Target Plan, Fit-for-55 Package, Circular Economy Action Plan and green public procurement provisions;
 - › **For WG2:** Renewable Energy Directive (RED II) and whenever relevant the EED;
 - › **For WG3:** Directive on Critical Entities Regulation and the related regulations on Security of Gas Supply and Risk Preparedness in the Electricity Sector.

1. [Renewable energy targets – European Commission \(europa.eu\)](https://european-council.europa.eu/media/e3000420/1/1618220120012_en.pdf)

- Chapter 3 identifies roadmaps for advancing sustainable energy in defence;
- Chapter 4 presents guidance for the implementation of the defence energy-related roadmaps;
- Chapter 5 highlights the cross-cutting support for implementing the energy roadmaps.

In light of this approach, the subsequent chapters of this Guidance Document aim to offer deeper insights into how the defence sector can strategically align itself with the EU's climate and energy objectives. Each chapter builds upon the foundations laid out in this introduction, offering practical roadmaps and actionable guidance that address the unique challenges and opportunities within the defence sector. By following these roadmaps and recommendations, the MoDs and other relevant stakeholders can effectively contribute to the broader EU energy efficiency, sustainability, and resilience goals, ultimately ensuring that the defence sector meets and exceeds its role in achieving climate neutrality by 2050. This document serves as a comprehensive resource, guiding the defence sector through the complexities of energy legislation, technological innovation, and cross-sector collaboration, paving the way for a more sustainable and secure future.

1. Strategic Context

This chapter provides an overview of the strategic context of the project, focusing on:

- **Strategic objectives of the CF SEDSS III** and its four working groups with regard to the mission of the project and the progressive implementation of the energy policy framework and legislation in defence; and
- **Energy policy developments** that have an impact on the activities of the CF SEDSS and how to enable the defence sector to further engage in their implementation.

As a coordination and support action of Horizon 2020, the Consultation Forum in Phase III has fostered the interactions and collaboration between experts from the defence and energy-related communities to share information, expertise and best practices on improving energy efficiency and utilising renewable energy sources and increasing the protection and resilience of defence-related critical energy infrastructures, including security of supply aspects.

Learning from the previous phases and with a view to adapt to future energy dynamics, environmental risks and climate change, Phase III has created a novel category to address the cross-cutting thematic areas on energy management and policy, identify the state-of-art and cutting-edge energy technologies and stimulate relevant research and innovation (R&I), as well as to present existing or new financing mechanisms and other funding instruments for defence energy-related topics. In this context, the Forum in Phase III has intensified its efforts to support or enable the decision-making process of the MoDs to develop, adopt or implement national defence energy strategies and policies and undertake the required measures to address the following core areas:

- Energy efficiency and building performance;
- Renewable energy sources;
- Protection and resilience of defence-related critical energy infrastructures;
- Cross-cutting: energy management and policy, innovative energy technologies, research and innovation and financing/funding defence energy-related topics.

1.1. CF SEDSS III Objectives

The CF SEDSS Phase III has pursued the following **eight objectives**:

1. Enhance energy efficiency and improve the energy performance of building stocks and fixed infrastructures (including through the development or acceleration of renovation plans and addressing the requirements concerning electro-mobility);
2. Promote the usability and viability of renewable energy or other alternative sources for the defence sector (including wind, solar, wave, tidal, biomass, and geothermal, and renewable energy applicability to military transport in all domains);
3. Strengthen the protection and resilience of defence-related critical energy infrastructure from present, emerging and future challenges ranging from man-made and natural disasters to hybrid threats, terrorist, and cyber;
4. Identify and evaluate the implications of the implementation of the current EU policy and regulatory framework for the defence sector;
5. Develop defence energy-related policy tools and methodologies to address common considerations and promote the application of energy management systems to be applied to defence-related infrastructures;
6. Identify innovative and smart energy technologies that could help lower the carbon footprint and, at the same time, increase the energy autonomy and operational resilience of the armed forces;

7. Enable the generation of defence energy-related project ideas and research studies (including dual-use synergies within the defence and civilian markets) that can:
 - › Act as enablers of military operational capabilities;
 - › Support the MoDs in addressing common energy challenges or shortfalls at multi-national, regional or cross-border level;
 - › Assist the EU in achieving its strategic objectives on energy sustainability and energy security.
8. Identify and present EU applicable financing mechanisms and funding instruments that could potentially support the MoDs in the development of defence energy-related project ideas resulting from the work of the Consultation Forum, either at the national or multinational level.

1.2. Energy Policy Developments

In June 2019, the Council of the EU acknowledged the work and the progress of CF SEDSS and invited the EU Member States, the European External Action Service (EEAS), the European Commission and the European Defence Agency (EDA) *"to develop concrete solutions within the defence sector for safe and sustainable energy models..." and called "for strengthening cooperation in tackling energy security challenges, including via energy efficiency, renewable energy solutions and the protection of critical energy infrastructure"*.² In June 2020, taking stock of the progress and work of the relevant preparatory bodies, the Council of the EU invited "the High Representative to propose, together with the Commission and the European Defence Agency, and in close dialogue with Member States, a set of concrete short-, medium-, and long-term actions addressing the links between defence and climate change as part of the wider climate-security nexus, notably in the areas of civilian and military Common Security and Defence Policy (CSDP), capability development, multilateralism and partnerships."³

Notably, the acknowledgement by the Council of the EU (Ministers of Foreign Affairs and Ministers of Defence) of the work of the CF SEDSS on assisting the MoDs in advancing sustainable energy in defence reflects the high interest of the political level for this field as well as the important role that the CF SEDSS community plays. Further to the June 2019 and June 2020 Council Conclusions, the EU Climate Change and Defence Roadmap was adopted in November 2020, including numerous references to the CF SEDSS project (more information below).

It is therefore important for the CF SEDSS III community to follow the ongoing developments and decisions in the domain of climate change and energy and to streamline the links with the defence sector (both within the defence sector and with external energy actors). In this context, section 1.2 keeps track of the EU's wider efforts to act towards a climate-neutral and climate-resilient society and provides a brief analysis in relation with the CF SEDSS project and the implications to the defence sector.

The European Green Deal

In 2019 the European Commission adopted the European Green Deal⁴ as a response to the climate and environment-related challenges. It aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases within the EU in 2050. To achieve this, the Commission published in 2021 its 'Fit for 55' package, referring to an intermediate goal of a 55% emissions reduction by 2030, compared with 1990 levels. The legislative proposals included the revision of several energy-related

2. Council Conclusions on Security and Defence in the context of the EU Global Strategy <https://www.consilium.europa.eu/media/39786/st10048-en19.pdf>

3. Council Conclusions on Security and Defence, <https://www.consilium.europa.eu/media/44521/st08910-en20.pdf>

4. The Deal is available [here](https://ec.europa.eu/economy_finance/european-green-deal). See also the Annex of the Deal "Roadmap and key actions". A 2-page fact sheet on the European Green Deal is available [here](https://ec.europa.eu/economy_finance/european-green-deal).

pieces of legislation to align them with the new climate targets: the Renewable Energy Directive (RED), the Energy Efficiency Directive (EED), the Energy Performance of Buildings Directive (EPBD), the Energy Taxation Directive and the gas and hydrogen package.

Particularly important for CF SEDSS are the initiatives on strategy for smart integration and on the "Renovation wave"⁵.

EU Climate Change and Defence Roadmap

In 2020 the European External Action Service published a 'Climate Change and Defence Roadmap'⁶ to support the EU's overall effort to address climate change. The Roadmap forms part of the EU's Common Security and Defence Policy and also contributes to the objectives of the European Green Deal 'by aiming to reduce the emissions in particular in the defence sector as part of the collective effort towards climate neutrality by 2050'. It addresses the links between climate change and security at three levels: operational, capability development and partnerships. Chiefly, in terms of military operations, the Roadmap regards reducing energy demand and increasing energy resilience as essential 'to ensure a high level of readiness and sustainability'. It also notes 'operational advantages', such as 'reduced logistical requirements and dependence on supply convoys in areas of high insecurity as well as budgetary aspects'.

The CF SEDSS has significantly contributed to the EU Climate Change and Defence Roadmap by aligning its core work with the objectives outlined in the roadmap. The CF SEDSS III working groups have been pivotal in analysing the implications of energy-related directives on the defence sector, focusing on green public procurement and the Renovation Wave. They have also undertaken contracting studies and planned workshops to explore these directives' impact on military infrastructure. In the medium term, CF SEDSS III supports establishing a mechanism to assist EU ministries in reducing energy consumption and increasing efficiency, aligning defence efforts with the EU's climate neutrality targets. Additionally, the CF SEDSS III contributes to research on the resilience of defence-related critical energy infrastructure (CEI) against hybrid and asymmetrical threats, further supporting the roadmap's objectives through studies and planned exercises to test vulnerabilities.

European Climate Law

In 2021, the EU adopted a Regulation commonly known as the European Climate Law, which enshrined a legal obligation for Europe to become climate-neutral by 2050, as well as a target of 55% less emissions by 2030, in comparison to 1990. These legally binding targets for net-zero greenhouse gas emissions will need to be implemented by the Member States, while ensuring that all EU policies contribute to this goal. All sectors have a role to play, including MoDs (i.e. inputs in the national energy and climate plans (NECPs), which were updated in 2023).⁷ In this respect, the CF SEDSS III has also explored the role of defence in this process and tried identifying the existing and new opportunities/investments that can be unlocked.⁸ The ambitious climate targets are, most recently, underlined by a Commission Communication from February 2024 recommending a 90% net greenhouse gas (GHG) emission reduction compared to 1990 level as an intermediate target for 2040. Consequently, there is a need for more actions on climate-proofing, resilience building, technological (carbon removal, digital, etc.) solutions, research and innovation (R&I), empowering citizens, prevention and preparedness, enhancing adaptivity capacity, strengthening resilience, and reducing vulnerability to climate change.⁹

5. For more details on buildings and renovation, climate-proofing of buildings, clean energy, sustainable mobility, etc., there is useful information (documents) at the end of the article in this [link](#).

6. <https://data.consilium.europa.eu/doc/document/ST-12741-2020-INIT/en/pdf>

7. See also this [link](#).

8. See Regulation on the **European Climate Law** here [Regulation – 2021/1119 – EN – EUR-Lex \(europa.eu\)](#).

9. Find more about the **European Climate Pact** (as regard raising awareness, engaging the public, involving all sectors and unlocking opportunities in buildings, mobility, etc.) at this [link](#).

Multiannual Financial Framework (MFF 2021-2027)

Under the heading 3, Natural Resources and Environment, the LIFE programme is the EU's funding instrument entirely dedicated to the environment and climate action. The funds for CF SEDSS IV come from this programme. Likewise, to address the social and economic consequences coming from the objective to reach climate neutrality in the EU by 2050, a Just Transition Fund is helping the most vulnerable coal- and carbon-intensive regions address the economic and social costs of the climate transition.

The European Green Deal's Investment Plan – the Sustainable Europe Investment Plan

The Sustainable Europe Investment Plan¹⁰ aims at mobilising through the EU budget and associated instruments at least EUR 1 trillion of private and public sustainable investments ("green investment wave") over the decade 2021-2030 to help reach the ambitious objectives set by the European Green Deal. The European Commission will defend a high climate ambition of at least 25% of the Multiannual Financial Framework (MFF 2021-2027) in the upcoming inter-institutional negotiations. The EU intends to significantly increase investments to address climate, environmental and energy challenges (see, for instance, the field of energy efficiency in buildings, RES, etc.).

Strategic Compass, March 2022

The Strategic Compass is an ambitious plan of action for strengthening the EU's security and defence policy by 2030. It provides an assessment of the strategic environment in which the EU is operating and of the threats and challenges the Union faces, including the climate change^{11,12}. The Compass has called upon EU member states to develop national strategies to prepare armed forces for climate change. Under the lead of EEAS, EDA has been supporting the coordination of a newly established Climate and Defence Network, gathering MS experts tasked with preparing their national climate change strategies.

In 2022, the European External Action Service (EEAS), with support from the European Defence Agency, established the EU Climate Change and Defence Network to monitor and assist MoDs in developing their national climate change strategies. The EDA has co-chaired this Network, while the CF SEDSS has provided a platform for discussions and exchanging expertise on climate change adaptation and resilience, mainly through its Working Group 3 (WG-3) and the Transversal Working Group (TWG). The Agency, in collaboration with the Joint Research Centre (JRC), completed a research study under the CF SEDSS framework, focusing on the impacts of climate change on defence-related critical energy infrastructure, including transportation. The findings and recommendations from this study were reported in the Joint Progress Report on Climate Change, Defence, and Security.

10. The Plan is available [here](#), see also this relevant [link](#) and [this one](#).

11. [A Strategic Compass for Security and Defence | EEAS \(europa.eu\)](#)

12. [Strategic Compass](#)

Action plan on military mobility, November 2022

The "Action Plan on Military Mobility 2.0"¹³ emphasises the importance of sustainable, resilient, and secure transport infrastructure for the swift and efficient movement of military forces across the EU. The Consultation Forum is supporting the implementation of this Action Plan by focusing on enhancing the resilience of military infrastructure against climate change and hybrid threats¹⁴. Specifically, the CF SEDSS has contributed research and expertise on integrating sustainable energy practices into defence-related critical energy infrastructure, aligning with the goals of Military Mobility 2.0 to ensure energy security and operational readiness. This collaboration underscores the importance of sustainable energy solutions in enhancing the overall resilience and sustainability of military mobility networks within the EU.

EU Joint Communication on the Climate-Security Nexus, June 2023

In June 2023, the High Representative and the European Commission adopted a Joint Communication on "A new outlook on the climate and security nexus – Addressing the impact of climate change and environmental degradation on peace, security and defence". The Joint Communication focuses on four pillars: 1) evidence-based analysis and foresight to support planning, decision-making, and implementation; 2) operationalisation of the climate-security nexus in all aspects of EU external action; 3) ensuring a sustainable and climate-resilient European security and defence; 4) and building strong partnerships. The EU operationalised these by identifying 28 actions to address the climate-security nexus, with EDA involved in over a third of them.

Likewise, the CF SEDSS is mentioned as one of the relevant EU instruments/tools providing a strong foundation for further work ensuring a sustainable and resilient European security and defence. Specifically, the CF SEDSS is contributing to implementing the actions of the Joint Communication by fostering discussions and developing practical solutions for integrating climate adaptation and resilience into defence planning and operations. Expressly, through its various working groups, the Forum has provided expertise on improving energy efficiency, enhancing the resilience of critical energy infrastructure, and adopting sustainable practices within the defence sector.

These efforts align closely with the Joint Communication's objectives to operationalise the climate and security nexus within EU external action, enhance climate adaptation in military capabilities, and support the EU's broader climate and energy goals. This underscores the strategic importance of the green transition within the defence sector.

A Eurobarometer survey from July 2023 on climate change¹⁵

According to the survey, more than eight in ten respondents think that it is important that their national government (86%) and the European Union (85%) take action to improve energy efficiency by 2030 (e.g. by encouraging people to insulate their home, install solar panels or buy electric cars). 58% of EU citizens think the use of renewable energy sources should be accelerated, energy efficiency increased, and the transition to a green economy sped up, considering energy price spikes and restrictions on gas supply due to the actions of Russia.

13. [Action plan on military mobility 2.0.pdf \(europa.eu\)](#)

14. See, Giannopoulos G., Jungwirth R., Hadjisavvas C., et al., Fortifying Defence: Strengthening Critical Energy Infrastructure against Hybrid Threats, EN, Publications Office of the European Union, Luxembourg, 2023 [fortifying-defence.pdf \(europa.eu\)](#) and R. Tavares da Costa, E. Krausmann, C. Hadjisavvas, Impacts of climate change on defence-related critical energy infrastructure, Publications Office of the European Union, Luxembourg, 2023 [climate-report-final-online.pdf \(europa.eu\)](#)

15. The survey is available [here](#)

2. Implications of Energy Legislative Landscape on Defence

This chapter provides a brief analysis of the defence energy-related directives and presents implications (including barriers) and opportunities on the defence and security sector. Each CF SEDSS III working group has provided an analysis of the implications and the benefits that can be derived in the defence sector from the implementation of the energy legislation and policy framework.

2.1. Energy Efficiency Directive (EED) and Energy Performance of Buildings Directive (EPBD)

The Energy Union and the Clean Energy for all Europeans Package (Energy Efficiency Directive (EED), Energy Performance of Buildings Directive (EPBD) and the new Regulation on the Governance of the Energy Union and Climate Action) – The EU Green Deal/Renovation Wave Strategy – 2030 Climate Target Plan – Fit for 55 Package – Circular Economy Action Plan – green public procurement provisions.

There is a worldwide recognition of the massive importance that climate change related issues and phenomena have on global living conditions and consequently to every economic associated activity. The energy aspect, with special regards to the efficient operation of the building sector, represents a significant portion of GHG emissions and energy consumption, thus it vastly affects climate change impact.

Hence, the involved EU institutions (European Commission, Council of the EU and European Parliament) have already set a whole nexus of ambitious goals to tackle climate change and environmental degradation effects, with specific focus on rendering the European Union area the first carbon-neutral geographical area, by 2050. The achievement of these goals is facilitated through the adoption of the flagship programme "European Green Deal" and its associated strategies and pieces of legislation.

This new overarching endeavour has subsequently resulted in a series of interlinked legislative initiatives in terms of Council decisions, EU regulations and directives, Action plans, etc. on energy efficiency and buildings performance. Assessing the significant potential of EU military building stock to contribute towards the achievement of the EU and national energy efficiency and energy consumption reduction targets is of outmost importance. This potential remains mainly unexploited and becomes an opportunity for the defence public sector to become pioneers and lead the public sector by example. Moreover, realising this potential will not only bring energy and cost savings to the sector, but also more autonomy, more resilience and less vulnerabilities.

All in all, the implementation of more efficient energy consumption procedures and technologies in buildings and the resulting energy and cost savings do not only act as mere contributors to national and EU corresponding targets and goals, but also as a capability multiplier and an effective tool towards greener and more efficient operational models for the defence sector with ample implications in its visibility and significance for the society.

The aforementioned legislative framework is comprised of the following main documents: The Energy Union and the Clean Energy for all European packages¹⁶, including the Energy Efficiency and the Energy Performance of Buildings Directives¹⁷, the new Regulation on the Governance of the Energy Union and Climate Action¹⁸, the EU Green Deal¹⁹ and

16. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN>

17. <https://www.eda.europa.eu/european-defence-energy-network/policy-legislation>

18. [Regulation – 2018/1999 – EN – EUR-Lex \(europa.eu\)](#)

19. https://ec.europa.eu/info/publications/communication-european-green-deal_en

more particularly the Renovation Wave strategy²⁰, the new EU 2030 Climate Target Plan, the Fit for 55 Package²¹ and the EU Circular Economy Action Plan²².

During the three phases of the Consultation Forum and following a series of inquiries (including questionnaires, round table discussions, subcontracting studies, etc.), a significant amount of information has been gathered and assessed with regards to the potential implications and impact that the implementation of this framework might have for the defence sector.

Hence the areas of consideration listed below constitute the bases of the impact assessment analysis performed. More specifically:

- **Recast EED (2023/1791)** (replacing old EED 2012/27/EU and its amending Directive 2018/2002- Articles impacting defence are 5, 6, 7, 12 and 29):
 - › **Article 4 (from old EED) – Building Renovation** (this Article has, actually, been eliminated from the recast EED and moved to the forthcoming recast EPBD): requiring MS to define long-term strategies for stimulating renovations (in particular, cost-effective deep renovations) in their building sector, in order to increase with immediate effect the historically low renovation rates, and ultimately reduce significantly the energy consumption of the building stock by 2050.
 - › **Article 5 – Public sector leading on energy efficiency:** requiring that total final energy consumption of all public bodies combined, which together accounts for about 30% of energy consumption of all services across the EU, or 5% of EU final energy consumption, be reduced by at least 1,9% each year, when compared to 2021 (with option for MS to exclude the armed forces).
 - › **Article 6 – Exemplary role of public bodies' buildings:** requiring that at least 3% of the total floor area of heated and/or cooled buildings with a total useful floor area over 250 m² that are owned by public bodies (at all levels of the public administration) and that, on 1 January 2024, are not nearly zero-energy buildings, be renovated each year to be transformed into at least nearly zero-energy buildings or zero-emission buildings in accordance with Article 9 of the EPBD (with option for MS to apply requirements that are less stringent for buildings owned by the armed forces and serving national defence purposes and historical buildings, among others).
 - › **Article 7 – Public procurement:** requiring contracting authorities and contracting entities to purchase only products, services buildings and works with high energy-efficiency performance in accordance with the requirements referred to in the Annex IV to the Directive when exceeding a value equal to or greater than established thresholds, and apply the energy efficiency first principle, unless it is not technically feasible (applicable to the contracts of the armed forces only to the extent that their application does not cause any conflict with the nature and primary aim of the activities of the armed forces, and not applicable to contracts for the supply of military equipment).
 - › **Article 12 – Data centres:** introducing an obligation for the monitoring of the energy performance of data centres, and the creation of an EU-level database to collect and publish data relevant for the energy performance and water footprint of data centres with power capacity over 500kW (not applicable to data centres used for defence).
 - › **Article 29 – Energy services:** promoting the energy performance contracting for renovations of large buildings that are owned by public bodies, with the aim to mobilise the private sector to provide finance, performance guarantees and share risks.

20. [Renovation wave \(europa.eu\)](https://european-council.europa.eu/media/e300042f-323d-4f30-b01d-30c829000000/en/press_corner/press_release/2020/07/20200720_renovation_wave_en.pdf)

21. <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/package-fit-for-55>

22. <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>

- **EPBD (2010/31/EU and amending Directive 844/2018** – Articles impacting defence are 2a, 5, 7, 8, 9, 10)
 - › Establishment of stronger long-term renovation strategies (Article 2a of the revised EPBD), aiming at decarbonising the national building stocks by 2050, with indicative milestones for 2030, 2040 and 2050, measurable progress indicators and with a solid financial component. The strategy should clearly contribute to achieving the energy efficiency targets, as outlined in the National Energy and Climate Plan. As mentioned, EU public domain (MoD having the lion's share of the building stocks, in the majority of the MS) has to play an exemplary role in this renovation campaign.
 - › Introduction of a common European scheme for rating the smart readiness of buildings, optional for EU countries (Article 8 of the revised EPBD).
 - › Further promotion of smart technologies, for instance through requirements on the installation of building automation and control systems and on devices that regulate temperature at room level (Article 8 of the revised EPBD).
 - › Support of the e-mobility, by introducing minimum requirements for car parks over a certain size and other minimum infrastructure for smaller buildings (Article 8 of the revised EPBD).
 - › Promotion of a homogenised processes of setting emerge performance requirements, so that cross-national comparisons could be allowed. These processes have to be reviewed every five years and, if necessary, updated (Article 10 of the revised EPBD).
 - › Promotion of health and well-being of building users, for instance through an increased consideration of air quality and ventilation. This specific provision is expected to be additionally promoted over the next year, in the light of the Covid-19 crisis (Article 7 of the revised EPBD).
 - › All new or deeply renovated buildings must be nearly zero-energy buildings (NZEB) from 31 December 2020. Since 31 December 2018, all new public buildings already need to be NZEB (Article 9 of the main EPBD).
 - › Establishment of cost-optimal minimum energy performance requirements for new buildings, for the major renovation of existing buildings, and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls and so on (Article 5 of the main EPBD)).

The new Regulation on the Governance of the Energy Union and Climate Action

The new regulation on the Governance of the Energy Union and Climate Action²³ establishes a unique framework for cooperation between Member States and the EU to ensure that national and EU trajectories are best aligned with a view to meeting the objectives and targets of the Energy Union, consistent with the Paris Agreement goal and in particular the EU's 2030 targets for energy and climate.

Under the [Governance Regulation](#), EU Member States have developed integrated national energy and climate plans (NECP), based on a common template and covering all five dimensions of the energy union: decarbonisation, energy security, energy efficiency, the internal energy market and research, innovation and competitiveness. The Commission has assessed these NECP both [at EU](#) and [Member State level](#).

Member States shall report the NECP progress to the Commission on a biennial basis and will need to update their national energy and climate plans by 30 June 2024 in a final form in order to reflect an increased ambition.

Following the spirit of the Clean Energy for All Europeans package and the new European Green Deal, these NECP should consider and include all sectors.

23. Fact sheet on the EU Regulation on the governance of the energy union and climate action, available at: [Factsheet: Regulation on the governance of the energy union and climate action – European Commission \(europa.eu\)](#)

The European Green Deal, the Renovation Wave strategy and the "Fit for 55" Package

The Communication on the European Green Deal²⁴ stresses the key role of renovation of buildings in order to achieve climate neutrality by 2050 and introduces a new "renovation wave" initiative²⁵ to boost energy performance of buildings in the EU. The objective of this initiative is to support an important increase (at least doubling) of renovation rates in the EU and to this end, it will include different strands of action to support renovation: an Open Platform for the buildings and construction sector, innovative financing schemes, additional work to lift national regulatory barriers, and a focus on some key segments of the building stock.

The most significant elements, objectives, targets and expectations of this "flagship" initiative are as follows:

- The renovation wave for Europe integrated strategy, presented by the EC in October 2020, aims to double the current annual renovation rate (1%) by 2030 and increase renovations' depth.
- Mobilising forces at all levels towards these goals will result in renovating 35 million European building units; a reduction of 60% in GHG emissions; a reduction of 14% overall energy consumption, a reduction of 18% of energy for heating and cooling; and the creation of 160.000 green jobs in construction.
- An annual investment gap of 270 billion EUR has been estimated if the EU is to reach the recently proposed more ambitious 2030 targets (55% emissions reduction, 38-40% share of RES and 36-39% energy efficiency increase).

However, the defence sector, despite its intensive energy consumption profile, is not explicitly and clearly referred to within these two Communications as a key target.

Under the Commission's work programme for 2021, the initiatives, mechanisms and legislative packages (new and/or revised pieces of legislation) linked to the European Green Deal climate action and in particular the climate target plan's net reduction target for 55%, are presented under the "Fit for 55 Package". Within this package, there is also the target of spending 37% of the €750 billion Next Generation EU Recovery and Resilience Plan on the wider EU Green Deal objectives.

The following initiatives²⁶ are linked in the aforementioned Fit for 55 Package, and could (in)directly affect the defence sector:

- Revision of the EU Emissions Trading System (ETS), including maritime, aviation as well as a proposal for ETS as own resource;
- Carbon Border Adjustment Mechanism (CBAM) and proposal for CBAM as own resource;
- Revision of the Energy Tax Directive;
- Revision of the EPBD, to implement the ambition of the new 2030 climate target;
- Amendment of the RED, to implement the ambition of the new 2030 climate target;
- Revision of the Regulation on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry;
- Revision of the Regulation setting CO2 emissions performance standards for new passenger cars and for new light commercial vehicles.

24. https://ec.europa.eu/info/publications/communication-european-green-deal_en

25. [Renovation wave \(europa.eu\)](https://europa.eu/renovation-wave)

26. <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/package-fit-for-55>

Concerning the corresponding revision of the EPBD, the new version aims at boosting the incentives for the building stock renovation by applying the following provisions:

- Reflecting a proper definition for "Deep Renovations".
- Introducing obligations for minimum energy performance requirements in existing buildings as well as the use of building renovation passports.
- Updating of the EPC framework and new approaches of EP certificates.
- Extending the electro-mobility provisions scope, among other subjects.
- Extending the targets beyond the NZEB concept (Net zero energy and net emissions) by 2030.

Green public procurement provisions under the EU public procurement strategy

Under the EU public procurement strategy, GPP is defined in the Communication (COM -2008- 400) "[Public procurement for a better environment](#)" as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."

While GPP is a voluntary instrument and Member States are able to determine the extent to which policies or criteria are applied, it might have a key role in the EU's efforts to boosting a resource-efficient economy. However, 55% of procurement procedures use lowest price as the only award criterion for public contracts²⁷.

The European Commission has been developing [voluntary GPP criteria](#) for several product groups. Furthermore, following the adoption of the 2020 Circular Economy Action Plan, the Commission is proposing minimum mandatory GPP criteria and targets in sectoral legislation and phase in compulsory reporting to monitor its uptake.

EU Ecolabels can play a particular role in developing technical specifications and award criteria, and in verifying compliance helping public buyers to save time in accordance with [Art. 43 of Directive 2014/24/EU](#). [More information on EU Ecolabel product groups](#) is available online.

Analysis of the implications and the benefits arising from the implementation of energy legislative landscape in the defence sector

Plenty of information regarding the status of implementation of the energy efficiency related legislative packages and measures has been gathered during the three phases of the CF SEDSS through questionnaires, studies, meetings and workshops, whose analysis has shown results that are, in general, below the expectations of the defence community.

This is mainly due to diverse and multiple hindrances faced by the defence sector in its efforts to keep up with evolving and more ambitious policies, targets and requirements that, in general, have been conceived and designed without consideration and consultation with the defence sector. Consequently, they do not take into account and are not adapted to the defence sector particularities and specificities. Moreover, MS normally exempt the defence sector from the compliance of many energy efficiency provisions and requirements, or at least allow exemptions only for defence operational buildings (sensitive buildings utilised for defence specific sensitive/confidential activities) based on the extremely demanding confidentiality and security issues specific to defence in some cases (access to information, priority of defence's mission), and/or on the wrong perception by the national energy competent authorities that the significance of sector concerning energy saving potential is low or at least limited in other cases.

27. https://single-market-economy.ec.europa.eu/single-market/public-procurement_en

The case where MS exempt fully, or at least to a great extent the defence sector from their national energy performance requirements ultimately leads both the defence sector and MS to reach lower than expected achievements due to the sector's unexploited potentials for energy saving and unexploited synergies with other public and private sectors, which could act as multipliers of capacity and resources and in benefit of all actors.

These statements are supported by the assessment of the existing situation in the defence sector through the analyses of the responses to multiple questionnaires, as well as from different studies²⁸ conducted under the umbrella of the WGI scope during the first, second and third phases of the CF SEDSS.

There is, thus, an excellent opportunity for the defence sector to (a) highlight the potential that exists for energy efficiency to play a significant role in achieving defence environmental goals, particularly in relation to climate change mitigation, (b) identify the barriers that exist to achieving the full potential that energy efficiency presents to the defence sector – some of which are specific to the defence sector but mainly common across the public and the private sector – and to outline potential solutions to those barriers and (c) rip the benefits of adopting energy saving policies, strategies, planes and tools to manage energy, emissions and resource use in line with national energy saving policies and targets, as well as to manage risk and reinforce resilience/continuity of supply chains to support operations.

Reducing energy waste and improving energy efficiency are not only the underlying principles at the core of all EU energy legislative efforts, but also a first and key step ("reduce") towards the transition to net zero emissions as depicted in the 4 R's of decarbonisation planning (*Source: The United Nations Industrial Development Organisation*), i.e. reduce, reuse, refuel, and redesign. The more energy efficient an installation is, the less energy is required from any sources, including renewable energy.

In addition to being a critical first step in the transition to net zero emissions, energy efficiency has many other benefits, among others:

- Improved security of supply, which is currently of paramount importance in the context of the energy crisis resulting from the invasion of Ukraine by the Russian Federation and other conflicts worldwide.
- Reduced exposure to attacks on logistics convoys in deployments, and refuelling operations of ships and aircraft in theatre operations.
- Improved comfort levels, process stability, and productivity resulting from improved operational control of buildings energy consuming systems.
- Reduced cost and reduced exposure to volatile energy prices.
- Reduced local pollution and consequent reduced health risks from the combustion of fossil fuels within military installations.

With this in mind, the authors believe that the implications and the benefits of the implementation of energy efficiency legislation broadly in the defence sector would be good and many and would certainly outweigh the cost and effort required to do it. However, this implementation is not taking place in the defence sector at the desirable pace and its benefits remain, thus, unlocked for now.

28. "Current and future trends in energy efficiency and buildings performance in EU Framework. Defence role and perspectives". Ilias Manolis (Colonel at the Hellenic MoD), December 2021.

"Green Public Procurement (GPP) Options in the EU Defence Sector", Abby Semple (Senior Associate Consultant & Trainer at Greenville Procurement Partners), January 2022.

"Barriers to Success and Solutions to Implementing Energy Efficiency Measures in Defence Buildings and Sites", Liam Mc Laughlin (CEO at GenO), July 2023.

One way to assess the defence sector unlocked potential for energy savings would be to look into the status and level of implementation by defence of the whole range of energy efficiency related instruments and tools covering policy requirements and targets, energy management, energy efficiency awareness-raising and behavioural change programmes, technology aspects and financing aspects. This has been assessed quantitatively and qualitatively, and the details and results of this assessment are available and can be consulted in the study *"Current and future trends in energy efficiency and buildings performance in EU Framework. Defence role and perspectives"*²⁹.

On the basis of the statistical data gathered from the defence sector and literature research, this study develops a methodology to map and score the level of maturity of the defence sector as a whole through the definition of **"Defence Energy efficiency Tools and implementation Indicators (DETI)"**, which show levels of implementation below 50% for all, and even lower for most of the tools and instruments considered (within a range of 0% to 100%), see here³⁰.

The level of implementation reflected by these indicators may be interpreted as the level of benefits achieved out of the full range of benefits attainable, whereas the unimplemented levels shown (up until 100%) would be a measure of the huge unlocked potential of the defence sector to achieve all attainable benefits.

All in all, an optimistic message must be conveyed that these shortfalls can surely be converted into great opportunities to unlock the sector's potential to enhance its energy efficiency and resilience and help progress in its path towards greener and more efficient operational models.

2.2. Renewable Energy Directive (RED)

Directive 2009/28/EC established a regulatory framework for the promotion of the use of energy from renewable sources, with binding national targets on the share of renewable energy to be met by 2020.

After several amendments and in the interest of clarity, the Directive was recast on 11 December 2018 and has since been referred to as the "RED II". A new target for the share of renewable energy was set at 32% for 2030, this time at Union level, which leaves greater flexibility for Member States (MS targets according to specific circumstances, energy mix and production capacity).

Given the size of the land and the infrastructure owned by the MoDs, a significant contribution could and should be made to help achieving the MS targets. Achievable targets should therefore also be set for the individual MoD contributions to their MS national targets and realistic roadmaps should be developed to ensure timely progress. Furthermore, due to the large number of aircraft, marine vessels and land vehicles, the effort should also include an increased use of RES in transportation.

As indicated hereabove, the RED II entered into force in 2018 and has been legally binding since June 2021. In July 2021, the Commission proposed another revision of the Directive, raising the 2030 renewable energy target from 32% to 40%. Less than a year later, following Russia's invasion of Ukraine and the need to accelerate the EU's independence from fossil fuels, the Commission proposed to further increase the target to 45%.

On 9 October 2023, the EU Council adopted the amended Renewable Energy Directive (RED III), as part of the "Fit for 55" package. The RED III aims to increase the share of renewable energy in the EU's overall energy consumption to 45%. On 12 September 2023, the RED III was adopted by the European Parliament.

29. Current and future trends in energy efficiency and buildings performance in EU Framework. Defence role and perspectives. Ilias Manolis (Colonel at the Hellenic MoD), December 2021.

30. [energy-buildings-performance.pdf \(europa.eu\)](#)

On 31 October 2023, the final version of the amended Renewable Energy Directive was published in the Official Journal of the EU and entered into force 20 days later, still allowing a further 18 months for Member States to transpose it into national law (not later than May 25).

Considering the current state of play (recent transition from RED II to RED III), the specific guidance provided here below remains based on the analysis of the RED II, obviously bearing in mind the new target of 45%. A full analysis of the impact of the RED III should be conducted as part of the next phase of the CF SEDSS.

Definition of the calculation of the share of energy from renewable sources:

"The share of energy from renewable sources shall be calculated as the gross final consumption of energy from renewable sources divided by the gross final consumption of energy from all energy sources, expressed as a percentage (sum of electricity, heating and cooling and transportation)."

Important remark:

The RED II requirements shall apply to the armed forces only to the extent that their application does not cause any conflict with the nature and primary aim of the activities of the armed forces and with the exception of material used exclusively for military purposes.

Notwithstanding the important remark here above, the analysis of the RED II offers clear and relevant guidance on increasing the RES share in the MoDs' energy mix and suggests focusing on the following aspects:

- Importance of district heating and cooling;
- Guarantees of origin for renewable gasses (including H₂);
- Alternate renewable fuels and renewable electricity in the transportation sector;
- Promotion of recycled carbon fuels;
- Promotion of non-biofuels based on production from renewable energy, i.e. synthetic fuels;
- Priority to waste prevention and recycling of waste (circular economy);
- Need for research in advanced fuels (aviation);
- Need for minimum RES levels for new and renovated buildings;
- Importance of energy performance contracts;
- Promotion of RES in isolated areas (including islanding);
- Promotion of decentralised renewable energy production.

On the other hand, the RED II also identifies several challenges:

- No additional land for biofuels (priority on use of waste and residues);
- Acceptable pollution by renewable energy installations;
- Geothermal only when there is a low environmental impact;
- Limitation on biofuels produced from food crops;
- Production of biofuels should not destroy biodiverse land or fragile ecosystems;
- Need for information and training (especially on heating and cooling).

Finally, the RED II defines calculation rules for the RES share, which allows establishing a clear baseline and monitoring the future evolution of renewable energy penetration in the armed forces.

2.3. Directive on Critical Entities Resilience (CER) and Related Regulations

Armed forces are, most of the time, not direct owners, or operators of critical energy infrastructures, although they may be major final users of services and goods provided by these infrastructures and their operators (e.g., electricity, gas, oil products, etc.). Therefore, the analysis of the EU regulations related to energy CEI is not directly carried out by MoDs, but by ministries in charge of energy issues, with sometimes low communication on these regulations' impacts for final users. Moreover, most of CEI related regulations do not apply to the defence sector, limiting the scope and willingness of the MoDs to engage with stakeholders over these regulations and their consequences.

Yet, as the MoDs are major final users of energy services and goods, CEI related regulations may have a direct impact over their operational efficiency and there is the need for MoDs to consider the analysis and adaptation to these regulations in order to avoid any major disruption in energy supply that could have an impact on nominal functioning. These CEI regulations can be divided in two major categories: security related regulations and other regulations.

2.3.1. Security-related ECI regulations

a) Energy-related regulations

Since the so-called "Gas wars" between Russia and Ukraine (2006-2009), the EU worked to elaborate regulations dedicated to energy security and energy infrastructure security, whether gas or electricity. They are also consistent with the 3rd Energy Package and Green Deal goals in terms of energy efficiency and interconnection, to support the European networks cross-border connectivity in the EU and abroad, with the Energy Community's non-EU Member States for example.

Security of Gas Supply, Regulation 2017/1938/EU

Regulation (EU) 2017/1938 has been introduced with the objective of reinforcing existing measures related to the security of gas supply in Europe. To achieve its goals, the Regulation has two main pillars: prevention of supply disruptions and mitigation of disruptions if they nevertheless occur.

As a first step, the Regulation contains a definition of certain groups of gas customers as "protected customers". While all household are to be considered protected, MS may also include other categories under certain conditions, such as SMEs, essential social services, and district heating installations. The supply to these protected customers must be ensured under very demanding conditions and their gas supply is the last to be curtailed in case of a crisis.

Moreover, for the first time in EU energy related policies, this Regulation contains explicit provisions regarding the practical application of the solidarity principle. MS must be prepared to help neighbouring EU countries and guarantee the provision of gas to a subset of their protected customers in the event of an extreme shortage, even if this would require domestic curtailments. This is a last resort measure and entails the payment of compensation.

Based on the results of the EU-wide simulations conducted by European Network of Transmission System Operators for Gas (ENTSO-G), Member States should prepare both national and common risk assessments. Common risk assessments aim to provide an accurate assessment of risks that are likely to affect several Member States in a given region, and for which an isolated national assessment would be insufficient. Both types of assessments are intended to identify and analyse both the likelihood and severity of risks at the national and regional level. All risk factors relevant to the case must be included, such as natural, technological, commercial, social, and political factors contributing to a crisis.

Building on the risks assessments, Member States have to prepare a Preventive Action Plan and an Emergency Plan. The Preventive Action Plan contains the measures necessary to remove or mitigate the risks identified in the common and national risk assessments. The Emergency Plan contains the measures to remove or mitigate the impact of a gas supply disruption. Both Plans require active cross-border cooperation and early drafts of these documents must be exchanged between Member States.

The Regulation defines three crisis levels:

- 'Early warning', where there is information to suggest an event may occur with a high likelihood of significantly deteriorating gas supply;
- 'Alert', triggered upon a significant deterioration of the gas system, but where the market is still able to manage the disruption; and
- 'Emergency', which requires an intervention and the use of non-market-based measures.

Additionally, the Commission may declare a regional or Union wide emergency where there is a crisis affecting several EU countries. In such cases, the Commission coordinates the action of the competent authorities, particularly regarding third countries, and ensures that action at Member State and regional levels is consistent with Union interests. In the event of a crisis, the Commission calls for a meeting of the Gas Coordination Group (GCG), an expert forum that facilitates the coordination of measures in the area of security of gas supply. This group includes representatives of national authorities as well as industry and consumer associations.

In an effort to identify vulnerabilities, major long-term supply contracts must be accompanied by a notification of the authorities. Additionally, major long-term supply contracts (i.e., that represent 28% or more of a Member State's annual gas consumption) must also be accompanied by a notification. Analysing these major contracts informs the preparation of sound policies regarding security of supply.

Risk preparedness in the energy sector, Regulation 2019/941/EU

The electricity sector in the Union is undergoing a profound transformation, characterised by more decentralised markets with more players, a higher proportion of energy from renewable sources that are also intermittent, and more highly interconnected systems that are vulnerable to cascading effects.

In this context, the Risk Preparedness Regulation (EU) 2019/941 aims to ensure that all Member States implement appropriate tools to prevent, prepare for, and mitigate electricity crises in a collaborative manner.

Based on the national and regional risk scenarios, Member States are obligated to develop a risk-preparedness plan containing measures to prevent and mitigate the risks identified. These plans must establish detailed procedures to follow in electricity crises, including market-based and, where necessary, non-market-based measures.

There are two crisis levels defined in the Regulation that can be declared by Member States: 'early warning' and 'electricity crisis'. An early warning is issued where there is information to suggest that a crisis may occur; this is typically informed by the findings of a short-term adequacy assessment. If prevention measures fail and the situation becomes critical, the competent authority may declare an electricity crisis.

In the event of an early warning or an electricity crisis, the Electricity Coordination Group (ECG) will be informed. The ECG is an expert group that includes national authorities as well as European Network of Transmission System Operators for Electricity (ENTSO-E), and the Agency for the Cooperation of Energy Regulators (ACER). It serves as a forum through which to exchange information and foster cooperation among Member States, particularly in the area of security of electricity supply.

In a spirit of solidarity, Member States must agree on measures to offer assistance to each other for the prevention and management of crises, notably with the purpose of protecting public safety and personal security. These provisions should be reflected in Member States risk-preparedness plans, following the spirit of solidarity provisions contained in the Regulation on measures to safeguard the security of gas supplies, Regulation (EU) 2017/1938.

b) Broader regulations

There is also the need to consider broader security-related regulations, related to both infrastructure protection and cybersecurity. The first major regulation in cybersecurity is the Network and Information Security (NIS) Directive (2016/1148/EU) that created obligations in cybersecurity for critical operators. NIS was an infrastructure-based regulation that considered the "critical" definition at a national level as being related to the ability of an operator to manage a facility or infrastructure itself considered critical.

Since 2018, the EU is considering a new orientation towards the security of critical infrastructure with a new nexus of directives intended to work as a global package, namely the Critical Entities Resilience Directive for non-cyber issues and the NIS2 Directive for cyber-issues. CER and NIS are switching from an infrastructure-based approach to an entity-based one. Moreover, they define the category of entity "of particular European significance", creating an expanded cross-border orientation for security.

2.3.2. Other ECI regulations

Some CEI regulations, if not directly related to security issues, may have a direct impact over the energy supplies for some EU members. They could be related to safety over industrial concerns such as the Seveso III Directive (2012/18/EU) or to data privacy concerns such as GPDR or NIS/NIS2.

a) Industrial hazards

Major accidents³¹ involving dangerous substances³² may have serious and extensive consequences. This is clearly shown by disasters, such as those of Seveso in Italy, Bhopal in India, or Schweizerhalle in Switzerland. The Seveso III Directive³³ is in force to ensure that a high level of protection against major accidents exists across the European Union. It achieves this by defining obligations for operators to take measures to prevent, mitigate the consequences of and recover from major accidents. It also requires operators to communicate important information regarding their activities (e.g., substances, quantities, surrounding factors increasing risk or consequences) and post-accident information, to draw up a major accident prevention policy, a safety report (for the highest-level hazards), and internal emergency plans.

In turn, the EU must designate a competent authority for implementing various obligations including compliance, the functioning of a system of inspections, making land-use decisions, and developing an external emergency plan. Also, some EU Members may decide to prohibit the use of a facility where measures are deemed insufficient and impose infringement penalties.

31. According to the Seveso III Directive, "...an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation (...) and leading to serious danger to human health or the environment, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances."

32. According to the Seveso III Directive, "... a substance or mixture ... including in the form of a raw material, product, by-product, residue or intermediate", they are categorised according to health hazards (acute toxic, specific target organ toxicity), physical hazards (explosives, flammable gases, flammable aerosols, oxidizing gases, flammable liquids, self-reactive substances and mixtures and organic peroxides, pyrophoric liquids and solids, oxidising liquids and solids), environmental hazards (hazardous to the aquatic environment) and other hazards (substances and mixtures in contact with water emit flammable gases).

33. Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0018>

The European Commission cooperates on the practical implementation of this Directive. However important this Directive is, and it has proven to be instrumental in reducing risk and consequences of major accidents over the years, it does not apply to military installations, nor to pipelines. The implications of this are such that there are no harmonised rules for chemical accident risk management nor is there any guarantee of a high level of protection against major accidents in military installations, which often house dangerous substances. For example, failure to apply a rigorous approach in a military setting contributed to the disaster in 2011 at the Cyprus Naval Base Evangelos Florakis where a sympathetic detonation of a stockpile of confiscated explosives took place, with severe consequences such as fatalities, injuries, property damage, and widespread power outages³⁴. Therefore, the Seveso III Directive has to be considered regarding ECI using or stocking potentially hazardous substances such as oil refineries, that are major contributors to military operational effectiveness.

b) Data protection

On December 2020, the European Commission presented a package of measures to further improve the resilience and incident response capacities of public and private entities, competent authorities and the Union as a whole in the field of cybersecurity and critical infrastructure protection. In that context, the proposal of the Critical Entities Resilience Directive ("CER" Directive) aims to enhance the provision in the internal market of services essential for the maintenance of vital societal functions or economic activities by increasing the resilience of critical entities providing such services. This proposal is consistent and establishes close synergies with the proposed Directive on measures for a high common level of cybersecurity across the Union ("NIS 2 Directive") which will replace the NIS Directive in order to address the increased interconnectedness between the physical and digital world through a legislative framework with robust resilience measures, both for cyber and physical aspects as set out in the Security Union Strategy.

Data security has been raised, during the legislation reviewing process as a major issue due to the development / creation of databases, open data sharing, smart systems, new provisions on data centres, etc. While the EU Commission calls for more efforts from the public sector – including armed forces – to achieve carbon neutrality, the necessary use of digital and smart tools to control the energy performance of buildings increase the risks of cybersecurity for the defence sector. Aside from the cyberattacks risk, other issues have to be considered:

- Risks of breach of confidential personal data and potential misuse of disclosed data;
- Risk of misappropriation, illegal processing or storage of data by service providers;
- Risk in the security and reliability of devices connected to the network and risk in the collection and processing of personal data by connected systems;
- Lack of possibilities to access or share data in a secure and reliable way;
- Lack of interoperability for data exchange between devices and/or actors.

In addition, defence buildings are mainly managed as sites and not as individual buildings. MoDs call for the use of smart devices for a site as a whole and not for individual buildings in order to decrease the number of cyber risks. Indeed, each single automation and control device carries a risk of cybersecurity.

34. Tavares da Costa, R. and Krausmann, E. (2021). *Impacts of Natural Hazards and Climate Change on EU Security and Defence*, EUR 30839 EN. Publications Office of the European Union, Luxembourg, ISBN 978-92-76-41947-1, JRC126315. [JRC Publications Repository - Impacts of Natural Hazards and Climate Change on EU Security and Defence \(europa.eu\)](#)

3. Roadmaps for Advancing Sustainable Energy in Defence

Based on the analysis of the energy policy framework, the relevant directives and regulations, this chapter aims at developing roadmaps, which MoDs will be encouraged to follow in order to address defence energy-related considerations and improve their energy sustainability and resilience in the following three energy strands:

- Energy efficiency and buildings performance;
- Renewable energy sources;
- Protection of critical energy infrastructure.

The roadmaps identify goals and desired outcomes and include the major steps and milestones needed to reach them. In other words, the roadmaps should provide clear guidance to achieve the specific objectives of each working group.

Indicative roadmap timelines take into account the ones of the European Green Deal and of the policy framework for climate and energy, e.g. reaching at least 50% of the greenhouse gas emissions reduction by 2030 and climate neutrality by 2050. In line with the three above energy strands under analysis, Chapter 3 will be divided in the following sub-chapters.

3.1. Roadmap for Energy Efficiency and Buildings Performance

The EU defence sector is considered a major infrastructure owner and energy consumer within the wider EU public domain. Therefore, it needs to take initiatives in order to exemplarily participate and actively contribute to each EU MS efforts to increase energy efficiency, upgrade the status of the public building stock and promote and adopt the rapidly rising technological solutions in the area of e-mobility.

The Regulation on the Governance of the Energy Union and Climate Action³⁵ offers the main regulatory framework to achieve the goals linked to the aforementioned efforts: the National Energy and Climate Plans (NECPs)³⁶. Therefore, it is considered of outmost importance that the defence ministries participate in the periodic revision of the NECP targets consultation dialogue with their competent authorities in order to define their roles and specific contributions in achieving the partial operational goals beforehand.

According to the data gathered and processed through specific inquiries performed in the framework of the three Phases of the Consultation Forum, it is obvious that there is limited involvement of the defence sector in national legislative, managerial and technological energy efficiency and building performance tools and consequently a limited access to national and EU funding opportunities.

Therefore, the adoption of a defence tailor-made Roadmap for addressing this challenge should be a top national priority of the defence domain, with the ultimate overall goal for the defence sector being to become fully involved in the national and EU energy saving efforts and a key contributor towards a decarbonised economy by 2050. The pursued overall desired outcome from this wider engagement of the defence sector would be the transformation of their actual operational models into greener, more efficient and resilient models that would not only not compromise their missions, but indeed increase their efficacy, extend their autonomy and enhance their resilience, with fewer costs. The main strategic axes of this roadmap refer to:

35. [Regulation – 2018/1999 – EN – EUR-Lex \(europa.eu\)](#)

36. [National energy and climate plans \(europa.eu\)](#)

- The active involvement of MoDs in implementing NECP goals;
- The establishment of effective long-term renovation strategies;
- The promotion of the massive implementation of existing and emerging technological solutions in these strategies;
- The adoption of GPP principles and guidelines to their procurement procedures;
- The conduct of suitable supporting evidence for applying e-mobility programmes of the defence conventional (internal combustion engine) fleet;
- The establishment of permanent mechanisms which ensure effective management of energy and climate-related considerations and MoDs access to national and EU funding schemes;
- The application of suitable energy efficiency policy instruments such as energy performance contracting and energy performance certificates and
- The continuing application of adequate training and educative programmes of the armed forces' personnel.

It is worth noticing that all relevant lines of proposals listed above follow a general plan, the steps of which are summarised below:

- Engage with your national competent authorities (NCAs) and other stakeholders and establish an effective channel of communication.
- Promote the defence related specificities for each energy efficiency and building performance element to the NCAs. Get involved, contribute and influence the definition of related policies and targets at national and EU levels.
- Engage in negotiations with your NCAs to define a staged progressive entrance of the defence sector into your NECP that is suitable, realistic and achievable for your organisation. Analyse your organisations' weakness and negotiate the setting up of SMART objectives and the provision of the external support required to help your organisation kick off and then develop its own initiatives until a certain level of maturity and autonomy can be acquired.
- Promote the outcomes of the discussions with NCAs to internal hierarchy. Foster capacity building, for obtaining consensus.
- Develop appropriate defence-specific energy efficiency policies, targets and objectives, supported by meaningful implementation strategies and consequent action plans, and make sure they are fully aligned with your national efforts and strategies, and supported by your NCAs.
- Explore options and implement the most suitable energy management system (EMS) or energy and environment management system (EnMS) to your organisation's needs and constraints.
- Explore existing technological and managerial solutions and identify suitable measures supported with justification cost-benefit analyses and corresponding implementation plans, with adequate allocation of resources and corresponding budgetary line proposals.
- Promote lower-cost initiatives based on awareness campaigns and behavioural interventions, both as stand-alone initiatives and in combination with buildings renovation and buildings systems upgrades interventions.
- Explore available mechanisms and identify lines of funding that are suitable to your organisation and plans and that may contribute towards their financing. If the progress of planning and building capacity within your organisation makes it possible, do start applying for funding for your projects to alleviate your organisation's budgetary effort.
- Plan properly for successful and effective implementation of planned interventions and define adequate performance indicators. Build organisational capacity, develop organisational procedures and allocate resources.
- Monitor, measure, verify and analyse data, obtain conclusions and then control and adapt implemented solutions and processes until efficiency and efficacy are maximised (Plan Do Check Act – PDCA – methodology).
- Inform, educate and train MoD personnel involved in the aforementioned processes.

The following timelines, milestones and desired outcomes are provided only for reference. MoDs are encouraged to liaise with their NCAs, to assess their existing level of implementation of energy efficiency legislation and measures, and to look into their organisations specific needs and constraints, with a view to define their own timelines, milestones and desired outcomes in accordance with their organisation's level of maturity, their own goals and objectives agreed with their NCAs, and with their resources and budget limitations.

› Preparation Phase: from now up to 2025

This phase will serve to set your organisation in track with your national and EU stakeholders, develop your own policies and strategies aligned with your national and EU targets and objectives, and start planning for implementation.

By the end of this phase, your organisation should be fully involved with your NCAs and have your own tailor-made policies and strategies and plans fully in line with your national and EU targets.

› Roll out Phase: from 2025 up to 2030

This phase will serve to initiate, launch, roll out and deploy planned energy efficiency actions and measures in a staged, progressive manner while developing capacity, knowledge and experience. Starting with pilot cases and small-scale initiatives, energy efficiency measures should be progressively extended and expanded across the whole organisation.

By the end of this phase, your organisation should be ready and capable to face implementation of complex initiatives and challenges with no, or very occasional support from other administrations. The following elements should be in place across the whole organisation: an energy efficiency vision, policy, long-term strategy and staged action plans, an energy related organisational structure and capacity, an EMS/EnMS implemented and maintained, effective green procurement provisions and procedures.

› Implementation Phase: from 2030 up to 2050

Implementation of energy efficiency planned actions and achievement of planned targets and objectives will be part of your organisation's business "as-usual" during this phase. You will use the capacity built and the knowledge and experience gained during the roll out phase to fully exploit your organisation's potential and contribution towards the achievement of national and EU targets.

Your organisation will make extensive use of the continuous improvement procedures embedded in your organisation's implemented EMS/EnMS and will become an autonomous player with little or none support required from other administrations.

By the end of this phase, your organisation should be able to work actively with your NCAs and play a proactive role in the elaboration of national legislation so that national and EU policies, targets and requirements are set in a way that facilitates and optimises your organisation's contribution without compromising the accomplishment and performance of your business.

<div>NOW</div> <div>2025</div> <div>2030</div> <div>2050</div>		
PREPARATION PHASE	ROLL OUT PHASE	IMPLEMENTATION PHASE
<ul style="list-style-type: none"> › Engage with your NCAs and other stakeholders and establish an effective channel of communication. › Promote the defence related specificities for each energy efficiency and building performance element to the NCAs. Get involved, contribute and influence the definition of related policies and targets at national and EU levels. › Engage in negotiations with your NCAs to define a staged progressive entrance of the defence sector into your NECP that is suitable, realistic and achievable for your organisation. Analyse your organisations' weakness and negotiate the setting up of SMART objectives and the provision of the external support required to help your organisation kick off and then develop its own initiatives until a certain level of maturity and autonomy can be acquired. › Promote the outcomes of the discussions with NCAs to internal hierarchy. Develop a sense of urgency, and foster capacity building and deeper understanding of leaders, for obtaining consensus. › Develop appropriate defence-specific energy efficiency policies, targets and objectives, supported by meaningful implementation of long-term strategies and consequent action plans, and make sure they are fully aligned with your national efforts and strategies, and supported by your NCAs. › Explore options for implementation of most suitable EMS / EnMS, as well as of existing technological and managerial solutions and suitable external lines of funding. › Explore available mechanisms and identify lines of funding that are suitable to your organisation and plans and that may contribute towards their financing. If the progress of planning and building capacity within your organisation makes it possible, do start applying for funding for your projects to alleviate your organisation's budgetary effort. › Plan properly for successful and effective implementation of planned interventions, and define adequate performance indicators. Build organisational capacity, develop organisational procedures and allocate resources. › Inform, educate and train MoD personnel involved in the aforementioned processes. 	<ul style="list-style-type: none"> › Continue and deepen your engagement with your NCAs and other stakeholders. Reinforce your participation in energy related fora and continue lobbying to promote defence related specificities. › Engage closely with assigned external support to help your initiatives kick-off as soon and as effectively as possible. › Commence and roll out organisational capacity and procedures. › Commence and roll out implementation of developed defence-specific energy efficiency policies, targets and objectives. › Commence and roll out implementation of chosen EMS/EnMS. › Commence and roll out implementation of technological and managerial solutions. › Commence and roll out implementation of long-term renovation strategies and action plans including managerial, renovation, technological, awareness campaigns and behavioural change initiatives. › Commence and roll out implementation of funding applications. › Monitor, measure, verify and analyse data, obtain conclusions and then control and adapt implemented solutions and processes until efficiency and efficacy are maximised (Plan Do Check Act – PDCA – methodology). › Monitor and review the achievement of your assigned targets closely with your NCAs. Reassess progress and renegotiate adjustments if considered necessary. › Inform, educate and train MoD personnel involved in the aforementioned processes. 	<ul style="list-style-type: none"> › Continue and deepen your engagement with your NCAs and other stakeholders. Adopt a proactive influencing role in promoting defence specificities. › Monitor performance and re-adapt your organisational built capacity to improve performance. › Continue with the implementation and deployment of strategies and action plans. › Monitor, measure, verify and analyse data, obtain conclusions and then control and adapt implemented solutions and processes until efficiency and efficacy are maximised (PDCA methodology). › Exploit the potential of continuous improvement procedures from your EMS/EnMS. › Monitor and review the achievement of your assigned targets closely with your NCAs. Reassess progress and renegotiate adjustments if considered necessary. › Inform, educate and train MoD personnel involved in the aforementioned processes.

3.2. Roadmap for Renewable Energy Sources

Policy developments relevant for the advancement of renewable energy sources

In the Council Conclusions on Security and Defence in the context of the EU Global Strategy (June 2019)³⁷, the Council of the EU acknowledged for the first time the relevance of environmental issues and climate change for CSDP missions and operations, including its impact on military capability planning and development. It also welcomed all progress achieved in the context of the CF SEDSS and called for strengthening cooperation in tackling energy security challenges, including via energy efficiency, renewable energy solutions and the protection of critical energy infrastructure. These commitments, together with the European Green Deal, provide a clear mandate for member states to support the implementation of the EU climate and energy targets within the defence sector. Likewise, the REPowerEU Plan³⁸ strongly emphasises the need to significantly accelerate the move to renewable energy sources in order to reduce dependence on importation of fossil fuels, in particular from Russia and other unstable regions.

Ministries of defence, as well as other ministries, can make a significant contribution to the completion of the national plans regarding RES and structured interaction between relevant ministries should be envisaged. A buy-in at strategic level within states is essential if substantive progress is to be made in the defence and security sector. CF SEDSS can have a significant impact in fostering the bottom-up element. However, it should be supported by a top-down component which sets agendas both at EU and national levels.

Based on the WG2 objectives above, as well as the as the strategic objectives of the Forum as described in Chapter 1 – 'Strategic Context', WG2 proposes the following goals and the required steps/milestones to achieve those goals. Chapter 4 will further elaborate on concrete implementation steps.

a) Introduce a strong renewable energy component in the national defence energy strategy/policy

It is essential that national defence energy strategies and policies recognise the key role of renewable energy in increasing resilience and energy security within the defence sector, by reducing dependence on external energy suppliers and encouraging diversification of energy sources.

A prerequisite for building a national defence energy strategy/policy is recognising the value of renewable energy in increasing resilience within the defence sector, and thus energy security, by reducing dependence on external energy suppliers and encouraging diversification of energy sources. Enhancing defence resilience through the introduction of renewable energy technologies and the use of energy management systems can lead to:

- Reduction of logistics burden;
- Greater endurance in the field;
- Reduction in harmful emissions;
- Reduced dependence on supplies from politically unstable countries.

Defence energy security and autonomy is especially relevant in the aftermath of the Russian invasion in Ukraine in 2022 and the resulting pressures on natural gas and oil supplies throughout Europe. In this respect, the REPowerEU Plan on reducing dependence on fossil fuels provides a useful guidance towards fast forwarding the transition to clean energy. The REPowerEU Plan and the decoupling from dependency on fossil fuels from third countries could accelerate the inclusion of a RES component in the defence strategy.

37. [sti0048-en19.pdf \(europa.eu\)](#)

38. [EUR-Lex – 52022DC0230 – EN – EUR-Lex \(europa.eu\)](#)

b) Increase resilience of the defence sector and contribute to European and national energy security by reducing dependence on fossil fuels

Renewable energy sources are key for increasing resilience within the defence sector. They will diversify energy sources and reduce dependency on external energy suppliers.

The use of distributed energy grids can contribute to the protection of critical infrastructure and to energy security. Furthermore, the increased use of RES and diversified energy storage within defence facilities will increase resilience and reduce dependence on external supplies. A multifactor analysis and decision-making process should underpin the roll-out of alternative fuels for defence capabilities, such as hydrogen.

c) Increase RES awareness and skills within armed forces at all relevant levels to maximise resilience and enhance operational effectiveness

The defence sector should ensure that RES awareness is maximised within its different branches (procurement, design, operation, etc.). This can be partially obtained by using existing systems from the civilian sector (COTS-commercially of the shelf). Other steps to reach the objective could include:

- Develop training programmes and communication campaigns regarding RES based energy technologies and systems within the armed forces in order to enhance the awareness of all personnel;
- Develop specific training programmes for respective defence branches (procurement, infrastructure and operational) to cover gaps in the implementation of different RES;
- Consider organising courses at European level in a similar manner to the very successful EDA Defence Energy Managers Course;
- Monitor new research related to renewable energy storage and alternative fuels.

The importance of communication on RES implications on the armed forces is to be underlined and implemented. Correct training and information on respective levels through different domains will enhance RES penetration and increase the resilience and effectiveness of military installations or systems.

The increase of awareness will furthermore augment the quality of technical installations on the day-to-day way of working. This will ensure the return of investment or cost reduction the RES will have on the OPEX.

d) Examine the feasibility of applying existing and emerging RES technologies across national defence sectors

Renewable energy technologies have an important role in supporting the achievement of climate targets and ensuring resilience and energy security. They should be examined comprehensively in terms of their potential value in supporting the defence energy transition and checked carefully against military requirements.

e) Adopt a lifecycle cost approach to energy procurement

It is widely accepted that adopting medium to long-term policies to reduce reliance on fossil fuels will lead to financial savings in the longer term. Also, energy diversification may also contribute to the energy economy and local/regional development. However, MoDs need to be prepared to increase financial provision in the shorter term in order to address challenges due to rising costs and scarcities in supplies:

- Renewable energy installations are capital intensive (CAPEX), so more investments and funding are needed. However, subsequent OPEX are expected to decrease over time.
- Diversification of energy sources may lead to more expensive and complex logistic support.
- Savings may not always benefit the defence sector directly.

f) Make the defence sector an 'exemplar' for national and EU RES efforts

EU climate ambitions require a whole-of-society approach, including the engagement of the public sector and the armed forces/MoDs. European armed forces have been supporting the energy transition with multiple initiatives, of which the public is often not aware. Therefore, the climate action achievements of the armed forces should be publicised, including with regard to renewable energy, to display national leadership in promoting the use of renewable energy, reducing carbon footprint and improving energy efficiency. Furthermore, where this is still not the case, the defence sector should be encouraged to become a leader in cutting-edge RES technologies and applications, by testing them against military requirements and implementing them in military infrastructure or camps and military mobility.

g) Stimulate cooperation with the civilian sector to boost the RES related economy, accelerate roll-out of RES in armed forces and accommodate military concerns

Defence can be a prime mover for new RES technologies in cooperation with the civilian sector. Defence requirements can be more stringent and challenging than the civilian sector. In this way the private company can get a competitive edge over its competitors, which makes it worthwhile to invest in and cooperate with the defence niche-market (e.g. lightweight solar panels). Public-private cooperation can be encouraged to accelerate sustainable projects implementation, business strategies and future developments. For example, innovative mechanisms such as energy performance contracting can be used to deliver more effective implementation of RES projects.

h) Exploit frameworks for delivery of renewable energy projects in both national and EU contexts

Trans-national frameworks at the EU level and national frameworks could help combine technologies and resources in a manner that best facilitates development and implementation of renewable energy solutions in terms of transportation, electricity and heating and cooling.

3.3. Roadmap for Protection of Defence-Related Critical Energy Infrastructure

The protection of defence-related CEI is a paradoxical issue for EU MoDs as they are not directly in charge of managing or regulating this sector in most countries. Therefore, all the subsequent elements of the roadmap have to be considered in conjunction with national competent authorities (e.g., Ministry in charge of energy) as this issue is usually a cross-cutting and interagency topic. Nevertheless, the MoDs as major users of services and goods provided by CEI have to consider implementing a strategy and carrying out specific actions to strengthen the protection of defence-related CEI and ensure their own resilience.

Milestones and concrete goals

Regarding the different EU goals in reduction of GHG emissions and energy transition, there is the need to consider two different milestones for the roadmap, namely 2030 and 2050, that are also consistent with MoD planification and budget issues to enable the development and deepening of some policies.

Six different subdomains have been identified in both technical and non-technical aspects to allow MoDs to strengthen and develop their level of awareness and resilience regarding the protection of defence-related CEI.

Reduce asymmetry of information

As already mentioned, MoDs are not – in majority – direct owners, operators and regulators of CEI. There is therefore the need to establish or deepen communication between MoDs and all energy value chain stakeholders to reduce the asymmetry of information regarding threats, regulations, use and protection. Sharing information on a regular basis, using dedicated systems or gateways is a major issue for the protection of defence-related CEI and could be considered a top-priority for MoDs, in dedicating manpower and resources.

Structural mapping and metering

To understand the potential vulnerabilities of MoDs regarding the supply of energy and the relationship to CEI, there is the need to establish a mapping of both interrelations and flows of energy inside the MoD. Having a day-to-day knowledge of the different areas of consumption, their interrelations to a specific provider, the possibility to switch from a provider to another and the criticality of specific facilities or infrastructures is necessary in order to further implement a resilience strategy based on prioritisation.

Prioritisation and strengthening

Resilience comes with the ability to run with lower access to resources and to restore nominal or acceptable system functions as soon as possible. The mapping and metering solutions implemented should therefore come with the ability to prioritise the use of energy in specific areas or infrastructure. Complementary to this ability to prioritise, there is also the need to maintain specific capacities for back-up energy production and storage, especially fossil fuels generators in the armed forces, that comes with the need to maintain the ability for proper function and maintenance for generators and fuels at satisfactory levels to maintain operability in MoD critical functions and areas. In terms of analysis, energy resilience should therefore be included as a key element in planification and in planification-design procedures, not only at a logistical and financial level (J4/J8) but at an operational level (J5).

Raising awareness and training for security conscious energy

Regarding the function of the MoDs and the actions taken from them towards training their personnel, both military and civilian on CEI security issues, there is the need to enhance the level of awareness and readiness. MoDs are major information-owners, with dedicated early-warning capabilities such as space-based systems. Moreover, MoDs could also provide dedicated training and certification for CEI security operators in order to raise the global security level. Further engagement from MoDs could also be considered as some specific CEI could benefit from having dedicated military units for security, notably in nuclear.

Tracking and investing in new technologies for resilience

There is also a major issue concern related to technology in protecting CEI and in strengthening MoD resilience in energy consumption. MoDs should therefore engage in a global identification and promotion of dedicated technologies. Depending on the specific capabilities of MoDs – including in terms of budget – maintaining a technological watch, investment in identified companies or projects and providing specific test-beds and test-facilities are the key elements to ensure the MoDs ability to benefit from technological developments in securing CEI.

Adaptability to structural changes in energy systems

MoDs should also be able to adapt their organisation and procedures to cope with structural changes in the energy (e.g., decentralisation of production and consumption, rise of prosumers, etc.) and climate landscape. The foreseeable multiplication of climate-related crises and their impact on defence-related CEI may lead to a broader involvement of MoDs in crisis mitigation and crisis relief activities. Creating and updating a dedicated doctrine for CEI protection, participating in nationwide crisis-based exercises and crisis-response plans should be part of the MoDs' adaptation towards this new situation.

Cross-cutting issues

The different milestones already considered must be consistent with the EU goals and therefore the roadmap should be implemented with a two-phase splitting between initial actions and generalisation. Yet some issues have to be exempt from this separation in two phases as they need to be implemented at the initial level and carried-out on a continuous basis to provide the fundamental layer for the whole roadmap.

Cybersecurity

The digitalisation of energy systems and networks has been an ongoing process in Europe for years. Implementation of smart meters and automated control systems may therefore create new security concerns as they progressively become targets for both state and non-state actors (organised crime groups, ideological groups, etc.). Investing in and implementing up-to-date cybersecurity strategies and technologies should therefore be a major element of the roadmap, to prevent any major cyber-related crisis for defence-related energy infrastructure (data leak, supply chain attack, etc.). The strategies should take a comprehensive approach addressing – beyond "classic" IT – also subjects related to operational technologies (OT) and internet of things (IoT) technologies.

Foresight analysis on energy issues

There is also the need – over the period from 2030 through 2050 – to maintain analysis and awareness capabilities in terms of foresight analysis in a multidimensional vision. This foresight analysis on energy systems needs to encompass both a permanent update on related risks (cyber, physical, hybrid), on technologies for protecting CEI (AI, sensors, etc.), on skills needed for dedicated personnel – especially digital-related ones – and broadly on the energy providers' overall landscape of geopolitical, economic, financial, and regulatory issues.

Quick response mechanism on acute events affecting energy related issues

There is a need to establish an effective and quick response mechanism in order to address acute events affecting energy related issues like the recent pandemic of Covid 19. Such events might seem to occur unexpectedly, but modelling and simulation as part of system-of-systems theories have shown that such events have elements in common such as cascading disruptions across sectors and borders and impacts on production and supply chains. Certain elements can be predicted, and key risks, vulnerabilities and threats can be addressed as part of a strategy for increasing resilience. This mechanism must be effective in the sense that every decision must be taken horizontally in order to ensure compatible responses in every MS as the CEI are interconnected and do not operate in isolation.

Geopolitical influence on financial and economic growth issues

Economics was a main driver of globalisation, and economics still account for the main vectors for the transmission of risks and disruptions across borders and even at global levels. Historically, in times of economic turmoil, as the world has seen in the recent economic recession years where some European countries were severely impacted, classic macroeconomic theory dictates that in order to restore economic growth, attracting foreign direct investment is a must. However, this might prove to be problematic in a globalised economy where the protection of critical energy infrastructure and of those dependent on it also has dimensions related to capitalisation, ownership (especially by entities from systemic rivals) and market pressures. This is extremely important considering the fact that the vast majority of energy related infrastructure is in the hands of the private sector and responds to different incentives and priorities than the public authorities. Both the pandemic and the war in Ukraine have shown the security concerns that can arise from ownership issues and from the impact of price volatility, risk perceptions and market movements on the financial health of CEI operators and their capacity to function.

Protecting offshore critical energy infrastructures

A key emerging issue, highlighted by the high-profile sabotage events on pipelines and undersea cables, is the protection of offshore critical energy infrastructures. They encompass oil and gas installation, offshore renewables such as wind farms, electricity transmission cables between countries and between production areas and the shore, and pipelines between countries or between installations and the shore. For a wider definition, we can even include the transport routes for shipborne energy such as oil and liquefied natural gas. These present unique challenges related to environmental hazards, accidental threats and deliberate threats, all in a difficult and dynamic environment with limited surveillance and intervention capability and with challenges also for normal operation, repairs and maintenance. Further issues are related to the grey zones of operation within the exclusive economic zones of every EU Member State to which this applies. The EEZs not only host oil and gas installations, pipelines and electricity or communication cables, but also increasingly floating wind farms, which can occupy a wide space. The delicate issues of military operations in these areas, deterrence and the use of lawfare by systemic rivals to discourage and disrupt legitimate and critical use are important issues and are magnified in international waters. Here we can refer to issues raised before and have to do with the harmonisation of defence-related issues with other ministries, such as energy and maritime affairs. Close collaboration with various actors from the private sector, the MoDs and the maritime world need to harmonise their actions with respect to international regulations.

Critical supply chain security

The EU has advanced steadily in raising awareness and developing a framework for critical raw materials and especially the rare earth metals vital to the development and large-scale implementation of green technologies. However, we must also consider the other aspects of supply chain security, related to providers of hardware and software (and of integrated solutions), which experience their own risks, threats and vulnerabilities to supply chains and also exposure to cyberattacks meant to infiltrate, damage or leave vulnerable CEI utilising the compromised components. MoDs require a better awareness of these threats, especially as they relate to the increasingly concentrated global market for computing power, for wind and gas turbines, for telecommunications equipment, for solar panels or industrial control systems. As prosumers, they will also experience these vulnerabilities; as consumers, they are exposed to them, and they must lend their voice to the pro-resilience and pro-security view of supply chain sustainability to balance the purely economic one.

4. Guidance for the Implementation of the Defence Energy-Related Roadmaps

This chapter will describe how to implement the roadmaps from the previous chapter, through a microlevel analysis and explanation of the defined steps/milestones and exemplifying case studies. The main lines of action identified in each roadmap will direct the sections of Chapter 4. These sub-chapters provide specific guidance and describe in further detail the measures that would need to be implemented to achieve the required outcome.

4.1. Guidance for Energy Efficiency and Buildings Performance

This sub-chapter provides general guidance for the implementation of the roadmap and milestones described in the previous chapter. More specifically, it provides general and more specific recommendations on the establishment of a roadmap on energy efficiency and buildings performance (REEBP) governance, policies and measures that act as the framework and tools required to support the action taking and attain the set objectives.

Establishment of a REEBP Governance

Table 1: Governance policy axes to attain the REEBP objectives

PGA1: Single governance framework
PGA2: Continuity and consistency in the implementation and performance of policies measures by institutional bodies
PGA3: Monitoring mechanism for the implementation and performance of policies and measures
PGA4: Strategic reference framework for development programmes to be planned and adopted by the network operators and the regulator
PGA5: Development and implementation of financing mechanismd and programmes for the attainment of the objectives
PGA6: Information and training actions for energy transition and addressing climate change

Along with the adoption of a REEBP policy in the organisations, the establishment of a tailor-made REEBP governance, laying down the appropriate structure of organisational hierarchy, practices, regulations and procedures to facilitate the type of effective decision making and management that will deliver the long-term success we are aiming for, is crucial to attain the REEBP policy vision, goals and overall objectives. However, such governance cannot possibly be designed and then implemented within our MoDs without the allocation of a multidisciplinary **Project Team** dedicated to the elaboration, execution and implementation monitoring of the REEBP policy and also to the design and implementation of the REEBP governance itself. Policy, governance, personnel, and resources are all, in view of the authors, interrelated in such a manner that the failure of one will bring the failure of the whole enterprise.

Starting with the Project Team, and to ensure the effectiveness of this assignment, it is strongly recommended that it be comprised of an **adequate number of competent multidisciplinary personnel**, with the necessary **resources** at their disposal in terms of access to information and of availability to funding mechanisms that allows them to subcontract the conducting of specific studies and the development of mathematical or other statistical tools which would enable the quantification of necessary energy data. It is also important to ensure the **consistency and continuity of this team**, so that potential political, governmental or other administrative changes do not affect the anticipated unimpeded fulfilment of its tasks.

It is also worth mentioning that due to the fact that this team has to coordinate its actions with the NECP CA and related stakeholders, it is necessary to put in place a **cohesive process** for ensuring both the effective implementation of the policy measures included in the Defence Long-Term Renovation Strategy and the redrafting of existing measures and the drafting new ones in order to attain the objectives and maximise synergies between cross-sectoral policies.

As far as the REEBP governance itself is concerned, the authors recommend that it be designed around the 6 policy axes described in the Table 1 above.

The development of a **single governance framework**, to monitor and assess in a cohesive manner both all the policy measures laid down in the Defence Long-Term Renovation Strategy by 2030. The implementation of such single governance framework will ensure **continuity of the policies and measures to be implemented and consistency** between **MoD and external institutional bodies** involved in the implementation of these policies and measures.

A fundamental component of the single governance framework is developing **an integrated monitoring mechanism for the policies and measures under implementation**. This mechanism will include procedures for the continuous monitoring of both the attainment of the individual objectives and the performance and impact of each policy measure individually, based on the use of relevant **critical performance indicators** that will take into account, inter alia, the degree of implementation in relation to the initial scheduling of policies and measures, the cost-benefit ratio of energy objectives and their potential degree of interdependence and complementarity.

A critical aspect of the monitoring mechanism is its capacity for assessment and redesigning of existing measures marked with lower performance levels on one hand and, on the other, promoting more intensively those marked with much higher performance levels. The continuous assessment of the policy measures under implementation is crucial for taking timely decisions about the redesign or replacement of existing policies, or the adoption of new policies that would need to be launched in order to prevent putting the attainment of the objectives at risk. The assessment of policy measures will be based on a specific methodological approach permitting the analysis of their socio-economic impact and balancing it against their contribution towards the attainment of the objectives that have been set. That is why it is **vital to ensure the methodological cohesion of the policies and measures planned on the basis of a detailed assessment of their quantitative and qualitative impact**.

A similar approach and a relevant model will be **used in designing and implementing financing mechanisms and programmes**. More specifically, the ultimate objective of this framework is to utilise existing resources and mechanisms in order to launch the implementation of the mix of policy measures initially envisaged in the context of the Renovation Strategy or those to result from the assessment procedure through the monitoring mechanism, with particular emphasis placed on designing appropriate financing mechanisms in the new programming period 2021-2027, as well as on ensuring the optimal utilisation of other financing funds.

Finally, although not falling clearly within the remit of the governance mechanism, emphasis will also be placed on the **central planning and implementation of specific information and training actions for all stakeholders (both within and outside of MoD activities)**, to get them acquainted with the requirements and challenges of energy transition of the defence sector. This axis aims, through specific actions, to provide comprehensive information and training to personnel and raise awareness among them in energy and environmental issues, to include energy efficiency considerations within all decision making, in line with the philosophy of the EED principle of the "energy efficiency first".

REEBP Policies

An indicative (suggested) list of the main policies regarding energy efficiency and energy performance of buildings is the following:

- Improvement in energy efficiency of MoD's buildings (for new constructions, renovations and maintenance) in the framework of the exemplary role of public sector – Improvement of urban public space microclimate in defence installations.
- Promoting energy efficiency contracts by energy service companies.
- Promoting innovative financial instruments to ensure private capital leverage and financial sector involvement.
- Framework for the replacement of MoD's fleet of polluting passenger vehicles and other types of vehicles (preferably electric ones / e-mobility).
- Energy efficiency improvement of defence electricity and gas infrastructures.
- Promoting measures for modernizing defence water supply / sewage and irrigation infrastructures.
- Promoting efficient heating and cooling.
- Training and informing MoD's personnel on energy-efficient equipment and rational use of energy.

REEBP Measures

An indicative (suggested) list of the main measures regarding energy efficiency and energy performance of buildings is the following:

- Promotion of energy performance contracts through targeted financing programmes.
- Financing programmes for the renovation of defence buildings in the context of the new programming period of EU structural funds.
- Financing of defence building upgrades as essential parts of the action plans for sustainable energy and the action plans for energy efficiency of buildings under the responsibility of municipalities and regions.
- Strengthening of the role of energy managers for defence buildings.
- Promotion of energy management systems in defence camps and at the ministry level (either under the auspices of EDA'S DEMC programme or other national initiatives).
- Regulatory and financial measures to promote nearly zero energy buildings (NZEBs).
- Establishment and definition of the role of the defence sector in the National Energy Efficiency Fund.
- Implementation of information actions on energy efficiency.
- Promotion of energy-efficient products through the implementation of energy labelling and of the eco-design Directive in the defence sector.
- Promotion of innovative smart city models through the use of state-of-the-art technologies, using military camps as pilot models (cluster approach).
- Creation of database for energy characteristics of defence buildings and energy upgrading actions.
- Implementation of a programme for the replacement of defence passenger vehicles and other types of vehicles with new high energy efficiency ones (preferably electrical).
- Promotion of measures for modernizing defence water supply / sewage and irrigation infrastructures, to save both water and energy.

Miscellaneous Measures

Elaborating on the aforementioned concrete measures, an additional set of miscellaneous suggestions/recommendations are hereby summarised that comprise concrete actions to alleviate the defence sector's process of adaptation to the EU and national energy efficiency related policies, strategies and pieces of legislation and promote the unexploited contribution towards set targets and objectives also under the perspective and some of the aspects of the EU EEAS/EUMS and their recent publications on the revised EU Concept for Environmental Protection and Energy Optimisation for EU-led Military Operations and Missions and the Climate Change and Defence Roadmap:

- Create incentives that allow a smoother implementation of both EED & EPBD's policy tools and instruments like energy saving contracts, long-term renovation strategies to NZEB standards and renovation passports, to the wider EU public and (therefore) to the defence sector.
- Identify defence (based on the outcomes of the CF SEDSS related studies and Phase III Guidance Document's conclusions) as a key stakeholder of EED's provision about NECP periodical strategic amendments to promote the potential contribution that energy efficiency action plans of the military domain can have in order to achieve national energy efficiency and saving goals.
- Although defence-specific operational buildings were exempted from complying with existing (at the time of this report) EU energy efficiency legislation (Art. 5.2 of EED), and in view of the removal of such exemptions in the forthcoming recast of the said legislation, there seems to be consensus within the defence sector around two approaches or lines of thought: the first one aiming at the introduction of such exemptions in the forthcoming recast EED, and the second one aiming at the setting of an appropriate categorisation of defence operational buildings, along with the definition of appropriate energy related metrics and indicators, and the introduction in the forthcoming recast EED of defence-specific adapted provisions, in order to allow the calculation of their energy performance and exploit opportunities for energy savings in line with defence operational specificities, taking into consideration potential constraints regarding the monitoring and disclosure of confidential data, related to the operational activities held within the corresponding buildings.
- Modify accordingly Articles 17 and 18 of EED to facilitate the establishment of suitable monitoring measures of awareness raising and capacity building activities, not only in the military but in the wider EU public sector. Such measures could render compulsory the setting of indicators which correlate, for instance, the number of people participating in training, education or even sensitizing programmes with regards to the energy efficiency achieved through these activities.
- Although defence non-operational temporary (less than 2 year's lifespan) buildings are exempted from complying with energy performance requirements (Art. 4.2c of EPBD), there is also consensus within the defence sector that, on one hand, there is a lack of planning when it comes down to deciding on energy performance requirements for temporary infrastructures, and on the other, that temporary (re)locations of personnel to temporary installations while building a new, or deep renovating an existing non-operational building (office or similar non-operational facilities) tend to extend in time and go beyond the 2 years' time expressed in the said article of the EPBD. This is also normally the case for military camps in missions abroad, which are normally planned for a period of 6, 12 or 24 months and then end up extending for several years, although these operational aspects are not be dealt with by the CF SEDSS.

There is general consensus within the defence sector that there is a need to implement a proper planning process for installation, use and removal of temporary infrastructures, both in terms of time horizon and energy performance requirements at the design phase, bearing in mind that a potential service life extension might, most likely, justify the additional costs involved in such investments. Also, there is agreement on the convenience and benefits of utilising the so-called "*Permanent Dismountable Buildings*" (PDB), which allow for transportation and re-installation of big infrastructures and the consideration of related costs as operational costs, and not as investments counting towards the national debt.

4.2. Guidance for Renewable Energy Sources

This chapter will present guidance for implementing the roadmaps introduced in Chapter 2, by providing more detailed analysis and key steps to achieve the required outcome.

a) Introduce a strong renewable energy component in the national defence energy strategy/policy

Recognising the importance of RES in defence needs to be supported by the creation of a clear defence energy policy and strategy. These should be underpinned by relevant energy management structures as well as the identification of collaboration possibilities, including with the private sector.

Likewise, the implementation should be aligned to the extent feasible with the REPowerEU Plan, including the recommended steps to save energy, diversify supplies, quickly substitute fossil fuels and smartly combine investments and reforms.

Key steps

- Prepare a defence energy policy and strategy.
- Develop an implementation plan for RES in the defence sector, consistent, where applicable, with NATO approaches to RES. Such a plan should identify relevant structures/bodies and their responsibilities and include a well-defined timeline including the required milestones, objectives and key performance indicators to follow and measure the degree of implementation.
- Develop and maintain an energy management structure for the defence sector at national level, informed by sharing of experiences with participating states as appropriate.
- Give strong attention to RES and prioritise energy efficiency in infrastructure development and mobility plans.
- Insert binding requirements in infrastructure procurement contracts to prioritise the use of RES.

b) Increase resilience of the defence sector and contribute to European and national energy security by reducing dependence on fossil fuels

Key steps

- Increase electrification of defence facilities, including through on-site generation from RES.
 - › This will increase resilience, contribute to diversification and reduce dependence on external supplies.
- Consider the use of suitable energy storage solutions to cover RES intermittency.
 - › Energy storage systems play a crucial role in enhancing the effectiveness of RES-based energy generation and the overall resilience and efficiency of energy systems. At certain times, installations can produce much more energy from RES than they can use, and at other times, the RES may produce little or no power. It is, therefore, desirable to store the surplus energy in a manner that makes it reusable within the installation (long-term storage).
 - › CF SEDSS Working Group 2 on RES has used a contracted research study to define the key requirements for an energy storage selection decision support tool for homeland defence installations. It has investigated how to best utilise energy storage technologies in combination with a selected RES solution. Based on this analysis it developed key requirements that can be used as a basis for a decision support tool. Such a tool would provide guidance to MoDs, about the most suitable energy storage technologies (or a mix thereof) to be used in combination with RES. However, further work is needed to explore the best options for robust renewable energy storage.
 - › The existence and applicability of specific regulatory and financial incentive tools for the installation of energy storage systems should be explored. At present, energy storage projects are costly, and therefore consideration should be given to any financial support for such projects.

- Consider islanding of installations to improve operational autonomy.
- Consider the use of distributed energy grids, including energy storage and energy management systems (EnMS), which will contribute to the protection of defence critical infrastructure and energy security.
- Consider connection of military bases to sustainable district heating and cooling networks where possible.
- Consider the use of alternate fuels, such as hydrogen.

c) Increase RES awareness and skills within armed forces at all relevant levels to maximise resilience and enhance operational effectiveness

Key steps

- Include an appropriate level of energy related subjects in all levels of military training.
- Consider organising courses at European level in a similar manner to the very successful EDA Defence Energy Managers Course.
- Prioritise focused training of key personnel engaged in design, engineering, procurement, construction, operation, maintenance, and other technical aspects of RES roll-out.
- Promote the use of RES decision making tools (planning, simulation, validation, database of energy systems).
- Provide demonstration/field tests of new technologies to raise awareness and increase skills and share as appropriate with other Member States.
- Communicate locally about the impact of RES on the local barracks or systems.

d) Examine the feasibility of applying existing and emerging RES technologies across national defence sectors

Key steps

- Encourage energy related studies, including innovation and development of different RES technologies and applications in the armed forces, renewable energy storage and new fuels.
- Examine the feasibility of applying existing and emerging RES technologies across national defence sectors, including by implementing pilot projects and other tools, such as dedicated test facilities and field labs for experimentation.
- Study and test the application of new fuels and electrification for mobility, including hydrogen technologies with special attention to supply chains and the challenges of roll-out of new fuels within armed forces.

e) Adopt a lifecycle cost approach to energy procurement

Key steps

In order to address the challenges of the rising costs of switching to RES, the following solutions may be considered:

- Continue switching from fossil fuel dependent systems to RES as much as possible and gradually.
- Identify and remove obstacles to implementation of RES and energy storage within the armed forces.
- Consider renting or leasing of equipment so that defence will not be compelled to use old(er) systems and systems and suppliers can be changed more easily.
- Consider working with modular systems to implement innovation step by step.
- Consider long term contracts for supply of a range of energy services and support. Use power purchase agreements to accelerate switch to RES.
- Consider a mechanism where the savings from RES contracts are earmarked for future investment in RES.
- Explore the use of the EU funding to alleviate financial burden and reduce the lifecycle cost.

f) Make the defence sector an 'exemplar' for national and EU RES efforts

Key steps

- Promote defence energy projects to the civilian sector.
- Improve the penetration of innovative RES technological solutions from civil sector into the military and disseminate to the public.
- Provide defence-based test opportunities to civilian companies to test/use new technologies, making the armed forces a strong contributor to innovation in RES technologies and applications. Such companies can help find solutions by understanding better the challenges confronting MoDs.
- Prepare strategic communication about energy projects and achievements in the defence sector.
- Initiate projects involving test and evaluation (T&E) centres, research and technology organisations (RTOs) and academia, promoting awareness via social media and universities (e.g. sponsoring students to work on projects relevant to defence) and fostering clusters amongst academia/RTOs/T&E centres/industries etc. on specific RES topics at EU level.
- Participate in energy-related events to raise visibility, e.g. energy systems innovation promotion, including as a way to attract new personnel to the armed forces.
- Raise interest of students during these visibility events, making it known that energy transition is a topical issue within MoDs. Where appropriate, Internships could be offered to students who are willing to work on defence energy-related topics.

g) Stimulate cooperation with the civilian sector to boost the RES related economy, accelerate roll-out of RES in armed forces and accommodate military concerns

Overall, it is important to establish and facilitate networking and collaboration with the private sector, RTOs and academia on mutually beneficial RES solutions (e.g. by means of FieldLabs / community networks around barracks). Likewise, military roadmaps should be aligned where appropriate with relevant civilian strategies.

Key steps

- Enable close coordination with the industry and academia to develop innovative RES solutions for defence.
- Communicate military needs more directly to industry.
- Consider use of innovative financial and contractual mechanisms such as energy performance contracting to facilitate and expedite roll-out of RES.
- Consider co-operative projects with local communities including district heating initiatives and pooling of energy generated from diverse RES sources.
- Support subsidies for the civilian sector to cooperate with the military in innovative projects.
- Encourage joint RES installation projects (e.g. extra power not needed by the military used by the civilian sector).

h) Exploit frameworks for delivery of renewable energy projects in both national and EU contexts

Key steps

- Ensure that military RES-related concerns are taken into account and reflected in appropriate EU and national regulatory frameworks, procurement procedures, collaborative processes and funding mechanisms.
- Explore the possibility of energy performance contracts and public-private partnerships at the national level with respect to the relevant Eurostat prerequisites.

Participate in international fora (e.g. through EDA) to share best practice, pool findings and explore possibilities for collaborative RES projects and EU funding.

4.3. Guidance for Protection of Defence-Related Critical Energy Infrastructure

The implementation of the different milestones defined in sub-chapter 3.3 should therefore be based on the need to set a basis for achieving different topical goals from 2024 to 2030 and, eventually, to generalise or deepen these bases in order to maintain a consistent system for the protection of defence-related CEI.

The roadmap is based on a multidimensional approach to the energy security issue, articulating governance, policy, HR and technological dimensions altogether to achieve an encompassing strategy that leaves no matter aside. Yet it is obvious that the implementation of the roadmap should also be consistent with the national policies, with the MoDs' budgetary priorities and limitations, and with the MoDs existing capacities such as manpower and expertise, allowing to deepen certain topics or limiting the MoDs engagement on others.

Engaging with direct CEI protection: French Gendarmerie Command for Nuclear (COSSEN)

Civil nuclear facilities (powerplants, enrichment facilities, etc.) present specific security risks linked to both military and non-military organisations. The possibility of malign intromission in a nuclear facility storing nuclear fuel is therefore considered a major security issue, whose consequences are dramatic enough to consider assigning direct military protection. The French Government therefore established in 2016 a dedicated Gendarmerie command for monitoring the security of civil nuclear facilities (Commandement Spécialisé pour la Sécurité Nucléaire-COSSEN), under the supervision of the Ministry of the Interior and the Ministry in charge of Energy³⁹. COSSEN is in charge of threat intelligence, coordination of security and intervention, capacity building of security personnel and security clearance control. In order to ensure an efficient level of protection for all facilities, COSSEN has direct authority over Specialised protection platoons (PSPG) garrisoned close to nuclear facilities and trained to intervene within.

The MoDs have dedicated capabilities that could be particularly relevant to energy companies and energy value chain stakeholders. Military knowledge in terms of threat intelligence, crisis management, exercise design and operation, could therefore be an interesting contributor to the development of CEI resilience. Also, MoDs could also provide their expertise in terms of testing and evaluating new technologies as the military requirements in terms of security and robustness often surpass the civilian ones. MoDs can also act as a proactive stakeholder in shaping the regulatory landscape for security governance.

The need for new skills in the Armed forces: FR MoD Energy Data Hack

The energy transition and the digital revolution create changes in both equipment and military operational processes, generating new opportunities and risks. Sensors and algorithmic analysis allow close monitoring and accurate management, while modelling and the use of energy data offer the opportunity for predictive analysis, and thus energy optimisation. Digitalizing military energy systems could therefore allow EU MoDs to better manage and reduce their energy consumption. Yet this digitalisation also comes with specific security issues, especially in cyber, related not only to the critical systems' vulnerability, but also the intelligence value in accessing such data.

The French MoD Energy Data Hacks (1st and 2nd editions in 2021 and 2022) allowed the identification of vulnerabilities in the defence energy domain and raised the issue of the sensitivity of energy-related data for defence.

Moreover, these data hacks also underlined the need for critical human skills in terms of cybersecurity for energy monitoring systems and data analysis. The paucity of these specific skills must therefore be addressed in order to allow a proper and safe integration of data-related systems such as smart sensors or AI-based monitoring systems.

39. In France the Gendarmerie is an administratively a military entity, under command of the Ministry of the Interior.

Moreover, the implementation of the roadmap should also consider the need to articulate internal and external issues with a strong commitment from MoDs to engage in information and capabilities sharing with all stakeholders. Fostering interagency cooperation and multistakeholder discussions, especially with public and private energy providers and operators, is a vital element in fostering an efficient participation of MoDs in the protection of defence-related CEI. Discussions could also lead to the adoption in the military of best practices from civilian entities, especially CEI operators.

Learning lessons on crisis preparedness: Schiphol Airport electricity islanding

The electrical energy consumption is not the only objective when it comes to achieving a high degree of resilience. Since the power consumption varies in the course of the day and in particular in the course of any mission, one needs to account for the instantaneous maximum power consumption. This is of utmost importance after a power outage as can be seen from the events at Schiphol Airport on 29 April 2018.

A short disruption of the public supply caused uninterruptible power supplies (UPS) to take over. What could not be foreseen was the high inrush current, which exceeded the anticipated levels by far. This caused the UPS to switch off and rendered the airport nearly inoperable for an extended period of time, causing flights delays and cancellations.

A careful analysis showed unexpectedly high inrush currents due to the high count of electronic equipment – computers, monitors, displays, safety appliances and other necessary equipment.

The solution to this situation was a kind of segmentation of the local network, which requires careful structural mapping and accounting for peak currents. Repowering one segment after the other, thus reducing the instantaneous inrush current, allowed to recover normal operations in the airport after several hours.

As a consequence, and due to the ever-growing number of electronic equipment, it appears to be advisable to account not only for energy consumption and real load profile, but more than ever before, for inrush current conditions when designing and structuring a highly resilient and reliable electrical network on premises.

The implementation of the roadmap also should be adapted to each national situation as the energy landscape and the MoD dependencies are national specific. Yet the European cooperation for the development of military equipment or non-military security technologies (e.g., sensors, cybersecurity), can be a major contributor to ensuring an adequate level of security in mutualizing the development costs and risks. One might consider also the usage of joint certification schemes as mandated by the Cyber Security Act 2019/881 to secure the military (energy) supply chain. The Armed Forces can also consider financial approaches towards increasing their energy resilience and security of supply, such as through power purchasing agreements allowing direct focus on particular defence-related CEI.

Roadmap sum-up

2030	2050
1. Reduce asymmetry of information	
<ul style="list-style-type: none"> › Establish multistakeholder information-sharing system. › Consider the creation of a dedicated entity in MoD in charge of managing the aspect of energy resilience. › Provide MoD feedback on major EU energy-related regulations during the elaboration phase. 	<ul style="list-style-type: none"> › Consider the possibility to embed liaison officers in major energy operators. › Establish automated information sharing mechanisms that include also MoDs, without affecting the primary role of ministries of energy or the interior in CIP efforts.
2. Structural mapping and metering	
<ul style="list-style-type: none"> › Introduce mapping of energy dependencies and metering of energy consumption in critical military infrastructure and functions. 	<ul style="list-style-type: none"> › Generalise mapping and metering for all military infrastructure and functions.
3. Prioritisation and strengthening	
<ul style="list-style-type: none"> › Include critical energy resilience analysis for any military operation at J5 level. › Maintain capabilities to operate any kind of backup systems, especially those running on fossil fuels. › Maintain knowledge of logistic feeds, storage etc. to fuel these systems. 	<ul style="list-style-type: none"> › Include energy resilience analysis as a compulsory element for any military operation in the strategic guidance for operation planning.
4. Raising awareness and training for security conscious energy	
<ul style="list-style-type: none"> › Explore the potential contribution for MoD participation in critical infrastructure plans. › Consider the possibility to provide military capabilities or military-grade information to protect CEI (e.g., satellite surveillance, training for energy operators, emergency telecom, certification of security professionals by competent authorities, etc.). › Develop training programmes for MoD staff to understand CEI resilience issues and prepare them to better cooperate with public and private actors in order to increase MoD energy resilience. 	<ul style="list-style-type: none"> › Engage with operators to promote a global security culture. › Consider the possibility that the most critical infrastructure should have dedicated military units to protect them (e.g., COSSEN Gendarmerie Command in France for Nuclear Power Plants).
5. Tracking and investing in new technologies for resilience	
<ul style="list-style-type: none"> › Explore the possibility for MoD to become a partner of private entities at each technology readiness level (TRL) level. 	<ul style="list-style-type: none"> › Consider the possibility for MoDs to provide test-bed facilities and certification for energy technologies. › Encourage allocation of MoD related or managed funds to energy technologies.
6. Adaptability to structural changes in energy systems	
<ul style="list-style-type: none"> › Create and update a doctrine for critical. › Assess the capability for MoDs to provide support for civilian energy-related crises. 	<ul style="list-style-type: none"> › Consider the participation of MoDs in exercises and training for critical infrastructure crises (tabletop exercises, stress-tests, red-teaming, etc.).infrastructure protection. › Introduce in public procurements for MoDs elements related to financial, cyber, data and physical security for critical energy providers.
Cross-cutting issues	
<ul style="list-style-type: none"> › Cybersecurity strengthening. › Multidimensional foresight analysis on energy issues (geopolitics, emerging technologies, needed skills, etc.). 	

2030	2050
1. Increased MoDs knowledge in critical energy supply and infrastructure	
<ul style="list-style-type: none"> › Nominate an Energy Security Officer per MoD. › Provide each year a report on MoDs views on 1/EU electricity production, demand and storage; 2/EU infrastructure; 3/Oil and gases supply and demand and 4/EU security of energy supply. 	<ul style="list-style-type: none"> › Consider the possibility to embed Energy Security officers in major energy operators to increase global energy security. › Explore the potential contribution for MoD participation in critical energy supply and infrastructure plans.
2. MoDs – EU energy interactions	
<ul style="list-style-type: none"> › Provide MoD feedbacks on major EU energy-related regulations during the elaboration and testing phases. › MoDs to have a say when DG COMP deals with controlling acquisitions of EU electricity production and infrastructure assets by systemic rivals or adversaries. › MoDs should be represented at the European Union Agency for the Cooperation of Energy Regulators (ACER) level as both a particular buyer and an entity that can provide views when dealing with energy security of supply. › MoDs to voice their concerns at national and EU electricity and gas regulators (ENTO-E & ENTSOG) in particular during the 10-year network development plans. 	<ul style="list-style-type: none"> › MoDs interactions should by then focus exclusively on electricity (see below) with some limited interactions on oil and gas depending on the MoDs energy transition path.
3. MoDs focus on electricity	
<ul style="list-style-type: none"> › MoDs should be able to contract directly via their national designated electricity supplier of last resort or directly from new power generation assets. › For electricity capacity mechanism, MoDs should ask ACER to review its "Technical specification for cross-border participation in capacity mechanisms". Foreign companies with capital in the hands of a non-EU states should not be allowed to participate. › MoDs should liaise with their respective national regulator for technical solutions to be implemented for the electricity grid to sustain more and more severe storms. › MoDs to voice their concerns at national and EU electricity regulator (ENTSO-E) to avoid risk of under forecasting electricity demand. › MoDs to be part of the analysis and feedbacks at EU level on impacts on CBAM on electricity imports. 	<ul style="list-style-type: none"> › Create and update a doctrine for critical electricity supply and infrastructure in particular vis-à-vis storage. › Consider the possibility to embed MoDs in critical electricity supply and infrastructure EU regulations.
Cross-cutting issues	
<ul style="list-style-type: none"> › Consider the participation of MoDs in exercises and training for critical energy supply and infrastructure crises (tabletop exercises, stress-tests, red-teaming, etc.). › Multidimensional foresight analysis on energy issues (geopolitics, emerging technologies, needed skills, etc.). 	

2030	2050
1. Reduce fragmentation at policy and actors' level for Offshore Critical Energy Infrastructure (OCEI)	
<ul style="list-style-type: none"> › Develop an aggregated EU-level OCEI Security Strategy for all types of OCEI an all-hazard approach, under a single policy umbrella. › Establish a comprehensive OCEI Forum at EU-level reuniting MoDs and OCEI stakeholders. › Develop an EU-standardised methodology to evaluate reliance on OCEI and identify risks, threats and vulnerabilities. › Establish an EU-level Observatory for OCEI Risk Assessment with the joint participation of the MoDs and civilian experts. 	<ul style="list-style-type: none"> › Synchronise protocols of prevention and response strategies among EU Member States, under a single EU-level Prevention and Response Framework with a dual military-civilian component.
2. Address the critical interdependency between the large variety of entities active in the OCEI field	
<ul style="list-style-type: none"> › Create an EU-level information disclosure and sharing mechanism for countering physical, cyber and hybrid attacks. › Create a practice-sharing framework composed of an incident-triggered technical task force. › Develop contingency plans and tabletop simulation exercises bringing together relevant stakeholders from all parts of the sector. › Keep track of ownership of defence-related OCEI. 	<ul style="list-style-type: none"> › Establish an EU legal instrument that will regulate the information disclosure, and the transparency of practices and of supply chains in the field of OCEI.
3. Enhance the MoD's role in the protection of OCEI	
<ul style="list-style-type: none"> › Enhance maritime security and protection of OCEI with updated technology, such as unmanned surface vehicles (USV), autonomous underwater vehicles (AUVs) and unmanned aerial systems (UAS) for intelligence and reconnaissance missions, incident detection, mines location and anti-submarine warfare. › Upskilling and reskilling of defence personnel, including through the cooperation between military and civilian academia. › Establish a hybrid actions reaction team for preventing and countering attacks on OCEI. › Conduct on a regular basis vulnerability assessments to improve situational awareness and mitigate risks in case of threats against defence-related OCEI. › Develop or update plans for the prevention, preparedness, response and recovery necessary to maintain the resilience of defence-related OCEI against physical, cyber and hybrid threats. › Increase the use of the artificial intelligence, as AI enabled systems will have a significant role in information control and counterintelligence activities. › Perform real scenario-based exercises, simulations and tabletop exercises. › Cooperate with the industry in order to take advantage of the existing advanced research and innovations in underwater robotics for extended monitoring and surveillance of the offshore and submarine infrastructure. 	<ul style="list-style-type: none"> › Include OCEI resilience analysis as a compulsory element for any military operation in the strategic guidance for operation planning.
Cross-cutting issues <ul style="list-style-type: none"> › Enhance and develop the civil-military collaboration towards developing comprehensive prevention and response capabilities. › Integrate high-end technologies for maritime and OCEI security. 	

2030	2050
1. MoD awareness of supply chain for critical materials	
<ul style="list-style-type: none"> Organise a yearly energy and defence meeting on critical materials that would result in a report for MoDs on key issues such as the military situation in supplier countries and possible support that can be offered such as security sector reform assistance. 	<ul style="list-style-type: none"> Develop real-time awareness of supply chain issues for energy and industry with MoD involvement as observer and potential security provider.
2. MoD involvement in supply chain security for technological products	
<ul style="list-style-type: none"> Organise mechanism for MoD assistance in testing the security and vulnerability of key equipment. Develop a yearly energy sector technology supply chain review with MoD experts assisting and with the MoD as one of the targets. Develop voluntary standards for civilian providers of technological and technical solutions for CEI, based on military requirements. 	<ul style="list-style-type: none"> The EU and the MS should have mandatory standards in place for CEI hardening, frequent testing and auditing and supply chain resilience. MoD resources and efforts in place, for instance through Energy Defence Technology Funds, to develop resilient technological supply chains and accompanying standards for equipment. Assist in developing and mainstreaming practices related to commercial-off-the-shelf hardware and software security, including the patchability of IoT devices such as sensors.
3. MoD involvement in awareness and education on defence-related CEI resilience issues	
<ul style="list-style-type: none"> MoD involvement in whole-of-society approaches in projects to address skill gaps in cybersecurity and other technical fields constraining supply of specialists. MoD support for introducing defence perspectives in CIP curricula both in Bachelor or Master training, as well as in continuing advanced education course or lifelong learning. MoD strategies for raising awareness of defence-related CEI issues among key stakeholders such as local authorities. 	<ul style="list-style-type: none"> Predictive analytics and threat intelligence: invest in advanced analytics and threat intelligence systems (AI based) that can predict potential threats to CEI. Integrated cyber-physical security: Develop and implement integrated cyber-physical security frameworks for CEI. With the increasing connectivity of infrastructure, a holistic approach that combines cybersecurity and physical security measures will be essential for long-term resilience. Research and innovation centres: Establish dedicated research and innovation centres focused on long-term threats to CEI. These centres would continuously monitor technological advancements and emerging risks, driving the development of cutting-edge solutions over the decades
Cross-cutting issues	
<ul style="list-style-type: none"> Consider the participation of MoDs in exercises and training for critical energy supply and infrastructure crises (tabletop exercises, stress-tests, red-teaming, etc.). Multidimensional foresight analysis on energy issues (geopolitics, emerging technologies, needed skills, etc.). 	

5. Cross-cutting Support for the Implementation of the Energy Roadmaps

This section aims at presenting the cross-sectorial topics that are valid and of interest for all the WGs. It will provide information on steps that need to be achieved at the **policy and management** level, indicative **energy technologies** and proposed **funding or financing opportunities that can support the MoDs to implement the proposed roadmaps with the ultimate goal of enhancing their energy sustainability and resilience**. In this respect, the [CF SEDSS III Transversal working group](#)⁴⁰ will be in charge of drafting and elaborating the following sub-chapters as below:

5.1. Energy Policy and Management

Energy management in the defence sector is crucial to achieving the broader goals of sustainability and energy resilience. The CF SEDSS has focused on developing policies, strategies, and action plans tailored to the unique needs of the MoDs across the EU. The Energy Policy and Management Observatory (PMO), a TWG subgroup, plays a pivotal role in this initiative. It supports MoDs by offering guidance on energy management, developing sustainability-related policies, and providing recommendations on energy investment aligned with defence requirements.

The PMO's mission extends to fostering a green and sustainable defence energy culture, emphasising practical approaches to energy management. This section highlights the strategies and tools developed to improve energy performance within the defence sector and offers recommendations to help MoDs align with the EU's energy and climate targets.

Key Areas of Focus

The PMO's work in CF SEDSS III has been directed towards several critical areas that are essential for advancing energy policy and management within the defence sector. These include:

i. Design and Implementation of Defence Energy Scorecards

- The Defence Energy Scorecard is a tool designed to benchmark and continuously improve energy management across EU Member States' defence forces. This scorecard facilitates the comparison of energy use, efficiency, and resilience, offering a common platform for sharing best practices among EU Member States (MS).
- **Recommendations:**
 - › **Adopt a Standardised Framework:** MoDs should adopt the Defence Energy Scorecard to ensure a structured and coordinated approach to measuring and improving energy performance.
 - › **Promote Data Sharing:** Encourage the exchange of energy-related data and best practices across EU MS to enhance collective energy resilience and autonomy.
 - › **Align with EU Climate Goals:** Integrate indicators that track progress toward reducing carbon emissions and enhancing energy efficiency to ensure that the scorecard aligns with the EU's broader climate neutrality goals.

40. For more information about the **Transversal WG** (Policy and Management Observatory; Technology, Research and Innovation Hub; or, Financing and Funding Gateway Cell), see also the relevant [factsheet](#).

ii. *Development of Managerial Frameworks for Energy Behaviour*

- Energy behaviour within the military is a critical but often overlooked factor in achieving energy efficiency. The PMO has emphasised the need for a comprehensive framework that addresses the energy behaviour of military personnel, leveraging models like the Capability-Opportunity-Motivation-Behaviour (COM-B) approach.
- **Recommendations:**
 - › **Integrate Behavioural Models:** MoDs should incorporate behavioural frameworks like COM-B into their energy management systems (EnMS) to encourage pro-environmental actions among personnel.
 - › **Focus on Group Dynamics:** Extend individual-focused behaviour models to include group or team-based energy behaviours, fostering a collective approach to energy conservation in military units.
 - › **Continuous Training:** Implement ongoing training and awareness programmes to reinforce positive energy behaviours and integrate energy management into military personnel's daily routines.

iii. *Assessment and Management of Defence Energy Resilience*

- Defence energy resilience is critical to maintaining operational effectiveness in the face of disruptions. The PMO advocates for the inclusion of energy resilience in the EnMS, emphasizing the balance between energy efficiency and resilience.
- **Recommendations:**
 - › **Develop Resilience Metrics:** MoDs should develop and implement metrics that assess energy resilience at military installations, ensuring these are integrated into the broader energy management framework.
 - › **Scenario-Based Planning:** Use scenario-based approaches to prepare for potential disruptions and enhance the resilience of critical energy infrastructure.
 - › **Enhance Coordination:** Foster collaboration between different military units and other national authorities to ensure a unified response to energy-related challenges.

iv. *Toolbox for Energy and Environmental Policy Implementation*

- The PMO proposes a toolbox designed to facilitate the implementation of energy and environmental policies within MoDs. This toolbox would include resources for communication, training, and decision-making support.
- **Recommendations:**
 - › **Centralised Resources:** Develop a centralised repository of tools and resources, including case studies, training materials, and communication strategies, to support energy management across EU MoDs.
 - › **Promote Leadership in Energy Management:** Empower military leaders with the tools and knowledge necessary to champion energy and environmental initiatives within their units.
 - › **Leverage Technology:** Incorporate digital tools such as online platforms and data analytics to streamline energy management processes and enhance decision-making.

Recommendations

The Energy Policy and Management section of the CF SEDSS III Guidance Document provides a comprehensive framework for advancing energy management within the defence sector. The PMO's initiatives, including the Defence Energy Scorecard, energy behaviour frameworks, resilience assessments, and the proposed toolbox, offer practical solutions to enhance energy efficiency and resilience in MoDs.

To maximise the impact of these initiatives, the following key recommendations are proposed:

- 1. Establish Permanent Defence Energy Assessment Teams:** These teams should be responsible for continuously collecting, analysing, and sharing energy data and supporting the implementation of energy management initiatives within MoDs.
- 2. Appoint Energy Behaviour Managers:** Each military unit should have a designated manager responsible for overseeing energy behaviour changes and ensuring alignment with broader energy management goals.
- 3. Foster Inter-Ministry Collaboration:** Encourage collaboration between MoDs, energy authorities, and other stakeholders to ensure a cohesive approach to energy management that aligns with national and EU climate goals.

By implementing these recommendations, EU MoDs can significantly enhance their energy management practices, contributing to the EU's energy security and climate neutrality objectives while ensuring the operational effectiveness of their armed forces.

5.2. Research, Technology, and Innovation

The integration of research, technology, and innovation is vital for advancing sustainable energy practices in the defence sector. The Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS III) has made significant strides in these areas, particularly through the establishment of the Research, Technology, and Innovation Hub. This hub serves as a focal point for exploring and promoting smart energy technologies and innovative practices that can enhance energy management, security, and resilience within Ministries of Defence (MoDs) across the European Union.

This section outlines the key thematic areas explored by the Research, Technology, and Innovation Hub, with a focus on hydrogen technologies and digitalisation. It provides an overview of the discussions and findings, and offers recommendations for the effective integration of these technologies into defence energy strategies.

The Research, Technology, and Innovation Hub

The Research, Technology, and Innovation Hub within CF SEDSS III has been instrumental in identifying and promoting best practices in innovative energy technologies. The hub primarily focuses on intelligent metering, data collection systems, blockchain, big data, sensors, energy management networks, and cybersecurity. These technologies are critical for advancing the defence sector's energy management capabilities, enabling more efficient, secure, and sustainable energy use.

One of the hub's key objectives is to explore disruptive technologies and their potential applications within the defence sector. Disruptive technologies, such as hydrogen as an energy vector and advanced digitalisation tools, are seen as pivotal to achieving a green transition. The hub has also been active in defining these technologies and understanding their implications for the defence sector.

Unlocking the Research, Technology, and Innovation Potential within CF SEDSS III

The Research, Technology, and Innovation Hub has identified two primary thematic areas that are essential for the green transition of the defence sector: hydrogen technologies and digitalisation. These areas are discussed in detail below.

i. Preparedness of Hydrogen and Hydrogen Valleys Around Europe

Hydrogen is increasingly recognised as a promising energy vector that can play a crucial role in the future of defence energy strategies. The Research, Technology, and Innovation Hub has extensively discussed the potential of hydrogen, particularly through the concept of hydrogen valleys. These are geographical areas where hydrogen is produced, stored, distributed, and consumed as an energy vector, integrating multiple sectors within a localised ecosystem.

Hydrogen's versatility—whether as a fuel, energy vector, or feedstock—makes it an attractive option for the defence sector. Its ability to be stored for extended periods and transported between different storage sites offers significant advantages over traditional battery storage, particularly for military applications where autonomy and flexibility are critical. Hydrogen can also be produced through renewable energy sources, making it a key component in the decarbonisation of defence operations.

The hub has identified several benefits of adopting hydrogen technologies in the defence sector:

- **Energy Flexibility:** Hydrogen can support autonomous operations of military bases, enabling long-term energy storage and flexibility in energy use.
- **Decarbonisation:** Hydrogen offers a pathway to defossilise difficult-to-electrify sectors, such as heavy transport, which is crucial for military logistics.
- **Sector Coupling:** Hydrogen can serve as an excellent energy vector for integrating various sectors, promoting synergy between civilian and military energy systems.

To fully realise hydrogen's potential, the hub recommends developing corridors across the EU, ensuring that hydrogen refuelling stations are strategically placed to support military mobility. This would require collaboration between the defence sector and civilian stakeholders to establish hydrogen hubs with adequate storage capacity, thereby ensuring freedom of movement for military operations.

ii. Digitalisation in Support of a Holistic Approach to the Green Transition of the Defence Sector

Digitalisation is a key enabler of the green transition, offering tools that can optimise energy systems, enhance efficiency, and reduce environmental impacts. The hub has emphasised the importance of integrating digital tools into defence energy management systems, particularly in the context of renewable energy deployment and energy efficiency improvements. Advanced digitalisation supports the design, monitoring, and management of complex energy systems, which are increasingly characterised by high levels of heterogeneity and intermittency. For the defence sector, digitalisation offers several benefits:

- **Optimised System Performance:** Digital tools can optimise energy systems through model-based control, fault detection, and predictive maintenance, enhancing resilience and reducing operational costs.
- **Holistic Energy Management:** Digitalisation enables a comprehensive approach to energy management, integrating various energy sources and systems into a unified management framework.
- **Reduced Development and Operational Costs:** Digitalisation reduces the time and cost associated with developing and deploying new energy technologies by virtualizing energy systems during the design phase.

The hub recommends that MoDs incorporate digital tools into all aspects of their energy strategies, from building energy rehabilitation to renewable energy deployment. This includes the development of digital twins, advanced modelling techniques, and machine learning algorithms to optimise energy use and improve decision-making.

Recommendations

The Research, Technology, and Innovation Hub has highlighted the transformative potential of hydrogen technologies and digitalisation in the defence sector. These technologies not only support the green transition but also enhance the operational effectiveness and resilience of defence forces.

Recommendations

1. Holistic Deployment of Hydrogen Technologies:

- MoDs should adopt a comprehensive approach to integrating hydrogen across their operations. This includes deploying existing technologies for local green energy production, hydrogen storage, and distribution, as well as supporting heavy transport vehicles with hydrogen as an alternative fuel.
- Ministries should also invest in research and development projects to adapt hydrogen technologies to specific military applications, ensuring they meet the unique demands of defence operations.

2. Integration of Digital Tools in Energy Management:

- Digital tools should be integrated into all aspects of energy management within MoDs, including building energy rehabilitation projects, renewable energy systems, and multi-energy systems management.
- Collaboration between MoDs, technology providers, and research institutions is essential to develop advanced digital twins, modelling techniques, and AI-driven algorithms that optimise energy use and enhance system resilience.

By embracing these recommendations, MoDs can significantly advance their energy management practices, contributing to the EU's climate and energy targets while ensuring the operational readiness and resilience of their forces. The Research, Technology, and Innovation Hub's findings underscore the importance of continuous innovation and collaboration in achieving these goals.

5.3. Finance and Funding Opportunities

Access to finance and funding is essential for advancing sustainable energy initiatives within the defence sector. The Consultation Forum has recognised the importance of providing clear guidance on available funding mechanisms and financial instruments. The Finance and Funding Gateway Cell was established to serve this purpose, offering comprehensive support to MoDs and other stakeholders seeking to implement their energy projects via EU or national funds. This section outlines the structure and function of the Finance and Funding Gateway Cell and provides recommendations for unlocking funding opportunities at both the European and national levels.

The Finance and Funding Gateway Cell

The Finance and Funding Gateway Cell is designed to be a central resource for MoDs and other stakeholders in the defence sector, offering guidance on available grants, funding mechanisms, and financial instruments. This cell provides a structured overview of potential funding opportunities through the European Defence Agency's "European Funding Gateway for Energy in Defence,"⁴¹ a platform that MoDs may replicate at the national level.

41. [Activities Search \(europa.eu\)](https://activities.europa.eu)



Key Functions of the Gateway Cell

- **Comprehensive Overview:** The Gateway Cell offers a comparative and interactive overview of funding opportunities, enabling MoDs to understand what funding is available when it can be accessed, and who is eligible to apply. This includes links to both national and European funding sources, ensuring a thorough understanding of the financial landscape.
- **IdentiFunding Tool:** The Gateway Cell's unique feature is the IdentiFunding tool, developed by EDA. This online tool allows users to perform tailored scans of existing funding opportunities based on project specifics such as topic, location, budget, and organisational nature. The results are confidential and provide immediate guidance on potential funding sources.
- **Replicability at National Level:** MoDs are encouraged to develop similar national-level gateways that mirror the structure of the EDA's platform. This would help stakeholders at the national level navigate available funding opportunities, providing a seamless link between national and European resources.

Recommendations

1. **National Gateway Development:** MoDs should consider establishing their own Finance and Funding Gateway platforms, modelled after the EDA's structure, to provide localised guidance on funding opportunities.
2. **Use of IdentiFunding Tool:** MoDs are encouraged to utilise the IdentiFunding tool for project-specific guidance and to explore the possibility of integrating similar tools at the national level to enhance accessibility and efficiency.

Unlocking Funding Opportunities through CF SEDSS

The Finance and Funding Gateway Cell plays a crucial role in aligning defence energy-related projects with the requirements of relevant EU funding programs. Through in-depth discussions and analysis, the Cell guides how to structure and adapt project ideas to meet the specific criteria of various funding opportunities, such as those offered by the European Defence Fund (EDF), LIFE, and InvestEU.

Strategies for Unlocking Funding Opportunities

- **Iterative Project Development:** The Cell emphasises the importance of revising and adapting project ideas to align with the funding criteria. This involves adjusting the project structure, timeline, and budget to fit the specific requirements of each funding source.

- **Guidance and Coaching:** The Cell recommends that MoDs engage external technical experts to provide coaching and assistance in refining project proposals. This approach has proven effective within the CF SEDSS and can be replicated at the national level to enhance the quality and competitiveness of funding applications.
- **Cross-Departmental Collaboration:** Successful access to funding often requires collaboration between different departments within MoDs, as well as with other ministries. This cross-cutting approach ensures that all relevant aspects of a project are considered and that the proposal is aligned with broader national and European goals.

Recommendations

1. **Engage Technical Experts:** MoDs should engage external technical experts to assist in developing and refining project proposals and ensuring they meet the specific criteria of targeted funding sources.
2. **Promote Cross-Departmental Collaboration:** Encourage collaboration across different MoD divisions and with other ministries to enhance the quality and alignment of funding applications.

Recommendations

While initial successes have been achieved with projects like RESHUB42 and ENSURE43, several challenges remain in accessing EU funding for defence-related energy projects. The Finance and Funding Gateway Cell has identified key barriers that need to be addressed to improve the process of securing funding.

5.4. Integrating Cross-Cutting Topics Across all CF SEDSS Working Groups

The rapidly evolving energy and climate change landscape presents new challenges that require a comprehensive approach to awareness, training, skills development, and behaviour change within the defence sector. The CF SEDSS members have identified the need to integrate these cross-cutting aspects into all levels of defence practices and policies. This section outlines the strategies and recommendations for enhancing these areas across the working groups (WG1, WG2, and WG3) to support the successful implementation of sustainable energy practices within MoDs.

Integrating Awareness, Training, Skills, and Behaviour Across Defence Energy Initiatives

The successful transition to sustainable energy in the defence sector requires not only technological and policy advancements but also a profound cultural shift within the organisations involved. This shift involves raising awareness, providing adequate training, developing relevant skills, and fostering behaviour change at all levels.

Awareness and Training

Awareness and training are foundational elements in ensuring that all personnel within the MoDs are informed about the importance of energy efficiency, renewable energy adoption, and the protection of critical energy infrastructure. Training programs should be designed to address the specific needs of different personnel levels, from decision-makers to operational staff.

- **Targeted Training Programmes:** MoDs should implement targeted training programmes that focus on the specific energy-related roles of their personnel. For instance, operational staff should be trained on energy-efficient practices in daily operations, while leadership should be educated on strategic energy management and policy integration.

42. [First Energy Consultation Forum project to receive EU funding \(europa.eu\)](https://europa.eu)

43. [New Energy Consultation Forum project to promote low carbon military camps \(europa.eu\)](https://europa.eu)

- **Continuous Learning:** Establishing a culture of continuous learning is crucial. This can be achieved through regular workshops, online courses, and seminars that keep personnel updated on the latest energy technologies and policies developments.

Skills Development

The transition to a sustainable energy model in defence requires a workforce with the necessary skills to manage and operate new technologies and systems. Upskilling and reskilling initiatives are essential to bridge the gap between current capabilities and the demands of future energy systems.

- **Upskilling and Reskilling:** MoDs should prioritise upskilling their current workforce to handle emerging technologies such as hydrogen energy systems, digital tools for energy management, and renewable energy installations. Reskilling programs should also be available for personnel whose roles are evolving due to the energy transition.
- **Collaborative Skills Development:** Collaborating with academic institutions, industry experts, and other MoDs can enhance the effectiveness of skills development programmes. Such collaborations can offer specialised training modules and certifications tailored to the defence sector's unique needs.

Behaviour Change

Behaviour change is a critical component of achieving energy efficiency and sustainability goals. The defence sector, with its hierarchical structure and disciplined workforce, is well-positioned to implement behaviour change initiatives that can have a significant impact on energy consumption.

- **Behavioural Interventions:** Implementing behavioural interventions, such as the Capability-Opportunity-Motivation-Behaviour (COM-B) model, can help instill energy-conscious practices among defence personnel. This model has been successfully applied in various defence contexts to promote pro-environmental behaviour.
- **Leadership and Behavioural Norms:** Leadership plays a crucial role in setting behavioural norms. Defence leaders should model energy-efficient behaviours and endorse sustainability initiatives, which can inspire widespread adoption throughout their organisations.

Recommendations for MoDs

To effectively integrate awareness, training, skills development, and behaviour change into their energy transition strategies, MoDs should consider the following recommendations:

1. Develop Comprehensive Training Programmes:

- Establish mandatory training programmes on energy efficiency, renewable energy, and critical infrastructure protection for all levels of personnel. These programmes should be regularly updated to reflect new technologies and policies. EDA, and other EU bodies, such as the European Defence and Security College (ESDC) can support the MoDs in this objective.

2. Promote Continuous Professional Development:

- Encourage continuous professional development through workshops, seminars, and online courses. Incentivise personnel to engage in learning activities that enhance their understanding and capabilities in energy management.

3. *Implement Upskilling and Reskilling Initiatives:*

- Launch targeted upskilling and reskilling programmes to equip the workforce with the skills needed for the defence sector's energy transition. Focus on emerging technologies such as hydrogen systems, digitalisation, and renewable energy.

4. *Leverage Behavioural Change Models:*

- Apply behavioural change models like COM-B to promote energy-conscious behaviours across all levels of the defence sector. Leaders should play an active role in reinforcing these behaviours through example and communication.

5. *Foster Cross-Sector Collaboration:*

- Engage in cross-sector collaborations with industry, academia, and other MoDs to share best practices and develop specialised training and skills development programmes. This will ensure that the defence sector remains at the forefront of the energy transition.

Reflections

Addressing the cross-cutting aspects of awareness, training, skills development, and behaviour change is essential for successfully implementing sustainable energy practices in the defence sector. By integrating these elements across all working groups, the CF SEDSS III aims to foster a culture of sustainability and resilience within European MoDs. The recommendations provided in this section are designed to guide MoDs in developing a workforce that is well-equipped to meet the challenges of the evolving energy and climate change landscape, ultimately contributing to the EU's broader goals of energy security and climate neutrality.

Key Barriers Identified

- **Internal Challenges:** These include political buy-in, familiarity with EU funding processes, and organisational issues such as resource availability and internal communication.
- **External Challenges:** These include misalignment between EU funding timelines and national planning processes, legal inconsistencies, and administrative burdens associated with paperwork and consortium building.

Recommendations to Overcome Barriers

1. **Simplify Administrative Processes:** EU policymakers should focus on simplifying the administrative requirements for funding applications, reducing redundancy, and potentially adopting a two-step application process that begins with a summary proposal.
2. **Enhance Technical Assistance:** There is a clear need for increased technical assistance at the national level to help identify and access suitable funding opportunities. This includes providing MoDs with the necessary support to navigate complex EU funding landscapes.
3. **Increase Awareness and Training:** Disseminate knowledge about available funding programmes and provide detailed training sessions for MoD staff. This will ensure a comprehensive understanding of accessing and leveraging EU funding for renewable energy and low-carbon projects.

By addressing these barriers and implementing the above recommendations, MoDs can significantly improve their ability to secure funding for energy-related projects. The Finance and Funding Gateway Cell's efforts are crucial, providing the tools and guidance necessary to navigate the complex landscape of EU funding and finance.

6. Conclusions

The CF SEDSS III Guidance Document provides a comprehensive and strategic framework for integrating sustainable energy policies and practices within the European defence sector, closely aligning with the EU's broader climate and energy goals. Through the collective efforts of the Forum's working groups, this document offers practical solutions to enhance energy efficiency, expand the adoption of renewable energy sources, and protect defence-related critical energy infrastructure. These forward steps and actions are essential for ensuring the resilience, operational readiness, and sustainability of the defence sector in a rapidly evolving energy landscape.

To fully realise the potential of these recommendations, the defence sector must undertake concrete actions to identify and address gaps, reduce vulnerabilities, and achieve energy resilience. The following key recommendations are vital for the effective implementation of the guidance:

- **Prioritise Infrastructure Modernisation:** Accelerate the renovation and modernisation of defence infrastructure to meet the latest energy efficiency standards, incorporating green building technologies and retrofitting existing facilities to reduce energy consumption.
- **Invest in Renewable Energy Integration:** Expand the use of renewable energy sources, such as wind, solar, and bioenergy, across defence operations, integrating these sources into the national grid where feasible to enhance energy security and reduce reliance on fossil fuels.
- **Enhance Resilience through Diversified Energy Sources:** Diversify energy supply routes and explore alternative sources such as hydrogen and advanced biofuels to strengthen resilience against energy disruptions and mitigate geopolitical risks.
- **Invest in Upskilling and Human Factors:** Prioritise the training and development of personnel to manage and operate new energy systems and technologies. This upskilling is crucial for ensuring that defence personnel are equipped to handle the complexities of sustainable energy management.
- **Adopt Smart Energy Models:** Implement advanced energy management systems that leverage real-time data, artificial intelligence, and digital technologies to optimise energy use across military operations. These intelligent systems will enhance both energy efficiency and mission effectiveness.
- **Integrate AI in Infrastructure Design:** Utilise artificial intelligence in designing and implementing military infrastructure to anticipate and mitigate the impacts of climate change. AI-driven solutions can create a resilient infrastructure capable of adapting to extreme weather conditions and other environmental challenges.
- **Enhance Interoperability:** Foster greater interoperability of energy systems across national and international defence sectors. Standardising energy practices and technologies will facilitate better coordination during joint operations and multinational projects.
- **Apply Circular Economy Principles and Green Public Procurement:** Promote adopting circular economy practices and green public procurement to reduce waste, optimise resource use, and ensure sustainable procurement decisions. These strategies will lower the carbon footprint of defence operations and enhance long-term resilience.
- **Strengthen Cybersecurity for Energy Systems:** As energy infrastructure becomes increasingly digitalised, enhance cybersecurity measures to protect critical energy systems from cyber threats, safeguarding energy supply chains and infrastructure.

By implementing these recommendations, the defence sector will not only enhance its energy efficiency and resilience but also play a pivotal role in driving the EU's transition to climate neutrality. The CF SEDSS III Guidance Document is a strategic enabler, charting a clear path for the defence sector toward a sustainable, secure, and resilient future for Europe. In Phase IV (2024-2028), the European Defence Agency, in close coordination with the European Commission and the active engagement of ministries of defence, armed forces, and stakeholders from the civilian, public, and private sectors, will continue to advance the defence energy transition. This ongoing collaboration will ensure that the defence sector remains at the forefront of Europe's sustained energy future.



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Energy Network



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