Green Hydrogen as a Sustainable Energy Source

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European Space Agency (ESA)

EUROPE'S GATEWAY TO SPACE

WHAT	23 Member States, 5000 employees
WHY	Exploration and use of space for exclusively peaceful purposes
WHERE	HQ in Paris, 7 sites across Europe and a spaceport in French Guiana
HOW MUCH	€6.49 billion = €12 per European per year

What is ESA Space Solutions?

Directorate of Commercialisation, Industry and Competitiveness

https://business.esa.int/

What we offer

Our aim is to work together to make your idea commercially viable, with:

- Zero-Equity Funding (€50K-€2M+)
- Tailored Project Management Support
- Access to our Network and Partners
- Use of ESA Brand for Credibility

Our impact and focus

Socio-Economic
+ Green

Space Use

Industry
Competitiveness

A variety of markets and space technology

ESA Business Applications and Space Solutions, work across various markets/verticals.

We advocate for space technology (SatCom, SatEO, SatNav, etc.) and complementary tech (IoT, AI/ML, Robotics, blockchain, etc.).

ESA Funding Call

https://business.esa.int/funding/open-competition/green-hydrogen-sustainable-energy-source

Green Hydrogen as a Sustainable Energy Source

Feasibility Study (FS:

This Invitation to Tender invites proposals for feasibility studies for services that explore innovative uses of space technology to advance green hydrogen as a sustainable energy source.

With a focus on evaluating practical applications of green hydrogen across multiple sectors, including:

Energy, Transportation, Maritime, Smart Cities

With support from the Energy Task Force members:

areg · dena German Energy Agency · EPRI · WWF

https://business.esa.int/energy-task-force

and **WWF Germany**

Use-cases of the partners are listed in the SoW (in the Tender Package to be released on 11 April 2025 in ESA–STAR)

Important info:

- Funding: ESA will co-fund 80% of the acceptable cost, up to €200K, per awarded study
- No IP or equity retention
- Open to Feasibility Studies
- Opening date: 11 April 2025
- Closing date: 23 May 2025

Guest Speaker #1 Dr Teresa Orellana Pérez

Team Lead Hydrogen Technologies and Supply Chains,
German Energy Agency

Dr. Teresa Orellana Pérez, Team Lead Hydrogen Technologies and Supply Chains
German Energy Agency (dena)

Introduction to the German Hydrogen Strategy

March 26, 2025

The National Hydrogen Strategy (NHS) was monitored annually and updated in July 2023

Phase 1: **Start of the market ramp-up**

Phase 2: **Accelerated market ramp-up**

https://www.nationale-wasserstoffstrategie.de

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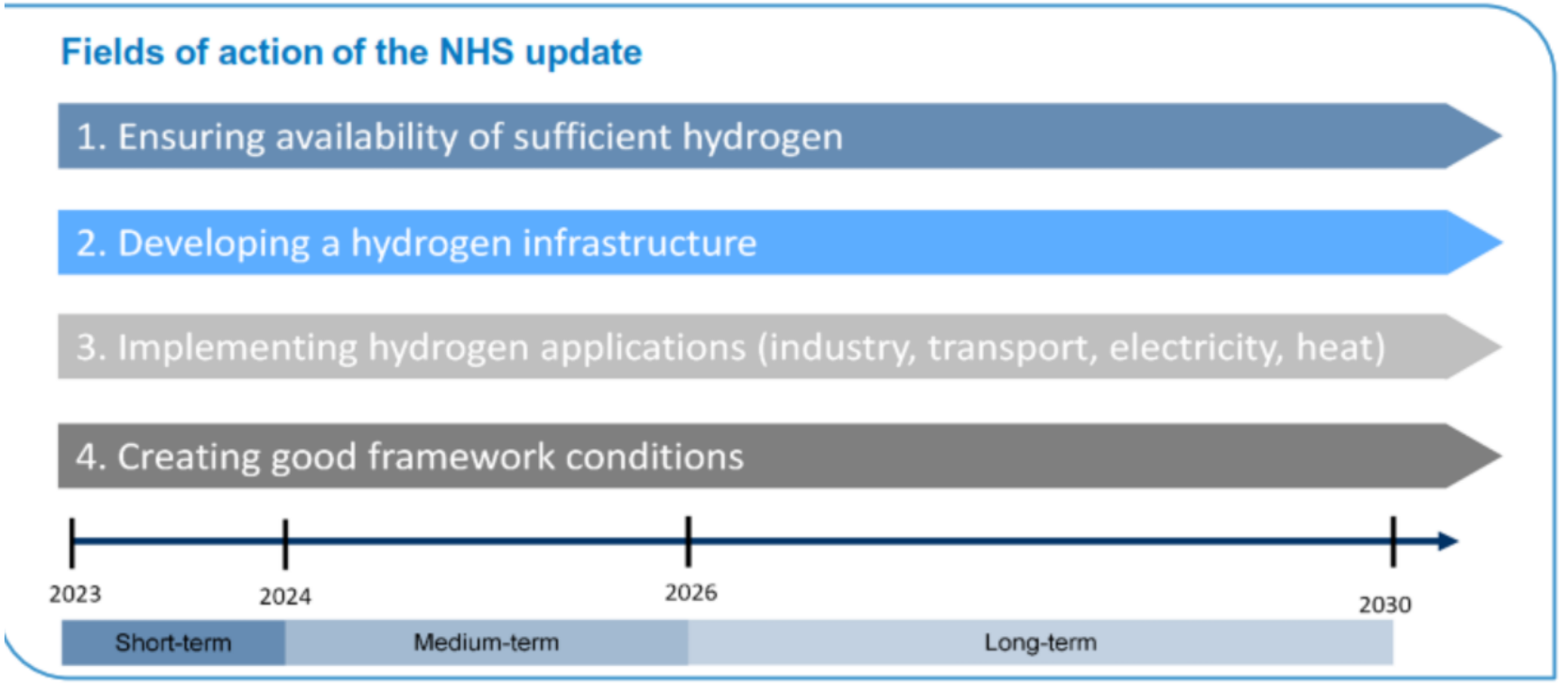
The NHS 2023 focuses on four objectives and specifies concrete measures in these fields of action

Phase 2: Accelerated market ramp-up



Cross-cutting field of action

Germany to become a leading provider of hydrogen technologies by 2030

Key elements of the update give answers to:

- Which hydrogen production paths will be promoted?
- What is the projected demand and supply of hydrogen?
- How will the hydrogen transport infrastructure be developed?
- Which hydrogen applications are in the focus?

Which hydrogen production paths will be promoted?

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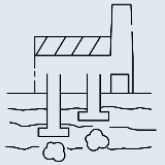
Blue, orange and turquoise hydrogen are to be promoted in addition to green hydrogen

To meet the ambitious GHG limits and **promote the availability and use of hydrogen during the market ramp**-up, the government will also promote the purchase of **low-carbon (blue) hydrogen for industrial consumers**

- **Direct financial support for hydrogen production is limited to the production of green hydrogen**
- **Application-side** funding is provided as long as the **limit value of 25 g CO2 eq./ MJ H2** is complied with
- The planned **Carbon Contracts for Difference** (CCfDs) are the main instrument to implement this
- The **NHS 2023** provides that, in addition, **turquoise and orange hydrogen can also be funded**

Blue H2



Natural gas + CCS

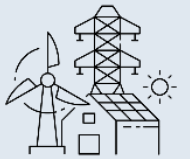
Turquoise H2

methane pyrolysis

Orange H2

waste & residual materials

Green H2



RE-Energy

What is the projected demand and supply of hydrogen?

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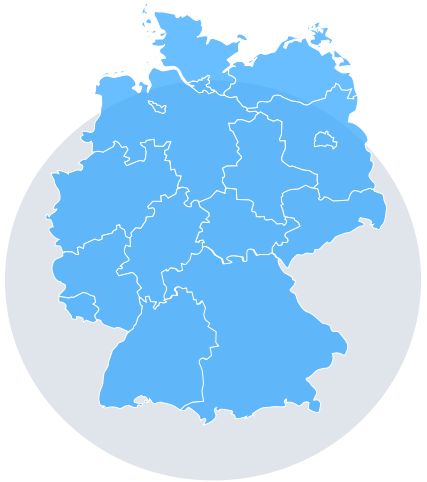
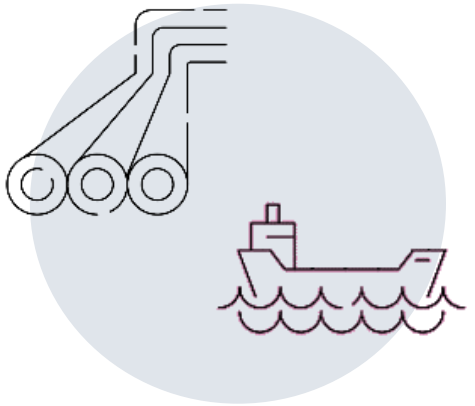
The projected total hydrogen demand to be supplied is projected to reach 95-130 TWh in 2030



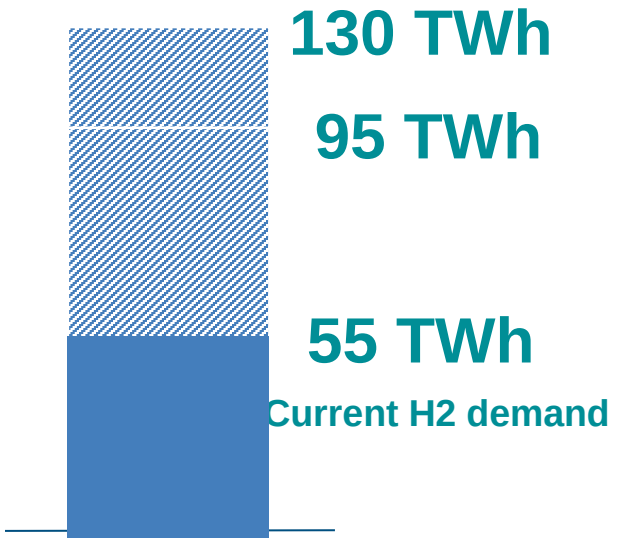
At least 10 GW

Domestic H2 generation until 2030



45-90 TWh

Projected H2 imports until 2030



95-130 TWh

Projected total H2 demand in 2030

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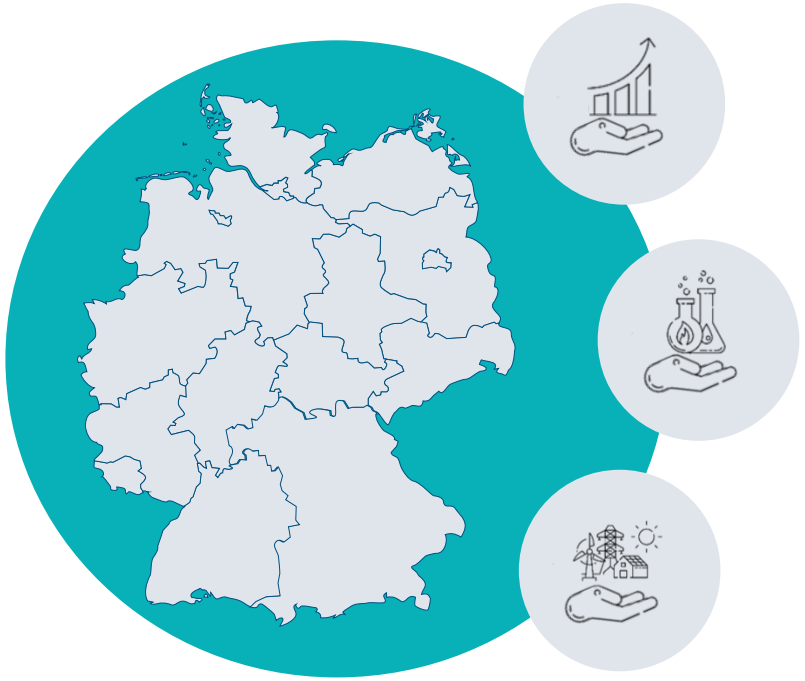
The target for the installed capacity of domestic electrolysis is raised to at least 10 GW by 2030

Doubling of the domestic electrolysis target from 5 GW to at least 10 GW by 2030 through:

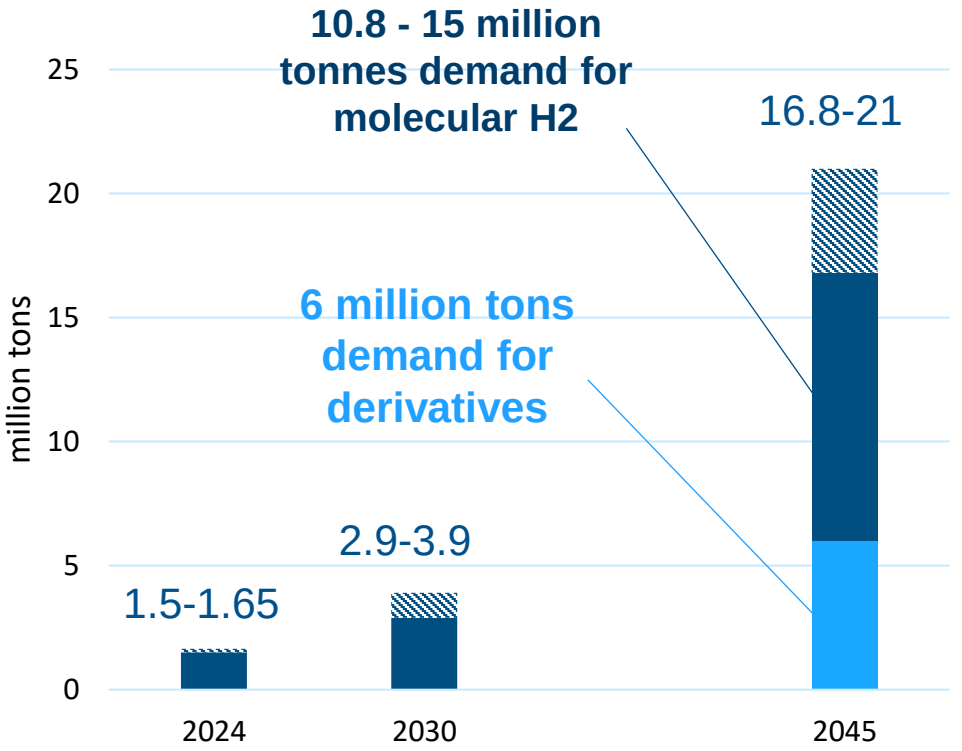


- Granting of the IPCEI Hydrogen funding decisions
- Regulation pursuant to §96 No. 9 WindSeeG on the tendering of 500 MW/a for system-serving electrolysis (2025-2028)
- Creating the conditions for developing a suitable mix of instruments to expand the production of hydrogen and hydrogen derivatives in Germany. For example by revision of the funding programs and further implementation of RED II.
- Direct promotion/support in generation of green hydrogen

The large-scale import of hydrogen and its derivatives is being prepared in various ways

The hydrogen import strategy is aimed to show:

- The needed quantities of imported hydrogen and its derivates **(2.9-3.9 Mt in 2030; 16.8-21 Mt in 2040)**
- Predicted **import share of 50% to 70%** of projected national consumption
- Parallel development of import infrastructure based on **pipeline and ship terminals**
- Four main **import corridors**: North Sea region, Baltic Sea region, south-western Europe, Southern Europe
- Mix of measures by the German government to stimulate imports from Europe and other countries with **around 40 energy partnerships**



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How will the hydrogen transport infrastructure be developed?

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By 2032, the German H2 core grid will connect all major generation, import, storage and relevant offtakers

Will contain 9,040 km of converted and new pipelines by 2032

- In October 2024, the Federal Network Agency approved the construction of the nationwide hydrogen core network.
  - Estimated investment of 18.9 billion euros will be financed by network tariffs
  - KfW loan of 24 billion euros for the amortisation account
  - Guarantees of 3 billion euros from the German government
- The core grid will be connected to the European Hydrogen Backbone by 2027/28 which is actively driven forward by the German government

Which hydrogen applications are in the focus?

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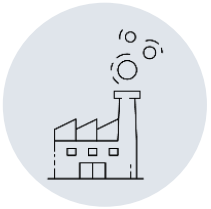
The German government focuses on sectors in which the use of hydrogen is absolutely necessary

There are no restrictions for the use of hydrogen in the individual fields of application, from the German government's point of view

The government funding focuses on areas where no direct (electric) alternatives for hydrogen are available



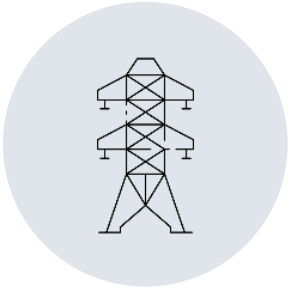
The Industry will be funded by:

- The **IPCEI Hydrogen** and **Carbon Contracts for Difference (CCfDs)**
- The **Decarbonisation in Industry (DDI) funding program**

The mobility sector will be funded by:

- Implementation of the **sub-quotas for RFNBOs (RED III)**
- Supporting and promoting **IPCEI projects in the transport sector**

The power sector was given a higher priority by the goal of climate neutrality in 2035



- The demand for hydrogen in the conversion sector in 2045 (long-term scenarios) is expected to be 80-100 TWh/a
- **New investments in gas-fired power plants must ensure hydrogen-readiness**
- **New CHP must demonstrate convertibility to hydrogen at low additional cost (KWKG 2022)**
- The system-serving use of hydrogen in the electricity sector is promoted through tenders:
  - H2-ready gas-fired power plant capacities of up to 7 GW will be put out to public tender. They must be converted from natural gas to H2 7 years after commissioning as part of a Power Plant Security Act
  - In addition, 5 GW of conventional gas-fired power plants, 500 MW of hydrogen sprinter power plants that run immediately on hydrogen and 500 MW of long-term electricity storage facilities

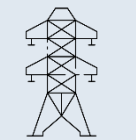
The update of the National Hydrogen Strategy (NHS) 2023 refines the NHS 2020 in six major aspects

Doubling of the domestic electrolysis target

Definition of promoted hydrogen production paths

Clear focus on hydrogen applications where no direct alternatives are available

Clear process for developing hydrogen transport infrastructure



Upgraded priority for the use of hydrogen in the power sector

Agreed to develop a standalone hydrogen import strategy

How can satellite-based technologies support green hydrogen up-take?

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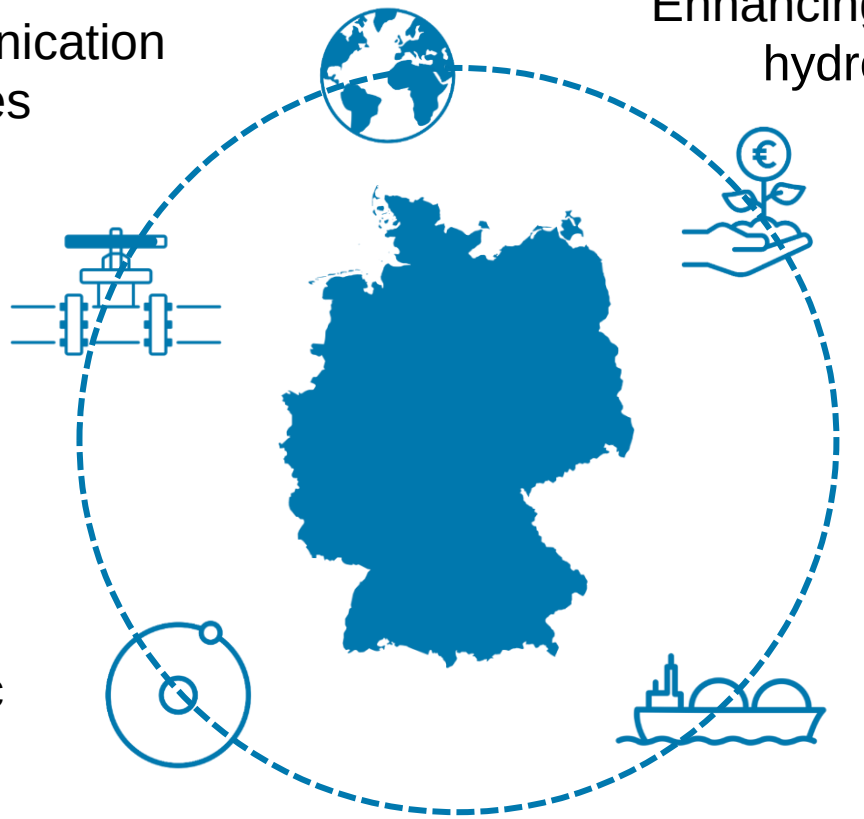
Satellite-based technologies can address many challenges along the hydrogen value chain

Backup communication capabilities

Enhancing Connectivity and Control of remote hydrogen infrastructure along whole international supply chains



Monitoring and inspection of critical infrastructure regardles of environmental conditions, predictive maintenance

Environmental Impact Assessment and Monitoring, unlocking Sustainable Finance

Resource Assessment and Optimal Site Selection for Production Facilities

Real-time diagnostic information

Transportation and Logistics Optimization

Maintaining safe operation in hydrogen production and distribution systems

Questions? Ideas?

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Dr. Teresa Orellana Pérez
Teresa.Orellana-Perez@dena.de

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Deutsche Energie-Agentur

Guest Speaker #2 Gordon McIntosh

Chairman and Director – Aberdeen International Associates Ltd
Director – Aberdeen Renewable Energy Group Ltd
Chairman and Director – QED Naval Ltd

EUROPEAN SPACE AGENCY

"GREEN HYDROGEN AS A SUSTAINABLE ENERGY SOURCE" WEBINAR

26 MARCH 2025

AIA | ABERDEEN INTERNATIONAL ASSOCIATES

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Aberdeen Renewable Energy Group

H_2 IN ABERDEEN

- Aberdeen City has almost 10 years of hydrogen production and vehicle deployment experience
- World's first hydrogen double decker buses

TECA,
350kg H_2 / day
350 bar

Kittybrewster
360kg H_2 / day
350 & 700 bar

ACHES, Cove
130kg H_2 / day
350 & 700 bar

REGIONAL STRENGTHS

Public and private sector primed towards making the Net Zero Transition

Highly skilled workforce transitioning from the oil & gas into low carbon industries

Home to the UK's most significant concentration of energy supply chain companies

Industry focused Universities, a Further Education College and a Net Zero Technology Centre

REGIONAL STRENGTHS

10 years of hydrogen production and operations experience

Public access to locally produced green hydrogen from multiple 350 & 700 bar dispensing facilities across Aberdeen City

Europe's most diverse fleet of hydrogen vehicles - Over 100 vehicles deployed to date

North East Scotland Hydrogen Ambition ($NESH_2A$) Steering Committee Overview

PROJECTS

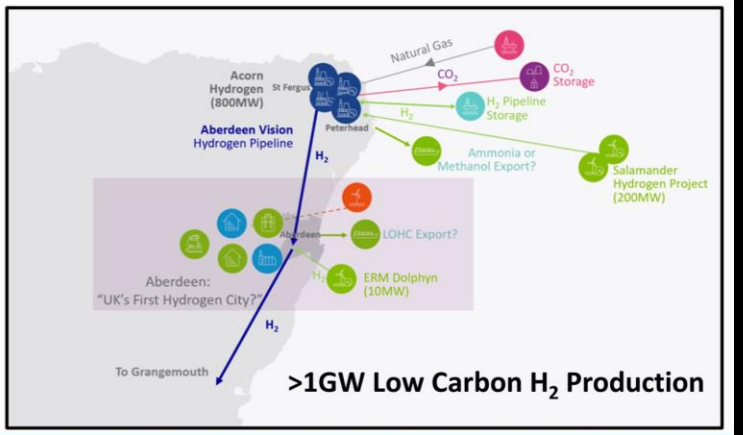
- **Aberdeen Hydrogen Hub**
- **Acorn CCS and Hydrogen**
- **Aberdeen Vision**
- **Kintore Hydrogen**

SUPPLY CHAIN, INNOVATION AND SKILLS DEVELOPMENT

- Hydrasun Hydrogen Skills Academy.
- ETZ Green Hydrogen Test and Demonstration Facilities.
- ETZ Ltd Green and Blue Hydrogen Masterclasses & Capital Fund (via Scottish Government JTF).

CURRENT FOCUS AREAS

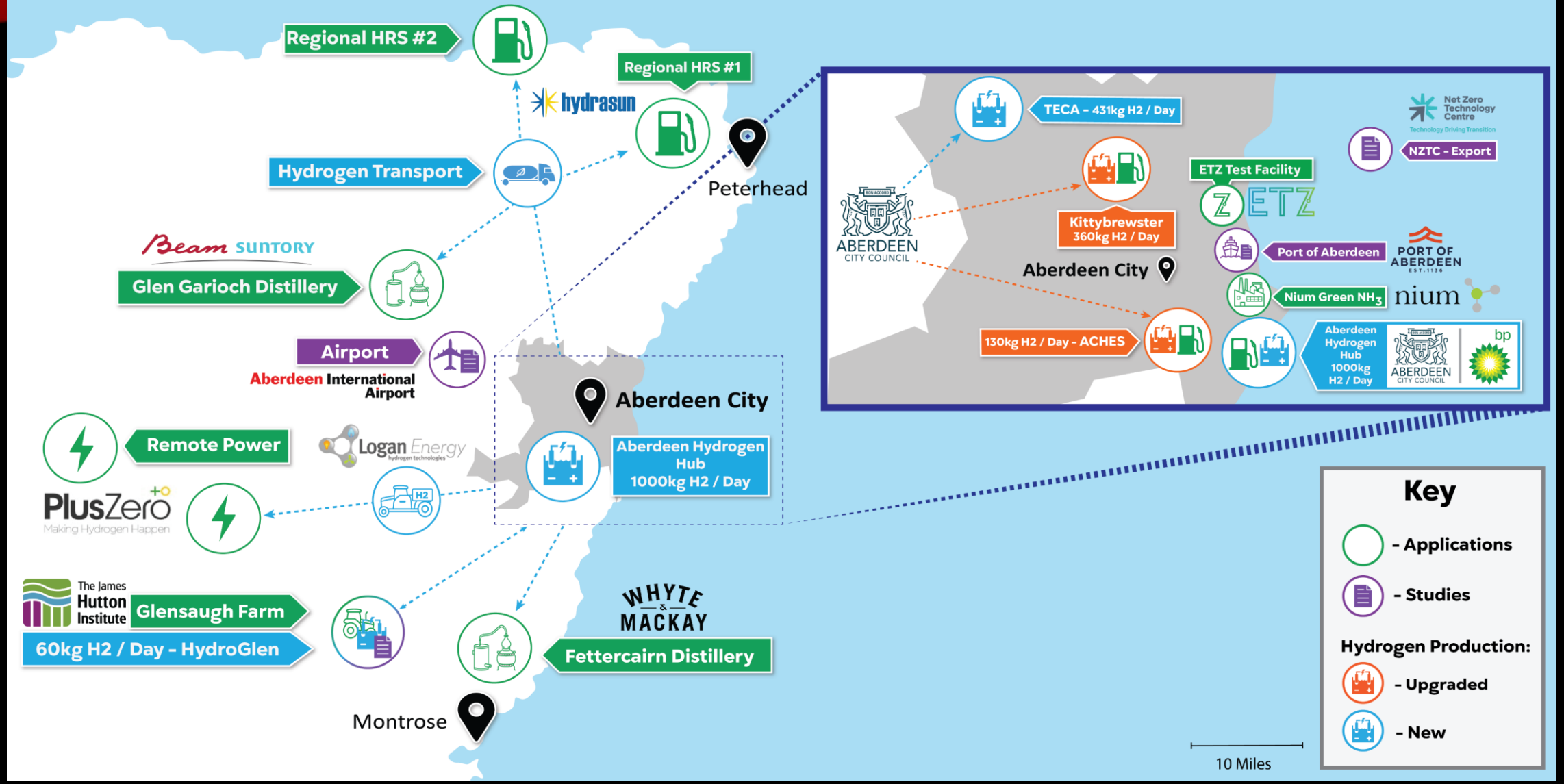
- **Establish a hydrogen economy in NE Scotland & grow low carbon hydrogen production to >1GW within a decade.**
- Aggregating hydrogen demand, e.g. transport.
- Improve awareness of the business opportunity.
- Develop a compelling investment proposition.



THE TRANSPORT GROUP

- Established in 2023 to advance hydrogen transport in the North East region
- 19 public & private sector organisations
- Front runners in the hydrogen transport sector

TH2ISTLE Hydrogen Valley Up To 2030

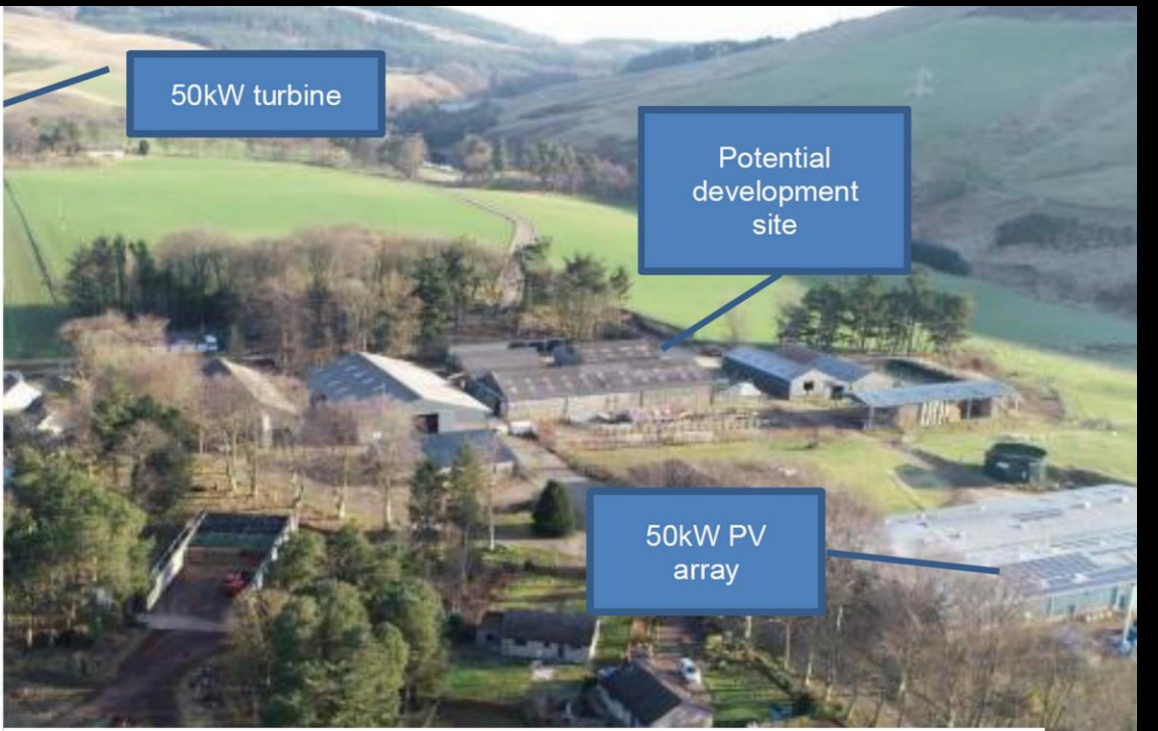


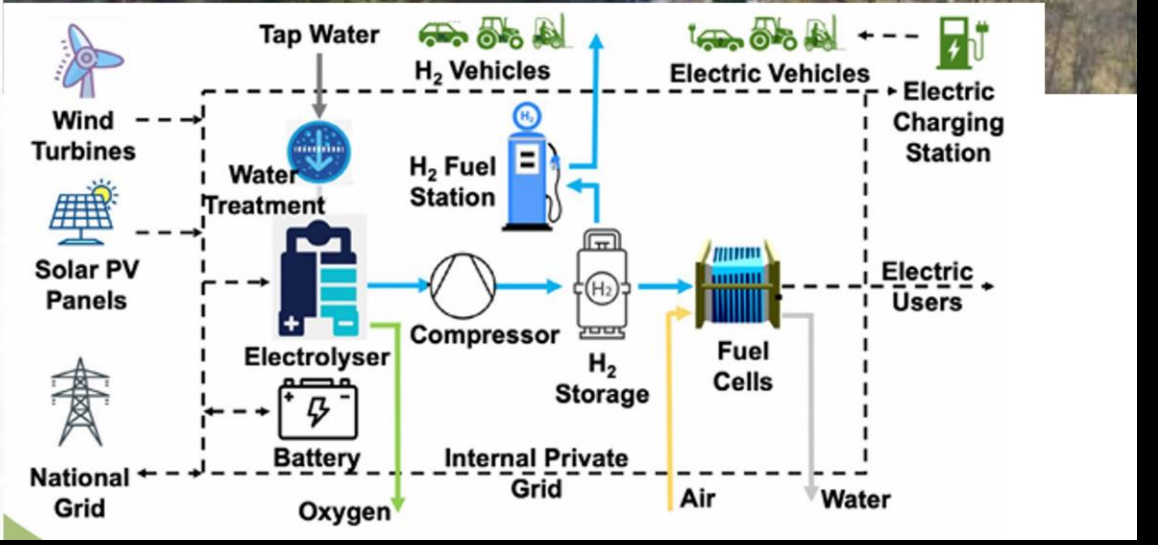
Hydrogen Campus

- ETZ will enable land to encourage clusters of specialised hydrogen activity
- A 15-hectare area of both brown field and green field land
- Green Hydrogen Test & Demonstration Facilities
- Purpose built hydrogen testing facility for industry

HydroGlen

- A £6m renewable energy ecosystem project at the James Hutton Institute at Glensaugh
- Aims to generate 100% of the community's energy needs through renewable sources
- Demonstrator for rural communities across Scotland
- Renewable electricity, on-site hydrogen electrolysis, compression, storage, hydrogen fuel cells for electricity and heat, vehicle refuelling, hydrogen vehicles and battery storage
- Demonstration of hydrogen powered tractors, pick-ups, ATVs/Quadbikes, cars.





Hydrasun Skills Academy

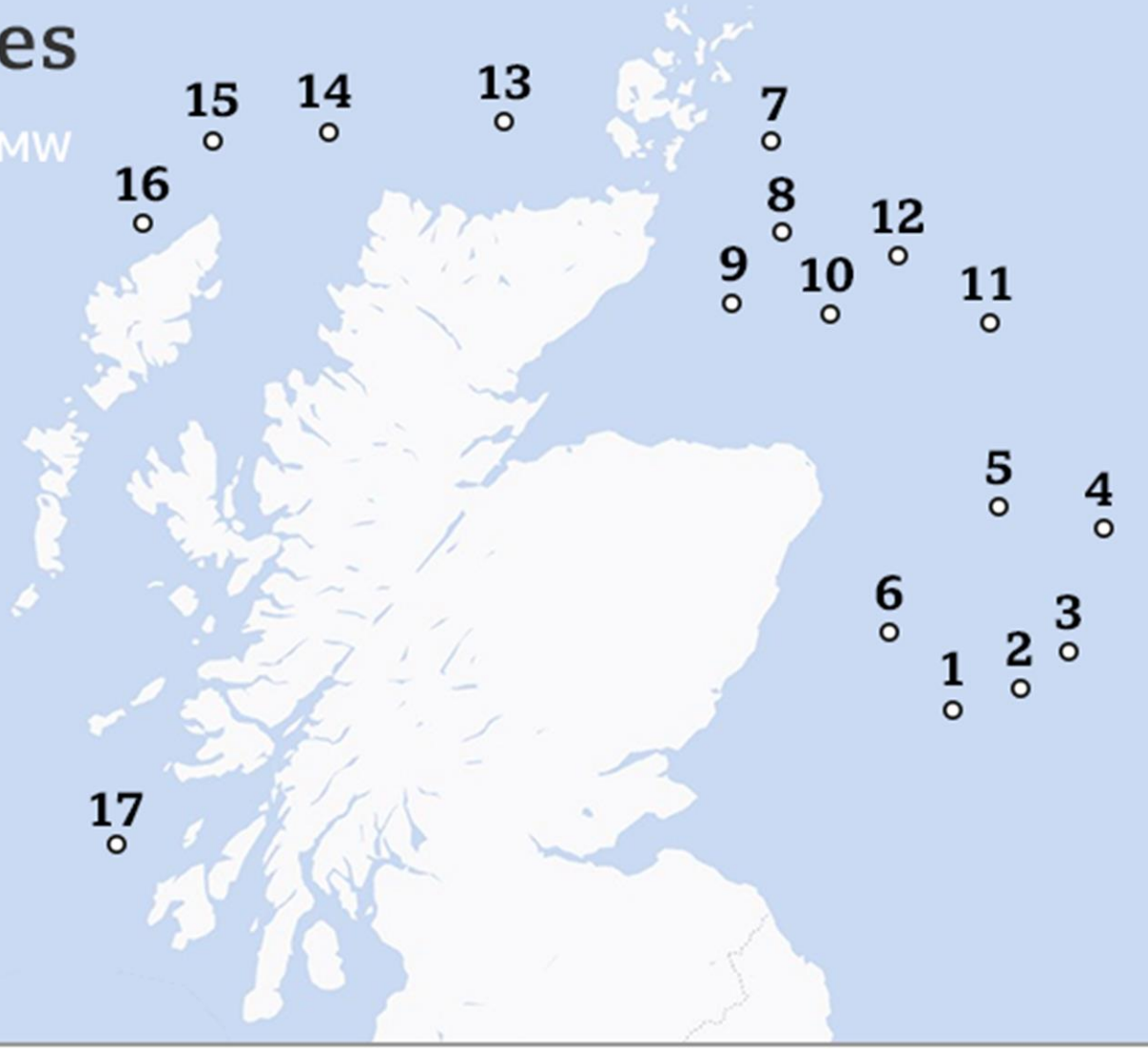
- Purpose built skills academy offering classroom & practical training
- Retaining and enhancing the existing talent in the region
- Retraining and upskilling for the hydrogen sector

Courses currently offered:

- Hydrogen Small-Bore Tubing Instrumentation Systems Installation
- Integration & Integrity,
- Gas Panel Build & Integration,
- Pneumatic Pressure Testing Safety
- Hydrogen System Leak Detection
- Hydrogen Safety Awareness

ScotWind Awarded Sites

1 BP Alternative Energy Investments 2,907MW
2 SSE Renewables 2,610MW
3 Falck Renewables 1,200MW
4 Shell New Energies 2,000MW
5 Vattenfall 798MW
6 DEME 1,008MW
7 DEME 1,008MW
8 Falck Renewables 1,000MW
9 Ocean Winds 1,000MW
10 Falck Renewables 500MW
11 Scottish Power Renewables 3,000MW
12 BayWa 960MW
13 Offshore Wind Power 2,000MW
14 Northland Power 1,500MW
15 Magnora 495MW
16 Northland Power 840MW
17 Scottish Power Renewables 2,000MW



Source: Crown Estate Scotland

BBC

Source: https://www.bbc.co.uk/news/uk-scotland-scotland-business-60002110

THANK YOU

GORDON MCINTOSH

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How to Apply?

How to apply [1/2]

1. **Register** by completing online questionnaire on ESA-STAR

   Registration (minimum “light registration) https://doing-business.sso.esa.int/

2. **Download** the official tender documentation (Invitation to Tender) via ESA STAR Publication “**AO 1-12743**” from 11th April 2025

3. **Create** a “**Bidder Restricted Area**” in ESA STAR Tendering

4. **Write** your proposal and request *Authorisation of Funding Letter* from the National Delegation

5. **Submit** your proposal via “**Bidder Restricted Area**” in ESA-STAR Tendering https://doing-business.sso.esa.int/ before the deadline of the ITT (23rd May 2025) and don’t wait until the last minute!

How to apply [1/2]

The Tender Package includes:

eli	Letter of Invitation
ews	Statement of Work
ecc	Draft Contract
etc	Tendering Conditions for Procurement Procedure
ept	Proposal and Cover Letter Template

Proposal Template

Your Proposal shall include the following information:

1. TECHNICAL PART
2. MANAGEMENT, ADMINISTRATIVE AND IMPLEMENTATION PART
3. FINANCIAL PART
4. CONTRACTUAL PART

Authorisation from National Delegation

1. Please note that funding participation is open to groups, organisations and businesses which reside in ESA Member States that have subscribed to the BASS programme.

2. To date, these countries include Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Norway, Poland, Portugal, Romania, Slovenia, Sweden, Switzerland and United Kingdom.

3. The **authorisation of funding** from the National Delegation will be required for submission of full proposals thus prospective applicants must contact their National Delegation as early as possible.

4. The contact information of the National Delegations can be found at https://business.esa.int/national-delegations

Thank you, Q&A.

Asimina Syriou

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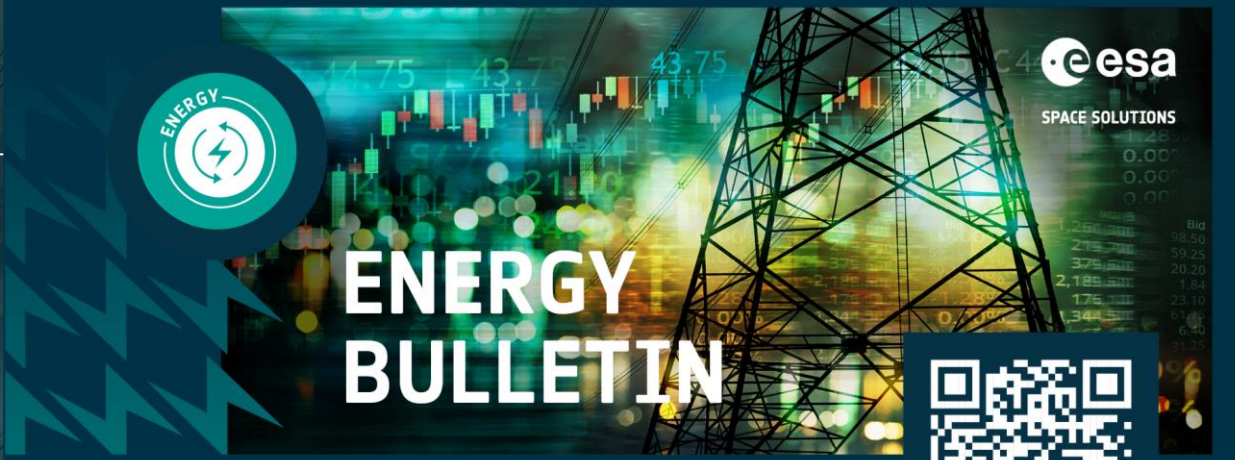
Directorate of Commercialisation, Industry and Competitiveness

LinkedIn

Energy BASS webpage



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