Clean Hydrogen Partnership

ENEA
Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Annual Working Plan 2024

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Call AWP24

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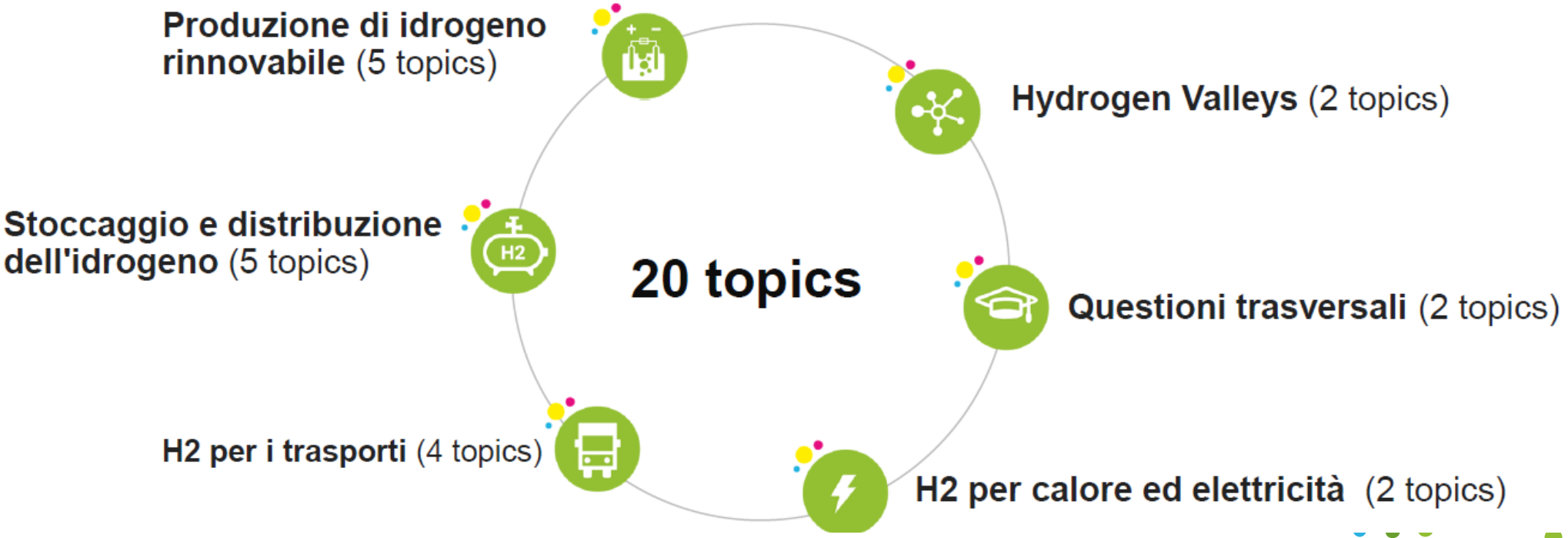

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Topics in the call 2024

Renewable Hydrogen Production

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Renewable Hydrogen Production Overview

Main Focus

- Electrolysers:
  - Improving PCCEL and AEMEL
  - Revisiting monitoring & diagnostic tools for electrolysers
- Circular Hydrogen production
  - Optimal integration of hydrogen production in industry

What is new

- Direct sea water electrolysis

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Renewable Hydrogen Overview

Topic	Type of Action	Ind. Budg (M€)
HORIZON-JTI-CLEANH2-2024-**01-01**: Innovative proton conducting ceramic electrolysis cells and stacks for intermediate temperature hydrogen production	RIA	3
HORIZON-JTI-CLEANH2-2024-**01-02**: Advanced anion exchange membrane electrolysers for low-cost hydrogen production for high power range applications	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-03**: Development of innovative technologies for direct seawater electrolysis	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-04**: Development and implementation of online monitoring and diagnostic tools for electrolysers	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-05**: Hydrogen production and integration in energy-intensive or specialty chemical industries in a circular approach to maximise total process efficiency and substance utilisation	IA	10

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Topics in the call 2024

Hydrogen Storage and Distribution

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Hydrogen Storage and Distribution Overview

Main Focus

Hydrogen Storage

- Microbiological interactions in H_2 underground storage in porous media
- Next generation aboveground storage solutions

Hydrogen Distribution

- Scaling up and demonstrating purification prototypes
- Flexible compressor coupled to RES

What is new

- Multi-purpose HRS up to 3,000kgH_2/day

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Hydrogen Storage and Distribution Overview

Topic	Type of Action	Budget (M€)
HORIZON-JTI-CLEANH2-2024-**02-01**: Investigation of microbial interaction for underground hydrogen porous media storage	RIA	3
HORIZON-JTI-CLEANH2-2024-**02-02**: Novel large-scale aboveground storage solutions for demand-optimised supply of hydrogen	RIA	4
HORIZON-JTI-CLEANH2-2024-**02-03**: Demonstration of hydrogen purification and separation systems for renewable hydrogen-containing streams in industrial applications	IA	6
HORIZON-JTI-CLEANH2-2024-**02-04**: Demonstration of innovative solutions for high-capacity, reliable, flexible, and sustainable hydrogen compression technologies in commercial applications	IA	6
HORIZON-JTI-CLEANH2-2024-**02-05**: Demonstration and deployment of multi-purpose Hydrogen Refuelling Stations combining road and airport, railway, and/or harbour applications	IA	8

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Topics in the call 2024

Hydrogen End Uses: Transport Applications

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Hydrogen End Uses: Transport Applications Overview

Main Focus

- Maritime and Heavy-Duty (with spill over to other applications);
- Balance of Plant (BoP design, architectures and operational strategies);
- Integration and demonstration for maritime application;

What is new

- Scale up of BoP components
- New storage solutions for maritime applications;
- Synergy between topics of the same call and existing projects (StaSHH)

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Transport Applications Overview

Topic	Type of Action	Ind. Budget (M€)
HORIZON-JTI-CLEANH2-2024-**03-01**: Balance of plant components, architectures and operation strategies for improved PEMFC system efficiency and lifetime	RIA	4
HORIZON-JTI-CLEANH2-2024-**03-02**: Scaling-up Balance of Plant components for efficient high-power heavy-duty applications	RIA	4
HORIZON-JTI-CLEANH2-2024-**03-03**: Next generation on-board storage solutions for hydrogen-powered maritime applications	RIA	5
HORIZON-JTI-CLEANH2-2024-**03-04**: Demonstration of hydrogen fuel cell-powered inland or short sea shipping	IA	6

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Topics in the call 2024

Hydrogen end uses: Clean Heat & Power

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Hydrogen end uses: Clean heat & power Overview

Main Focus

- Next generation fuel cell: Portable robust and long-term autonomous FC systems for quick integration into the power system of a critical user, providing backup power in an uninterruptible manner
- Hydrogen-fired Gas Turbines

What is new

- Portable FC to power critical infrastructures under demanding operational conditions
- Covering knowledge gaps on premixed hydrogen combustion at high pressure

Clean Heat & Power - Overview

Topic	Type of Action	Ind. Budget (M€)
HORIZON-JTI-CLEANH2-2024-**04-01**: Portable fuel cells for backup power during natural disasters to power critical infrastructures	IA	5
HORIZON-JTI-CLEANH2-2024-**04-02**: Improved characterisation, prediction and optimisation of flame stabilisation in high-pressure premixed hydrogen combustion at gas-turbine conditions	RIA	4

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Topics in the call 2024

Cross-cutting Issues

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Cross-cutting Issues Overview

Main Focus

- Continue raising the environmental sustainability of fuel cell and hydrogen (FCH) systems by developing bespoke guidelines
- To research novel materials environmentally friendly for PEM-based hydrogen technologies

What is new

- Development of ‘safe and sustainable-by-design’ (SSbD) guidelines for systems across the hydrogen value chain
- Development of non-fluorinated components

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Cross-cutting Issues Overview

Topic	Type of Action	Ind. Budget (M€)
HORIZON-JTI-CLEANH2-2024-**05-01:** Guidelines for sustainable-by-design systems across the hydrogen value chain	CSA	1.5
HORIZON-JTI-CLEANH2-2023-**05-02**: Development of non-fluorinated components for fuel cells and electrolysers	RIA	3

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Hydrogen Valleys

Topics in the Call 2024
&
Lessons Learnt

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Hydrogen Valleys - Overview

Main Focus

- Demonstrate an ecosystem built on the complete value chain of hydrogen;
- Large and small-scale hydrogen valleys acting as testbeds to showcase first regional "hydrogen economies";
- Topic open to foster the emergence of the widest possible array of valleys configurations;
- Innovation in Hydrogen Valleys is not about the technology development of an application, but on system integration of hydrogen production, its distribution and storage, and its subsequent use (TRL >=6-8)

What is new

- FAQs on Hydrogen Valleys available

Hydrogen Valleys - Overview

Topic	Type of Action	Ind. Budget (M€)
HORIZON-JTI-CLEANH2-2023-**06-01**: Hydrogen Valleys (large-scale)	IA	20*
HORIZON-JTI-CLEANH2-2023-**06-02**: Hydrogen Valleys (small-scale)	IA	9*

*For the Call for Proposals 2024, up to 60 MEUR additional budget is available to top-up the allocated budget for hydrogen valleys under the Call for Proposals 2024. More than one (Hydrogen Valley) project per topic will be funded, according to the final ranking at the end of the evaluation process.

!! The maximum JU contribution that can be requested is an eligibility criteria !!

Hydrogen Valleys - Topics

HORIZON-JTI-CLEANH2-2024-06-01: Hydrogen Valleys (large-scale)

Develop and demonstrate a large-scale Hydrogen Valley with innovative approaches at system level

- Production of ≥ 4,000 tonnes of clean H2 per year using new hydrogen production capacity (GOs)
- ≥ 2 hydrogen applications from ≥ 2 sectors (energy, industry, transport),≥ 2 years of operations
- Costs of renewable energy plants (e.g. PV or wind plant) or related costs for operation of the Hydrogen Valley (e.g. electricity for electrolyser) are not eligible for funding

HORIZON-JTI-CLEANH2-2024-06-02: Hydrogen Valleys (small-scale)

Develop and demonstrate a large-scale Hydrogen Valley with innovative approaches at system level

- Production of ≥ 500 tonnes of clean H2 per year using new hydrogen production capacity (GOs)
- Supply more than one end sector or application (mobility, industry energy), ≥ 2 years of operations;
- Costs of renewable energy plants (e.g. PV or wind plant) or related costs for operation of the Hydrogen Valley (e.g. electricity for electrolyser) are not eligible for funding

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Hydrogen Valleys - Topics

Common elements applicable to Hydrogen Valley Topics

- Provide concrete project **implementation plans** with a clear calendar, defining the key phases of the implementation of the action;
- Provide a **funding plan** to ensure implementation of the project in synergies with other sources of funding;
- Clearly and coherently present the Hydrogen Valley including the investments/actions supported directly by this topic as well as **other investments/actions supported by other funding /financing sources**;
- Provide **evidence of the commitment** and role of public authorities and of any other necessary stakeholders at least in the form of **Letters of Intent (LOI)** should be provided (remember to include as annexes);
- Ensure coverage of aspects such as **replicability and cooperation** between regions to facilitate transfer of knowledge across the EU as well as **scalability**;
- The topics are expected to contribute to the **EU competitiveness** (support of the EU value chain and FC system components);

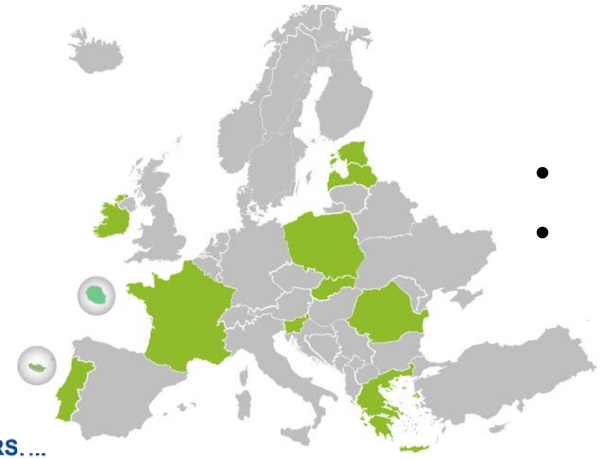
Hydrogen Valleys Facility

PDA I

2020 – 2021

- 11 Projects supported;
- Observers' Network;

PDA II



2023 – 2024

- 15 Projects supported;
- Workshops and supporting knowledge;

Hydrogen Valley facility

Duration: 2024 …

Budget: € 12.5 m

Project development assistance

Support Hydrogen Valleys at different level of maturity to investment decision

Horizontal Activities

- Gather knowledge & lessons learnt
- Maintain Mission Innovation Hydrogen Valley Platform;

Synergies and combination of funding

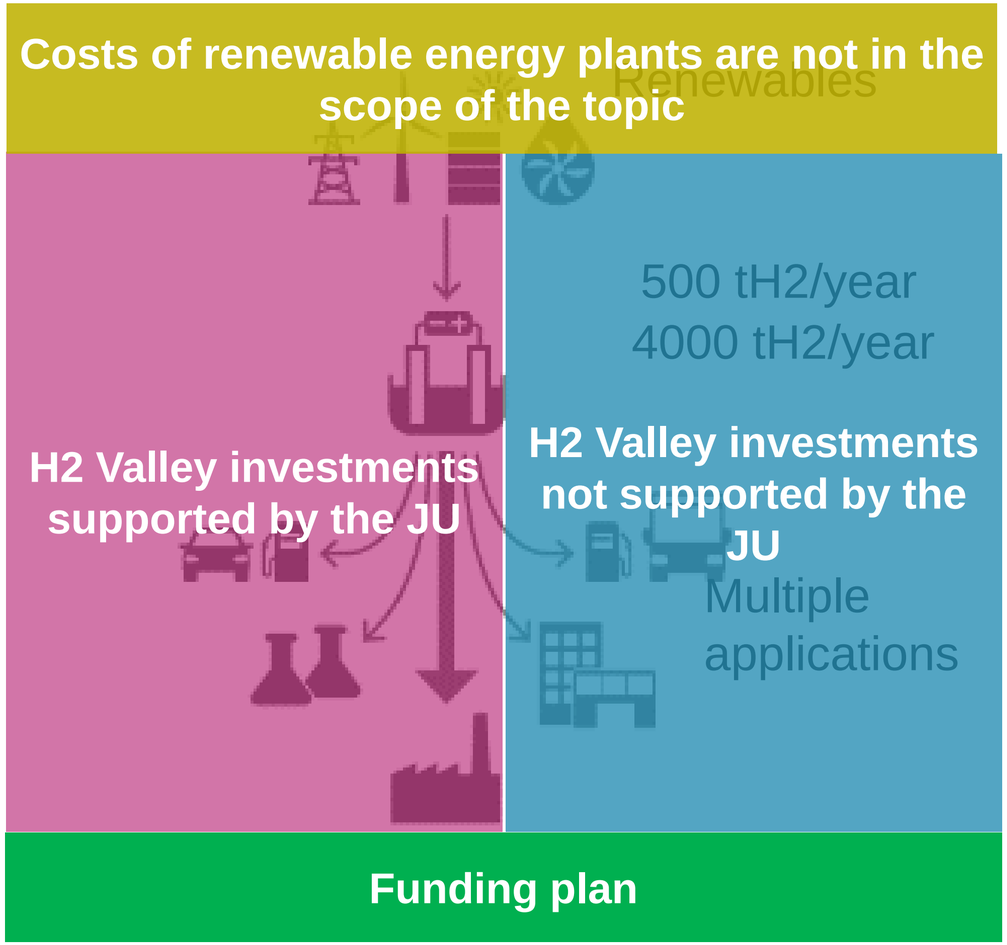
Hydrogen Valleys require significant investments (JU funding covers only a fraction) -> co-funding from other sources needed

Present the H2 Valley across the whole value chain including:

- investments/actions supported directly **by the JU;**
- investments/actions supported (exclusively**) by other sources**

Necessary to, **convincingly**, address all elements of the Hydrogen Valley that are necessary to respond to the topic requirements

Provide a **funding plan** to ensure implementation of the project in synergies with other sources of funding and/or commitment from the partners to provide own funding



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Synergies and combination of funding

FAQ: How to present costs in the proposal for Hydrogen Valleys that are being financed/funded using a combination of funding sources including Clean Hydrogen JU funding?

EXAMPLE: We want to include a hydrogen production plant that will be exclusively funded using national programmes (already awarded):

WHAT:

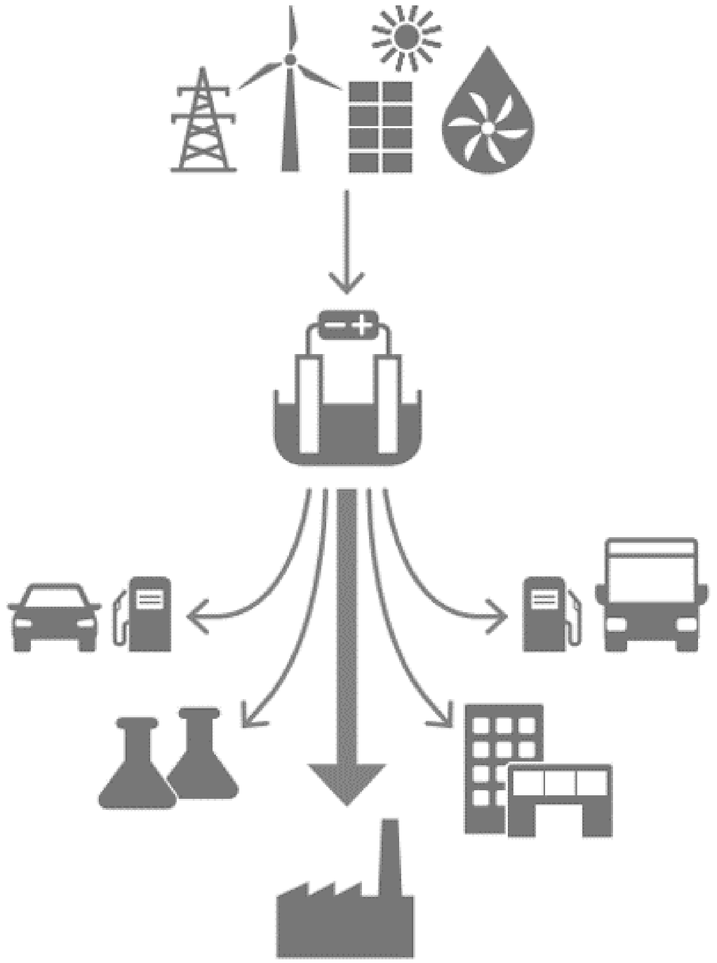
- describe the hydrogen production plant as an integral part of the Hydrogen Valley (TRL, methodology, implementation, stakeholders, risks, funding/financing, etc)

HOW:

- present the Hydrogen Valley including **all elements,** irrespectively of whether they are supported with JU funding or not, in order to show how they form a Hydrogen Valley
- present a **credible work plan** (tasks, timing, responsibilities, etc.) & **preliminary funding strategy,**
- demonstrate the commitment of the necessary **stakeholders**

Hydrogen Valleys

Lessons learnt



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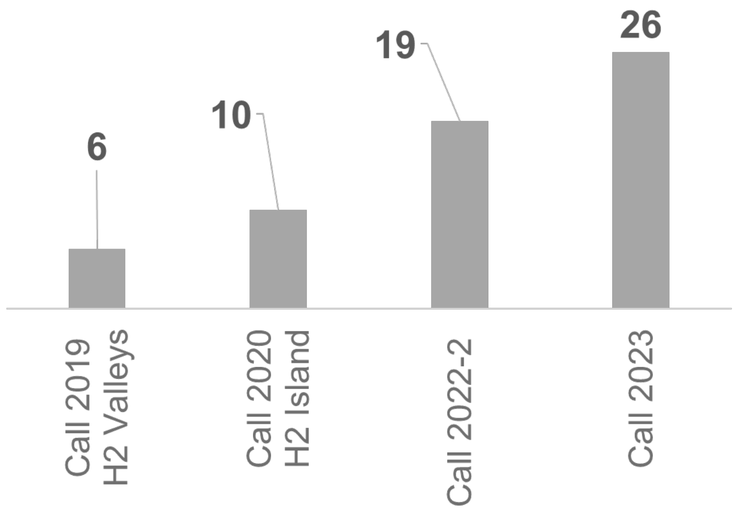
Overview of former Calls

Number of proposal submitted in Hydrogen Valleys Calls



Call 2023 overview

- 26 eligible/admissible proposals submitted, less than 20% above the threshold
- Expected impact of proposals was good or very good
- A large number of proposals either:
  - passed Impact and Implementation but **failed on Excellence**
  - passed Excellence and Impact but **failed on Implementation**

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Lessons learnt: Excellence

Various proposals passed impact and implementation but failed on excellence

EXCELLENCE

- Clarity and pertinence of the **project's objectives**, and the extent to which the proposed work is ambitious, and goes beyond the state-of-the-art.
- Soundness of the proposed **methodology**, including the underlying concepts, models, assumptions, inter-disciplinary approaches, appropriate consideration of the **gender dimension** in research and innovation content, and the quality of **open science practices** including sharing and management of research outputs and engagement of citizens, civil society and end users where appropriate.

Soundness of hydrogen to decarbonise a certain geography not sufficiently supported by evidences/early studies

Technology maturity (SoA) not adequately demonstrated -> undermines the credibility of having a functional Valley by of the end of the project

Methodology not sufficiently explained, e.g:

- Elements of the Hydrogen Valley supported by other funding sources briefly mentioned and connection to proposal not explained;
- Interaction (including governance) between production, storage, distribution and end- use cases not clearly explained, do we have Hydrogen Valley?;
- Techno-economic considerations not covered;
- Quantification of hydrogen produced in the project not provided;
- Renewable nature of the hydrogen to be produced/used in the Hydrogen Valley not sufficiently explained / demonstrated;
- ……

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Lessons learnt: Implementation

Various proposals passed Excellence and Impact but failed on Implementation

QUALITY AND EFFICIENCY OF THE IMPLEMENTATION

- Quality and effectiveness of the **work plan**, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.
- Capacity and role of each **participant**, and extent to which the **consortium** as a whole brings together the necessary expertise.

Work Plans do not demonstrate how the project objectives will be met

- a clear calendar for the implementation and validation of the use cases not presented
- tasks in the work packages not clearly identified nor leading to the implementation of the Hydrogen Valley (lack of details, too general, etc.)
- exclusion from the work plan of key elements of the Hydrogen Valley (specially those for which costs will be covered by other funding schemes)

Cost information too general, breakdowns insufficiently detailed

Funding plan/strategy not clearly presented

- ….

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Take aways

- Proposals **not mature** enough
- **Technological solutions** not credible nor sufficiently backed-up with sufficient information
- **Implementation plans are too generic** and do not lead to reaching the objective of deploying a fully functional Valley
- **Larger costs** included in proposal **not justified / detailed enough**
- Proposals do not present **a coherent and credible Hydrogen Valley concept**

Use the 70 pages you have available wisely

Do not forget to involve and evidence the commitment and role of stakeholders