EUROPEAN DEFENCE AGENCY

EUROPEAN HYDROGEN WEEK
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Hydrogen applications in the defence sector: research and project opportunities

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MAIN MISSION

… to support the Council and the Member States in their effort to improve the Union's defence capabilities in the field of crisis management and to sustain the CSDP*

* Council decision 2015/1835
of 12 October 2015 on statute, seat and operational rules of the EDA

EUROPEAN DEFENCE AGENCY: FACTS & FIGURES

Only EU Agency whose Steering Board meets at ministerial level

26 Member States
(all EU members except Denmark)
Administrative Arrangements
with Norway, Serbia, Switzerland and Ukraine

Budget 2020
€36,5 Mio

EDA Portfolio:
ca. 300 activities related to capability development,
R&T and defence industry

Value R&T projects 2004-2017 run within EDA:
approx. €1 billion

RESEARCH & TECHNOLOGY

- EDA promotes, facilitates and manages Research and Technology activities in 13 technology domains (CapTechs) and 2 Working Groups, in order to **develop knowledge and technologies needed for future defence capabilities.**

R&T CONTRACTING TOOLS:

- EDA studies from EDA operational budget (OB)
- Cat B projects funded by Member States, Bottom-up initiatives (Opt In)
- Cat A programmes funded by Member States, Top-down steering (Opt Out)
- Adapted mechanisms

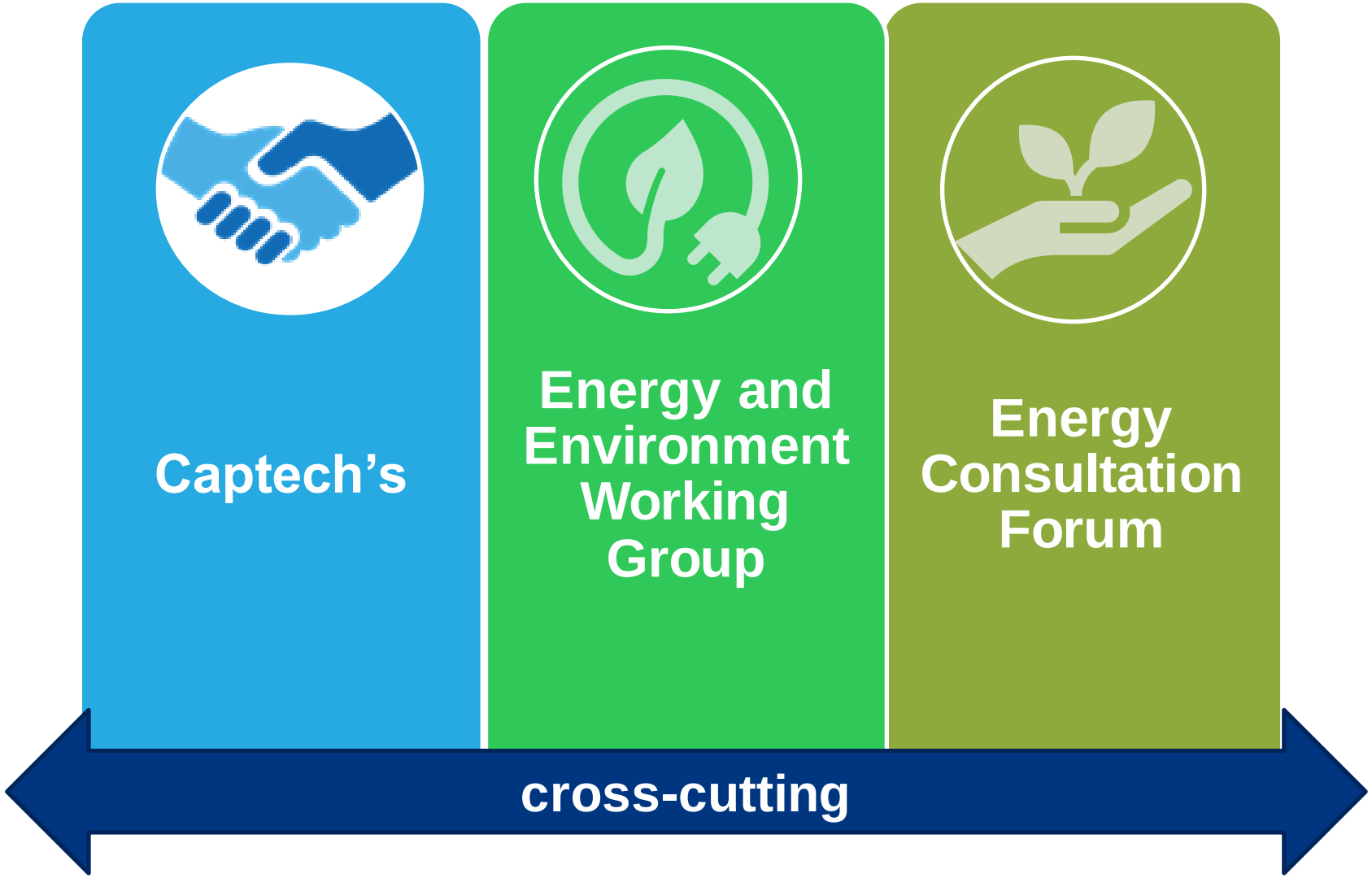
R&T MANAGEMENT TOOLS:

- Identification of technologies - **Technology Watch and Foresight**
- Technology assessment and prioritisation:
  - **Overarching Strategic Research Agenda (OSRA)**
  - **Strategic Research Agendas (SRAs)**
  - **Technology Building Blocks (TBBs) Roadmaps**

MANAGE THE CF-SEDSS

- Assist the MoDs and relevant stakeholders to move towards green, resilient and efficient energy models.

EDA's Pillars of Research on H2 Domain



Captech's Research

A CAPABILITY TECHNOLOGY GROUP ("CAPTECH") IS A WORKING GROUP OF THE EDA DEDICATED TO A PARTICULAR TECHNOLOGY AREA (AREA OF RESPONSIBILITY)

- 13 CapTechs and 2 Ad-Hoc Working Groups

OBJECTIVE

Develop pMS collaborative ad-hoc R&T Projects and Programmes within the Area of Responsibility

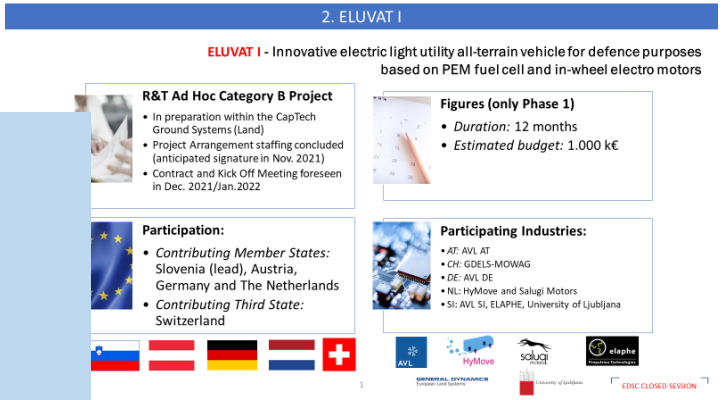
Industry

Research Centers

Projects

CURRENT PROJECTS ON H2 TECHNOLOGIES

- **ELUVAT:** Innovative electric light utility all-terrain vehicle for defence purposes based on PEM fuel cell and in-wheel electro motors
- **FUSS** : project is to develop an enhanced soldier-sized fuel cell energy source



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 882171

Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS) – since 2015

…a European Commission initiative managed by EDA to assist the European Union Ministries of Defence to move towards green, resilient, and efficient energy models…

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

Defence energy network: 30 European Countries
〉150 members

Energy legislation and policy framework analysis

Contributing to the European Green Deal implementation

CF SEDSS

Producing guidance to advance sustainable energy in defence

Sharing best practices, expertise and knowledge

Producing defence energy-related research studies and project ideas

WORKING GROUP 1

Energy Efficiency & Buildings Performance

Improve the energy efficiency of military building stock and fixed infrastructure

WORKING GROUP 2

Renewable Energy Sources

Use renewable energy sources and technologies in the defence sector (generation, conversion, storage and use in transportation)

WORKING GROUP 3

Protection of Critical Energy Infrastructure

Increase the protection and resilience of defence-related critical energy infrastructure (tools, guidelines, methodologies)

TRANSVERSAL WORKING GROUP

Policy & Management Observatory

(Action plans, human factors, awareness, best practices, skills, etc.)

Technology, Research & Innovation Hub

(Energy management, networks, cyber, AI, digitalisation, sensors, micro-grids, etc.)

Financing & Funding Gateway Cell

(IdentiFunding methodology for defence energy projects, ad-hoc, SRSS, ECP, etc.)

CF SEDSS project on RESHUB (success story)

First Energy Consultation Forum project to receive EU funding

Brussels - 10 March, 2020

'RESHUB', a Slovenian-led project increasing reliable and sustainable energy in the defence sector, has been selected to receive technical support thanks to funding from the EU's Structural Reform Support Programme (SRSP). EDA assisted the Slovenian Ministry of Defence in applying for the SRSP.

Defence Resilience Hub Network in Europe (RESHUB)

led by the SI MoD

…use of hydrogen-based energy networks in the delivery of military base power requirement

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Decarbonising defence sector through hydrogen energy technologies Potential areas of collaboration in the context of the CF SEDSS

- Build defence "**hydrogen valleys**" across Europe to increase defence self-sufficiency, resilience, and autonomy;
- **Energy Storage** – explore the use of hydrogen as one of the options of the CF SEDSS III WG-2 research study regarding the definition of the requirements for an energy storage selection decision support tool for homeland defence installations.
- **H2 applications for military vehicles**.

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Energy and Environment Working Group (EnE WG)

MISSION: The EDA's **EnE WG** will provide capability aware and strategically informed advice on energy and environmental factors affecting the armed forces of Europe, delivering tangible benefits in accordance with pMS guidance.

TECHNOLOGIES & RESEARCH DOMAINS:

- Training, Education and Knowledge;
- Data Collection & Analysis;
- Energy Efficiency & Sustainability and
- Alternative Energy Sources.

OBJECTIVES

- **Establish a common approach to energy management within the EU armed forces**
- **Achieve energy savings through energy efficiency and alternative energy sources**
- **Reserve and enhance operational capability or output**

	TBB Name	
1	Alternative fuels and drive/propulsion systems	
2	Energy storage: electrical, electrochemical, mechanical, structural and thermal	
3	Engine and power distribution system efficiency technologies	
4	Energy management technologies: innovative and efficient systems	
5	Solar energy generation (thermal and electrical generation)	
6	Militarization of environmental technologies: water and waste water	
7	Energy harvesting / scavenging	
8	Wind energy	
9	Energy and environment technology systems integration	
10	Militarization of environmental technologies: Energy from waste (or waste to energy) technologies	

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EDA EnE WG Exemplary Research Fields (1/2)

Hydrogen Generation and Storage in military environment

Applications to be explored:


H_2 Generation in operation:

- Ruggerisation of hydrogen technologies(Hydrogen production solutions for military operations should be modular, downsized, flexible, versatile and rugged)
- Production methods to be explored and optimise to military: electrolysis, Multi-Fuel Reformer, Aluminium / Iron Powder, Solid State Hydrogen.

H_2 Storage and transportation in operation:

- Along with the production units, a driver for hydrogen production could be adapting H_2 logistics to military needs.(Gaseous and solid state in terms of flexibility. Storage density, safety, minimised logistic burden)

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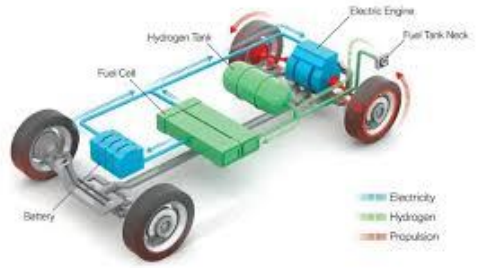
EDA EnE WG Exemplary Research Fields (2/2)

Hydrogen Use in military environment



Applications to be explored:

- Hydrogen-Methanol Ship propulsion system using on-board pre-combustion carbon capture
- Hydrogen generator for higher fuel efficiency and lower carbon emissions in maritime transport
- Hydrogen internal combustion engine vehicles (HICEV) using an internal combustion engine and hydrogen fuel cell vehicles (e.g. EU Hydrogen Fuel Cell tactical Ground Vehicle and EU Hydrogen Fuel Cell UAVs)
- Polyfuel engine for military application

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EDA EnE WG Relevant Activities

Planned Study : Fuel Cells Technologies in Defence

Planned Study : Energy Storage for Operational Conditions

EnE WG invites Clean Hydrogen Partnership experts in view of enriching the upcoming EnE Captech with Hydrogen experts (industry) to implement the EnE research agenda

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Concluding remarks - reflections
Sustainable energy and green transition matter for the defence sector

- Since 2014 EDA has been assisting MoDs to decrease carbon footprint
- An ongoing global rise of energy prices -European Green Deal is the solution
- Energy cost impact on defence - Military needs in balance with energy/green transition
- National - multinational collaboration + industry's expertise have a multiplier effect towards climate-neutrality
- Increased interest for Fuel cell Hydrogen technology in Defence
- Several barriers/challenges to address
- EDA has developed and pMS approved its research agenda for H2 technologies
- EDA explores with Clean Hydrogen Partnership synergies for promoting the EnE WG's research agenda

Thank you for your attention!

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