



## HYDROGEN TOPICS IN HORIZON EUROPE

### **Information & Matchmaking Event: EU Calls for Proposals 2023 on Battery and Hydrogen Technologies**

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- > Hydrogen Topics in Horizon Europe
  - > **Cluster 4 and Cluster 5**
  - > Clean Hydrogen Partnership



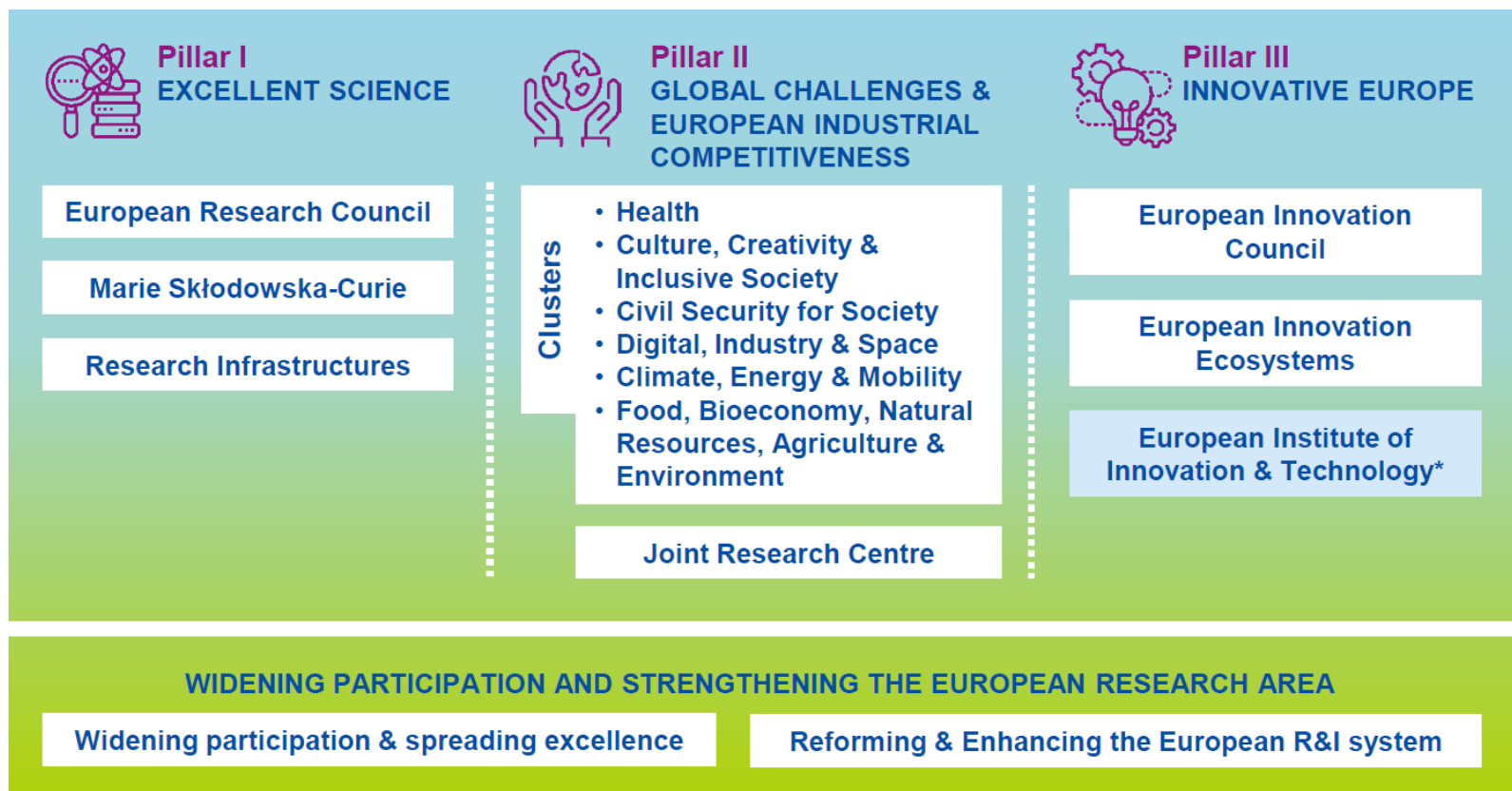
## EU FUNDING PROGRAMMES AND FUNDS 2021-2027

- > **Horizon Europe → Clean Hydrogen Partnership**
- > Innovation Fund
- > Connecting Europe Facility CEF
- > LIFE
- > InvestEU
- > ...



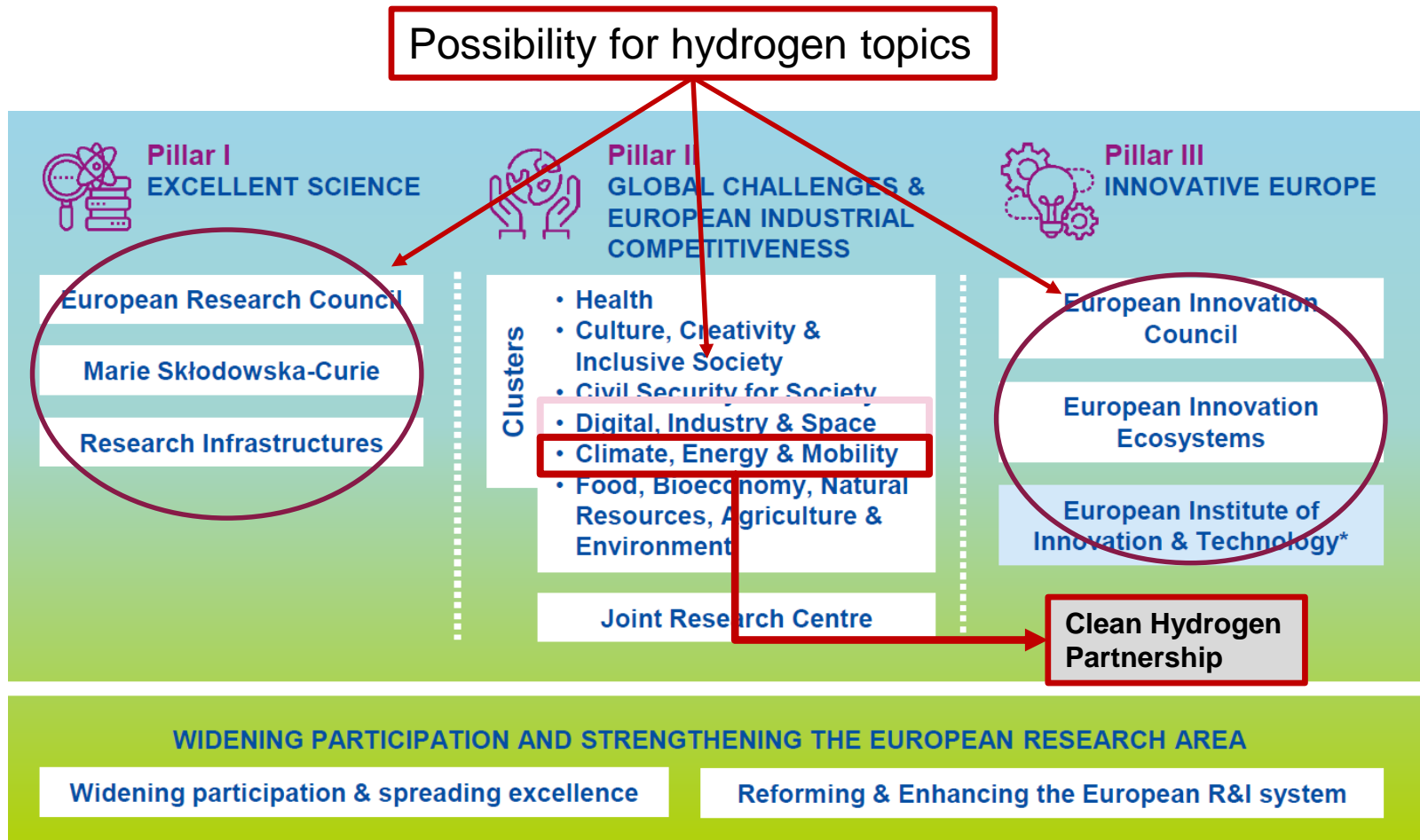
**Hydrogen Public Funding Compass**

# HYDROGEN IN HORIZON EUROPE



Source, extract: [https://ec.europa.eu/info/files/horizon-europe-investing-shape-our-future\\_en](https://ec.europa.eu/info/files/horizon-europe-investing-shape-our-future_en)

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# HORIZON EUROPE – PILLAR 2

## GLOBAL CHALLENGES AND EUROPEAN INDUSTRIAL COMPETITIVENESS

- Collaborative research for RIA and IA → min. three legal entities independent from each other and each established in a different country as follows:
  - at least one independent legal entity established in a Member State; and
  - at least two other independent legal entities, each established in different Member States or Associated Countries
- Annual or multi-annual work programmes including overarching information and specific topic descriptions → top down approach
- From applied science to demonstration activities → TRL 3 (Experimental proof of concept ) – TRL 8 (System complete and qualified)

## TOPICS IN CLUSTER 4 – DIGITAL, INDUSTRY AND SPACE

- > Destination 1: Climate neutral, Circular and Digitised Production
  - > Global leadership in clean, climate-neutral and resilient industrial value chains, circular economy and climate-neutral and human-centric digital systems and infrastructures

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Deadline
HORIZON-CL4-2024-TWIN-TRANSITION-01-34	Renewable hydrogen used as feedstock in innovative production routes (Processes4Planet Partnership)	RIA	4 → 6	8 - 10	2	07.02.2024
HORIZON-CL4-2024-TWIN-TRANSITION-01-46	CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (Clean Steel Partnership)	RIA	4 → 5/6	3 - 5	4	07.02.2024

- > Interfaces for the use and application of hydrogen can also be found in other Topics

## TOPICS IN CLUSTER 5 – CLIMATE, ENERGY AND MOBILITY

### > Destination 1: Climate science

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Deadline
HORIZON-CL5-2023-D1-01-03	Climate impacts of a hydrogen economy	RIA		4	2	18.04.2023

### > Destination 2: Cross-cutting Solutions

HORIZON-CL5-2023-D2-01-06	Open Pilot Line/Test Bed for hydrogen	IA		10	1	18.04.2023
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### > Destination 3: Energy supply

HORIZON-CL5-2023-D3-01-01	Renewable Energy Valleys to increase energy security while accelerating the green transition in Europe	IA	→ 7/8	20	2	30.03.2023
HORIZON-CL5-2024-D3-02-02	Development of next generation synthetic renewable fuel technologies	RIA	→ 3/4	4	3	05.09.2024



## TOPICS IN CLUSTER 5

### > Destination 5: Clean and competitive solutions for all transport modes

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Deadline
HORIZON-CL5-2023-D5-01-07	Hydrogen-powered aviation	IA	→ 6	20	2	20.04.2023
HORIZON-CL5-2023-D5-01-08	Accelerating climate-neutral hydrogen-powered/electrified aviation	RIA	→ 2/3	17	4	20.04.2023
HORIZON-CL5-2023-D5-01-12	Demonstrations to accelerate the switch to safe use of new sustainable climate neutral fuels in waterborne transport (ZEWT Partnership)	IA	→ 7/8	34	3	20.04.2023

### > Interfaces for the use and application of hydrogen can also be found in other Topics

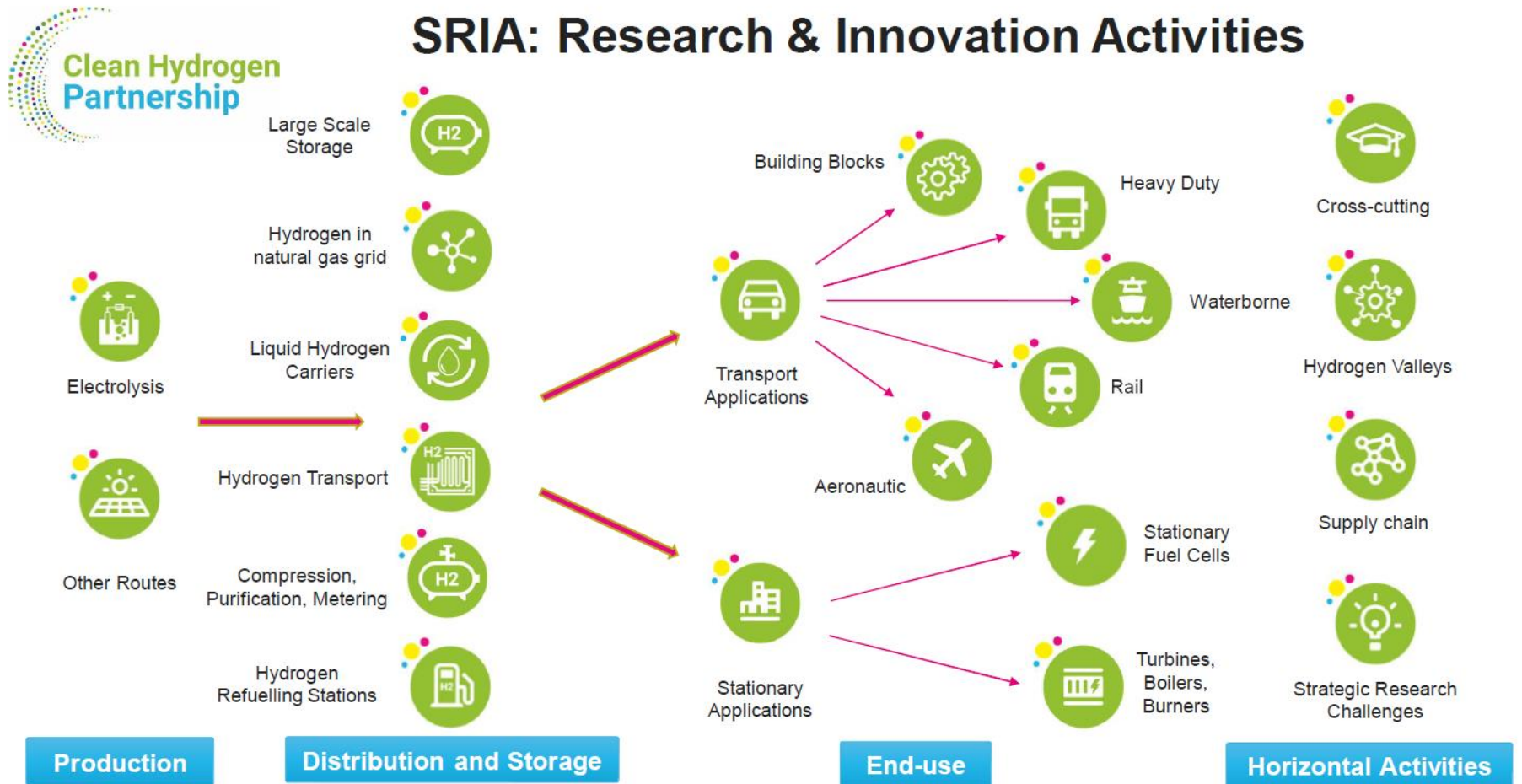
- > Hydrogen Topics in Horizon Europe
  - > Cluster 4 and Cluster 5
  - > **Clean Hydrogen Partnership**



## Institutionalised partnership *Clean Hydrogen*



- Successor to the partnership FCH JU since end of 2021 (legal basis *single basic act*)
- Members
  - European Commission (public side)
  - Hydrogen Europe and Hydrogen Europe Research (private side)
- Total budget EUR 1 billion from EC + at least 1 billion from private side
- General objectives:
  - Support the implementation of the European Hydrogen Strategy
  - Stimulate research and innovation on clean hydrogen production, distribution, storage and end use applications
  - Strengthen the competitiveness of the EU clean hydrogen value chain
  - Contribute to the EU 2030 and 2050 climate ambition



# OVERVIEW – ANNUAL WORK PROGRAMME 2023



## Call for proposals 2023

**Total budget: 195 M€**

**Publication date: 17th January 2023**

**Opening of submission: 31st January 2023**

**Deadline: 18th April 2023**



# OVERVIEW – RENEWABLE HYDROGEN PRODUCTION

- Main Focus
  - Cost reduction and efficiency increase for renewable hydrogen production routes:
    - Going low in TRL for LT and HT electrolyser concepts
    - Ringfencing support to AEL
    - Revisiting PEC and PC devices
- What's new:
  - Waste to Hydrogen
  - Valorising Oxygen and heat from electrolysis

## TOPICS – RENEWABLE HYDROGEN PRODUCTION

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-01-01	Innovative electrolysis cells for hydrogen production	RIA	2 → 4	3	2	
HORIZON-JTI-CLEANH2-2023-01-02	Innovative Solid Oxide electrolysis cells for intermediate temperature hydrogen production	RIA	2 → 4	3	1	
HORIZON-JTI-CLEANH2-2023-01-03	Advances in alkaline electrolysis technology	RIA	3 → 5	2,5	1	
HORIZON-JTI-CLEANH2-2023-01-04	Photoelectrochemical (PEC) and/or Photocatalytic (PC) production of hydrogen	RIA	2 / 3 → 5	2,5	1	
HORIZON-JTI-CLEANH2-2023-01-05	Waste to Hydrogen demonstration plant	IA	5 → 7	10	1	<b>Flagship Projects</b> max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-01-06	Valorisation of by-product O2 and/or heat from electrolysis	IA	→ 7 / 8	10	1	
HORIZON-JTI-CLEANH2-2023-01-07	Hydrogen use by an industrial cluster via a local pipeline network	IA	→ 8	15	1	

# OVERVIEW – HYDROGEN STORAGE AND DISTRIBUTION

- Main Focus
  - Hydrogen Storage:
    - Scaling up underground storage for both salt caverns and depleted gas fields
    - Next generation on-shore liquid storage
  - Hydrogen Distribution:
    - Facilitating the re-purposing of steel pipelines to transport hydrogen
    - High pressure supply chain for gaseous hydrogen transport
- What's new:
  - Liquid Hydrogen Refuelling Stations



# TOPICS – HYDROGEN STORAGE AND DISTRIBUTION

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-02-01	Large-scale demonstration of underground hydrogen storage	IA	→ 8	20	1	<b>Flagship Project</b> max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-02-02	Pre-Normative Research about the compatibility of transmission gas grid steels with hydrogen and development of mitigation techniques	RIA	3 → 5	4	1	
HORIZON-JTI-CLEANH2-2023-02-03	Novel insulation concepts for LH2 storage tanks	RIA	2 → 3	2	1	
HORIZON-JTI-CLEANH2-2023-02-04	Demonstration of high pressure (500-700 bar) supply chain	IA	6 → 8	5	1	max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-02-05	Demonstration of LH2 HRS for Heavy Duty applications	IA	4 → 6 / 7	5	1	

# OVERVIEW – HYDROGEN END USES: TRANSPORT APPLICATIONS

- Main Focus
  - Aviation, maritime and non-road applications
  - Adaptation of fuel cells and stacks to the specific needs of non-road applications
  - Increased power, lifetime and modularity
- What's new:
  - Development of dedicated fuel cell systems for non-road mobile machinery
  - Large power at stack level for maritime applications
  - Cooperation/ synergies with the Clean Aviation Partnership

## TOPICS – HYDROGEN END USES: TRANSPORT APPLICATIONS

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-03-01	Real environment demonstration of Non-Road Mobile Machinery (NRMM)	IA	4 / 5 → 7	5	2	max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-03-02	Development of a large fuel cell stack for maritime applications	RIA	4 → 6	7,5	1	
HORIZON-JTI-CLEANH2-2023-03-03	Ultra-low NOx combustion system for aviation	RIA	→ 4	8	1	

# OVERVIEW – HYDROGEN END USES: CLEAN HEAT & POWER

## > Main Focus

- > Next generation fuel cells for stationary applications able to run under 100% H<sub>2</sub> and other H<sub>2</sub>-rich fuels – Reducing CAPEX and TCO
- > Combustion of hydrogen in retrofitted Gas Turbines

## > What's new:

- > Fundamental research on combustion of unconventional hydrogen blends
- > Demonstration activities on the retrofitting of burners and furnaces so that they are able to run up to 100% H<sub>2</sub>

## TOPICS – HYDROGEN END USES: CLEAN HEAT & POWER

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-04-01	Development and validation of high power and impurity tolerant fuel cell systems ready to run on industrial quality dry hydrogen	RIA	3 → 5	4	1	
HORIZON-JTI-CLEANH2-2023-04-02	Research on fundamental combustion physics, flame velocity and structure, pathways of emissions formation for hydrogen and variable blends of hydrogen, including ammonia	RIA	2 → 4	3	1	
HORIZON-JTI-CLEANH2-2023-04-03	Retrofitting of existing industrial sector natural gas turbomachinery cogeneration systems for hydrogen combustion	IA	5 → 7	6	1	max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-04-04	Hydrogen for heat production for hard-to-abate industries (e.g. retrofitted burners, furnaces)	IA	5 → 7	6	1	

# OVERVIEW – CROSS-CUTTING ISSUES

## > Main Focus

- > Raising the environmental sustainability of FCH systems by developing rules on how to measure the life cycle environmental performance of several FCH product categories
- > Underpinning the build of a highly skilled workforce in FCH technologies and applications
- > Assessing the potential effects of a hydrogen economy on the climate

## > What's new:

- > Development of Product Environment Footprint Category for FCH products
- > Establishment of large alliances of universities, education institutions and schools
- > Assessment of the number, sources, release rates, etc. of hydrogen releases expected from the hydrogen value chain

## TOPICS – CROSS-CUTTING ISSUES

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-05-01	Product environmental footprint pilot for a set of FCH product categories	CSA		1,5	1	
HORIZON-JTI-CLEANH2-2023-05-02	European Hydrogen Academy	CSA		3	1	
HORIZON-JTI-CLEANH2-2023-05-03	Pre-Normative Research on the determination of hydrogen releases from the hydrogen value chain	RIA	n/a	3	1	

# OVERVIEW – HYDROGEN VALLEYS

## > Main Focus

- > Demonstrate large- and small-scale hydrogen valleys that can be sustained and grow with time and replicated elsewhere
- > Hydrogen as an enabler for sector coupling and integration of renewable energy
- > Covers the complete value chain of hydrogen
- > Contribute to EU competitiveness by supporting a European value chain

## > What's new:

- > Increased focus on innovation at system level
- > Topics less prescriptive on the volumes of hydrogen allocated to each sector and application

as part of the REPowerEU Plan additional budget of EUR 200 million for Hydrogen Valley Projects → EUR 60 million will be already allocated to activities in the AWP 2023.



## TOPICS – HYDROGEN VALLEYS

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-06-01	Large-scale Hydrogen Valley	IA	6 → 8	20	1	<b>Flagship Project</b> max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-06-02	Small-scale Hydrogen Valley	IA	6 → 8	9	2	

- Funding plan to ensure implementation of the project
  - synergies with other sources of funding (EU or national/ regional programmes)
  - Commitment of private investment
- Evidence of the commitment and role of public authorities (Member States, Regions, Cities) and any other necessary stakeholder to implement the Hydrogen Valley

# OVERVIEW – STRATEGIC RESEARCH CHALLENGES

## > Main Focus

- > Generate continuous innovation and long-term knowledge on early-stage research:
  - > Multidisciplinary investigations, gathering the expertise across the EU research community
  - > Covering most relevant research challenges identified in the SRIA
  - > Development of multi-functional materials for hydrogen storage tanks
  - > Understanding degradation mechanism and improve the stability of electrolyzers

## > What's new:

- > Addressing sustainability and circularity
- > Public annual progress reports

# TOPICS – STRATEGIC RESEARCH CHALLENGES

Topic Code	Topic Title	ToA	TRL to be achieved	Approx. Budget/Grant (Mio. €)	Expected Grants	Funding Rate*/ Model
HORIZON-JTI-CLEANH2-2023-07-01	Advanced materials for hydrogen storage tanks	RIA	2 → 4	10	1	max. contribution / at least one member of HE or HER
HORIZON-JTI-CLEANH2-2023-07-02	Increasing the lifetime of electrolyser stacks	RIA	2 → 4 / 5	10	1	



## Summary of call conditions elements to pay attention to:

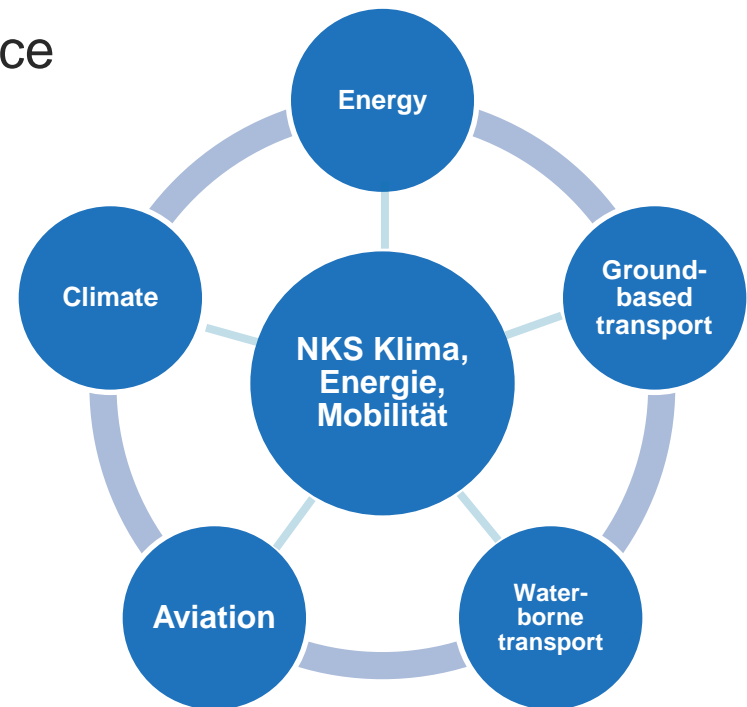


## FURTHER INFORMATION

- > Clean Hydrogen Partnership
  - > [https://www.clean-hydrogen.europa.eu/index\\_en](https://www.clean-hydrogen.europa.eu/index_en)
- > Info Days - Presentation of the Calls
  - > [https://www.clean-hydrogen.europa.eu/apply-funding/info-days-0\\_en](https://www.clean-hydrogen.europa.eu/apply-funding/info-days-0_en)
- > Annual Work Programme 2023
  - > [https://www.clean-hydrogen.europa.eu/about-us/key-documents/annual-work-programmes\\_en](https://www.clean-hydrogen.europa.eu/about-us/key-documents/annual-work-programmes_en)

# GERMAN NATIONAL CONTACT POINT FOR CLIMATE, ENERGY AND MOBILITY

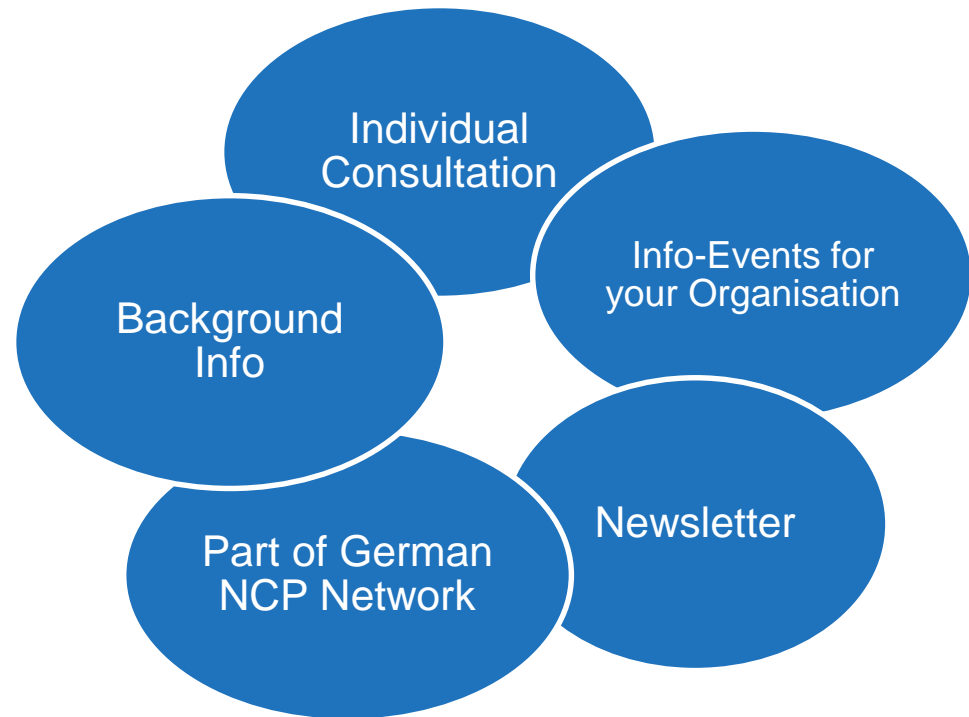
- > Network for joint information and advice under HEU - Cluster 5 in the areas climate, energy and mobility
- > **Our Website:** [www.nks-kem.de](http://www.nks-kem.de)
- > **Our Newsletter:** <https://www.nks-kem.de/aktuelles/newsletter>



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#### Projektträger Jülich

Energie und Klima

Energiesystem: Integration | Europäische Energieforschung (ESI2)

Nationale Kontaktstelle LIFE -Clean EnergyTransition  
und Klima, Energie, Mobilität (KEM) | Bereich Energie

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