Space for Energy's sector resilience challenges

ESA COMMERCIALISATION GATEWAY

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Business Applications and Space Solutions initiatives in the Energy sector

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The relevance of energy resilience and security in energy transition

- Secure electricity is vital for thriving societies and powering the 24/7 digital economy.
- According to IEA (World Energy Outlook, 2021), electricity's usage is expanding across sectors like heating, cooling, transport, communication, finance, and healthcare.
- Robust electricity security measures are essential for modern economies to adapt to dynamic power sector changes.

Energy resilience

“ The term resilience describes the ability to survive and quickly recover from extreme and unexpected disruptions.”

The relevance of energy resilience in energy transition

Climate Resilience

- Ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate.
- A climate-resilient electricity system has the ability to anticipate, absorb, accommodate and recover from adverse climate impacts

Cyber Resilience

- Cyber resilience refers to the ability to defend against and recover from cyber threats, safeguarding critical digital infrastructure.
- Proactive defence and incident response planning are crucial for safeguarding critical infrastructure.

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Energy Security

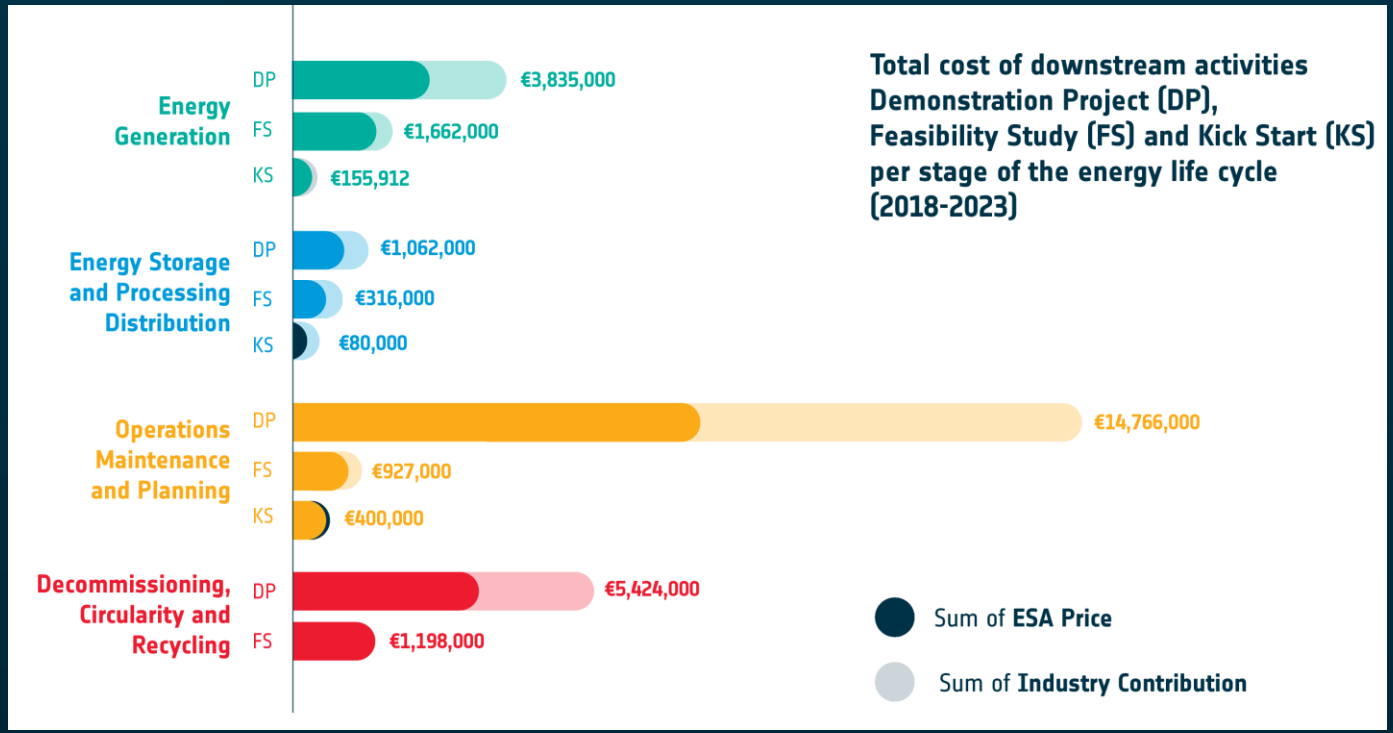
- The concept of energy security overlaps with energy system resilience.
- Energy security as “uninterrupted availability of energy sources at an affordable price” (IEA)

ESA Business Applications Space Solutions (BASS)
Energy portfolio: Reliability, resilient and renewable

61 Activities Implemented(*)

30m Euros invested by ESA

12m Euros invested by by industry and potential customers

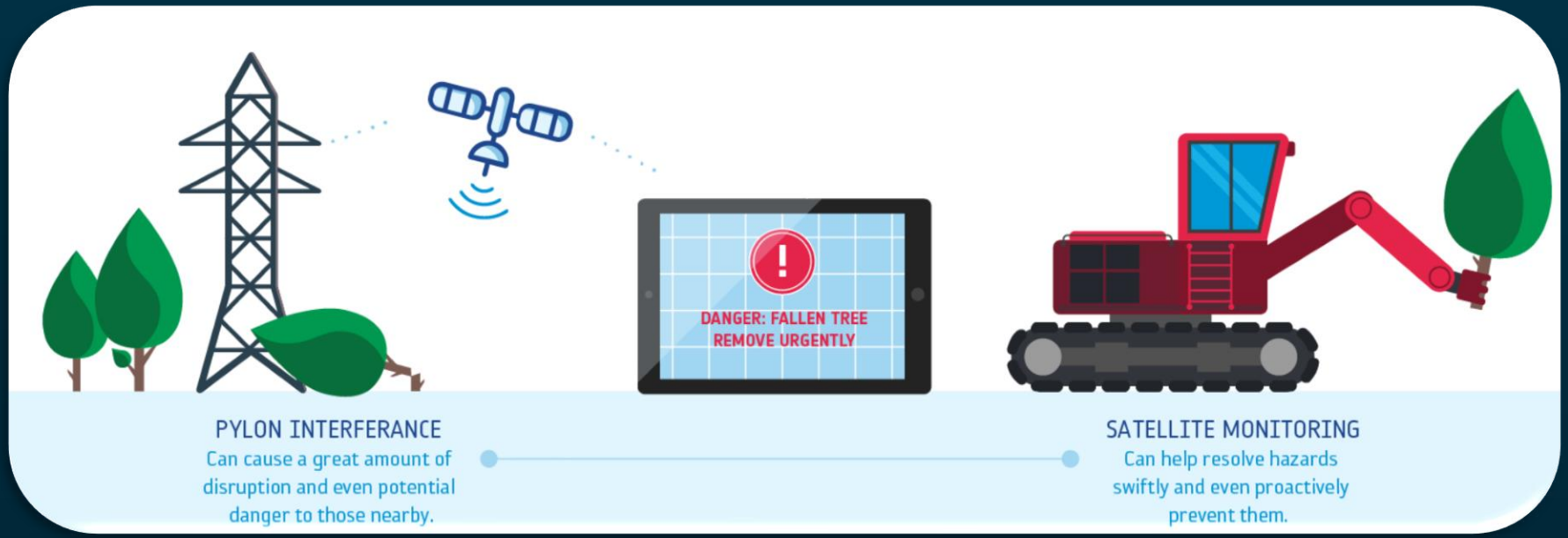


(*): in the period of 2018-2023

Space applications for climate resilience

Climate Resilience

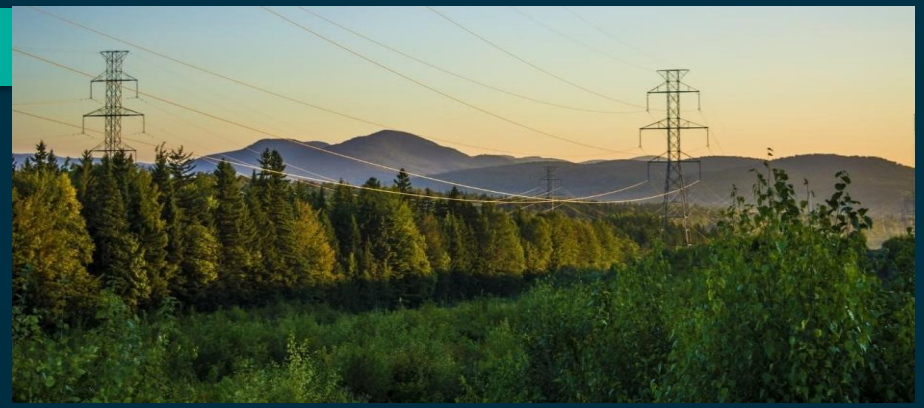
- Critical infrastructure monitoring: satellite imagery enables real-time monitoring, identifying vulnerabilities and aiding maintenance and disaster response.
- Weather prediction: space-based weather monitoring offers early warnings for extreme weather, aiding energy providers in preparation and mitigation.
- Satellite-based communication and navigation systems ensure reliable communication and coordination during emergencies, enhancing energy system resilience.



Space applications for climate resilience: examples

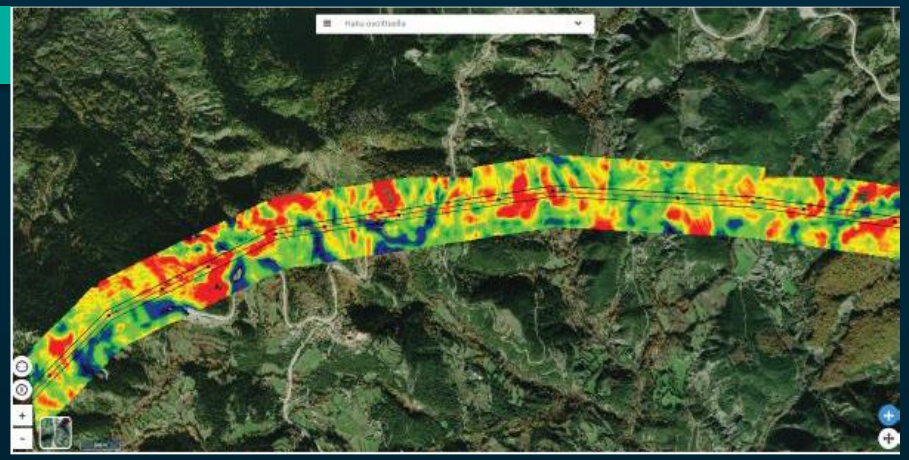
Example: SIM, LiveEO

Space-enabled full-stack solution for infrastructure monitoring (SIM) is a tailored platform for operators in Europe and North America, detecting vegetation, ground changes, and third-party interactions for predictive maintenance. It aims to cut operational costs by at least 25%.



Example: SatNetMonitor, Headpower Oy

SatNetMonitor enhances grid reliability with cloud-based AI and automated workflows, resolving issues faster, preventing incidents, and streamlining resource management for enhanced efficiency from data collection to risk management.



Space applications for energy security

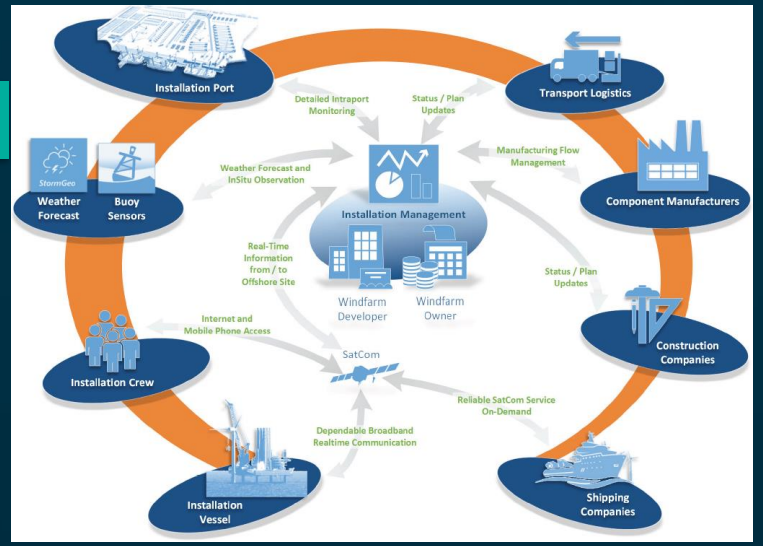
Energy Security

- Satellite-based communication facilitates reliable communication between remote energy facilities for operational support.
- Satellite-based navigation enhances transportation logistics for energy resources through satellite-based navigation systems.
- Satellite Earth Observation provides insights relevant bankability and environmental impact assessment.

Space applications for energy security: examples

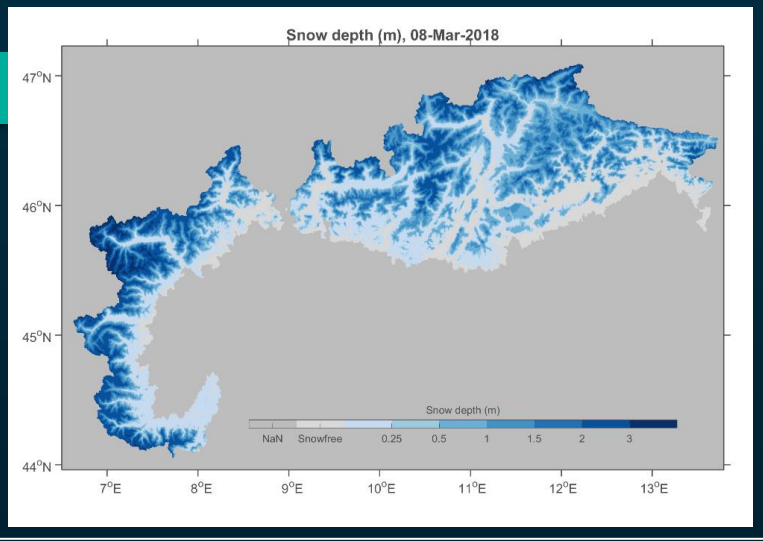
Example: COM4OFFSHORE, OHB System AG

COM4OFFSHORE one-stop solution for optimised communication, monitoring operations, and business support services for offshore wind farms installation and maintenance



Example: SNOWPOWER, EOMAP GmbH & Co. KG

SnowPower combines satellite-retrieved information with data assimilation techniques to feed a physics-based snow model to generate daily SWE information. 20% boost in estimating snow-related parameters(*).



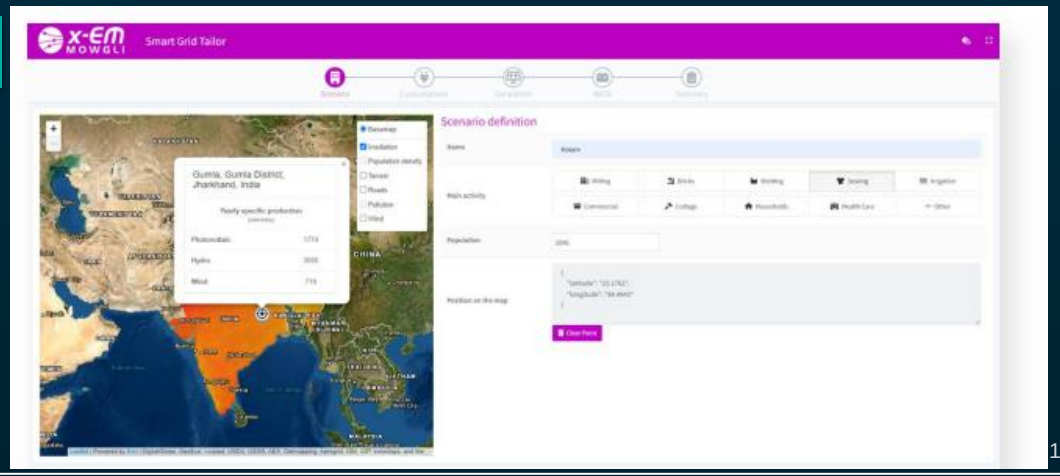
Space applications for energy security: examples

Example: MESPAC, WaveForEnergy

MESPAC (Marine Energy Space Control) integrates Satellite Earth Observation data sources with advanced physical models and Artificial Intelligence algorithms to boost the development of new ocean energy applications

Example: MOWGLI, i-EM Srl.

MOWGLI offers satellite-based services for comprehensive microgrid planning, design, operations, and maintenance in both urban and rural areas of developing countries



Space applications for cyber resilience

Cyber Resilience

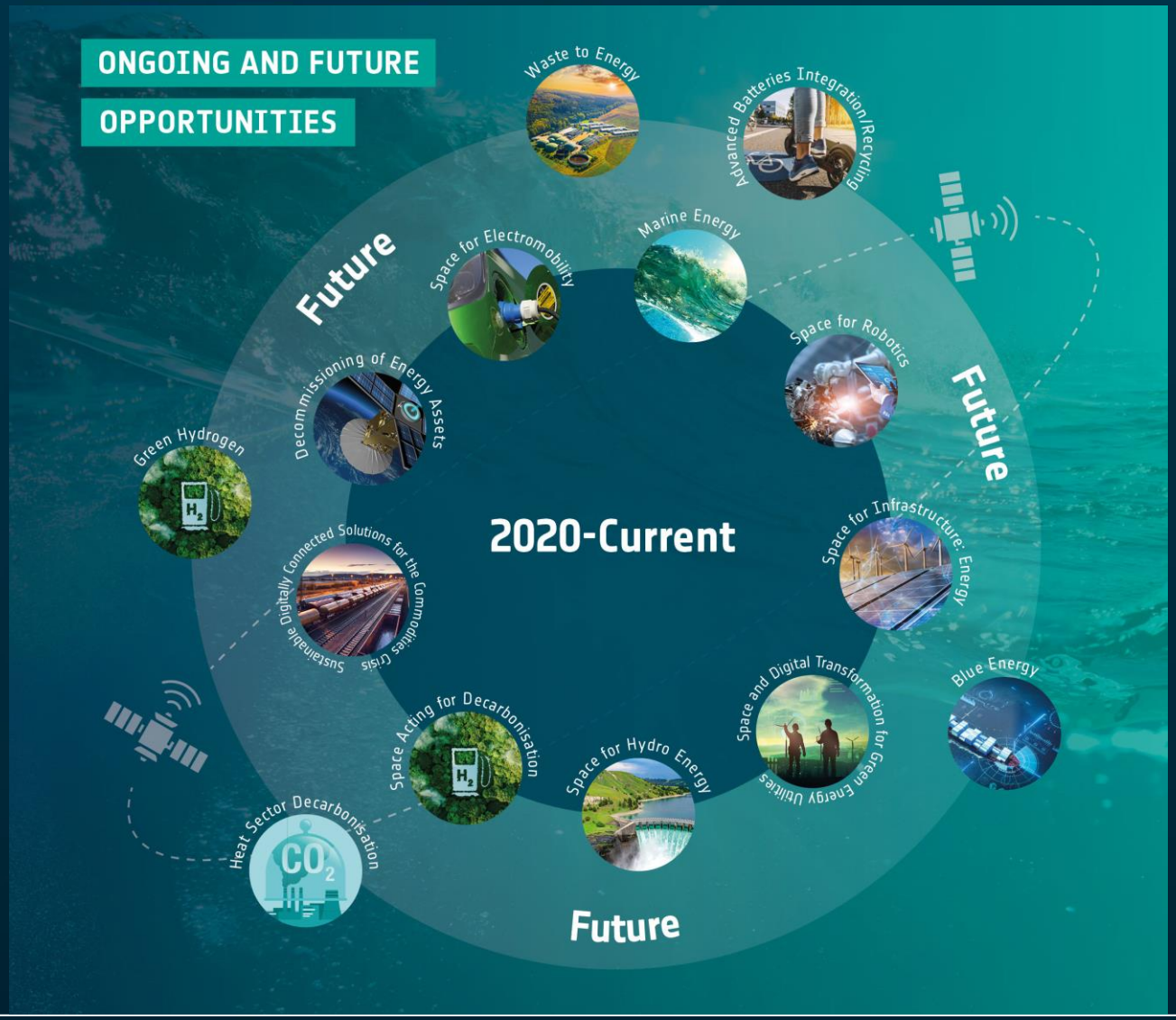
- Satellite-based communication enables secure data transmission and real-time monitoring, enhancing cyber resilience by facilitating rapid response to cyber threats.
- Satellite-based navigation ensures accurate timing synchronisation for critical energy system operations, mitigating the risk of cyber-attacks disrupting grid functionality.
- Satellite Earth Observation provides insights into potential physical vulnerabilities and anomalies in energy infrastructure, complementing cyber defences with early detection capabilities.

Space applications for cyber resilience: examples

Example: MoniCATO, ALTEC Spa.

- MoniCATO provides end-to-end protection for power grid synchronisation devices, focusing on European energy sector clients such as Distribution System Operators (DSOs) and Transmission System Operators (TSOs). It integrates authenticated Galileo signals with advanced digital identity and cryptography to secure time information in grid devices, ensuring secure data transmission to central processing facilities for decision-making.

ESA BASS energy initiatives:
Reliability, resilient and renewable



Task Force for Innovation in Energy Through Space (Energy Task Force)

Key objectives:

- Leverage the use of space for advancing sustainable innovative services addressing the priorities of the green energy ecosystem and supporting the growth of a sustainable green economy.
- Increase the impact in the energy sector of the space-based applications developed through ESA programmes, thanks to the support of the energy sector stakeholders.

Priority areas:

- Renewable Energy (Net Positive)
- Electric Mobility Planning
- Small-scale Renewable Generation
- Circularity & Decommissioning
- Green Hydrogen & Alternative Energy Carriers
- Decarbonisation
- Ensuring Energy Supply Security
- Energy Asset Operation & Maintenance

Conclusions

1. Space applications play a vital role in tackling energy resilience and security challenges.

2. It's not just about technology.

3. Collaboration across sectors is key to support innovation addressing energy resilience and security.

4. ESA BASS energy task force has taken initial steps towards this goal, enabling cross-sectoral cooperation to advance energy innovation through space applications.

Thank you for your attention!