

ENNOH H₂ Quality Monitoring Report Webinar

9 June, 14h30 – 15h30



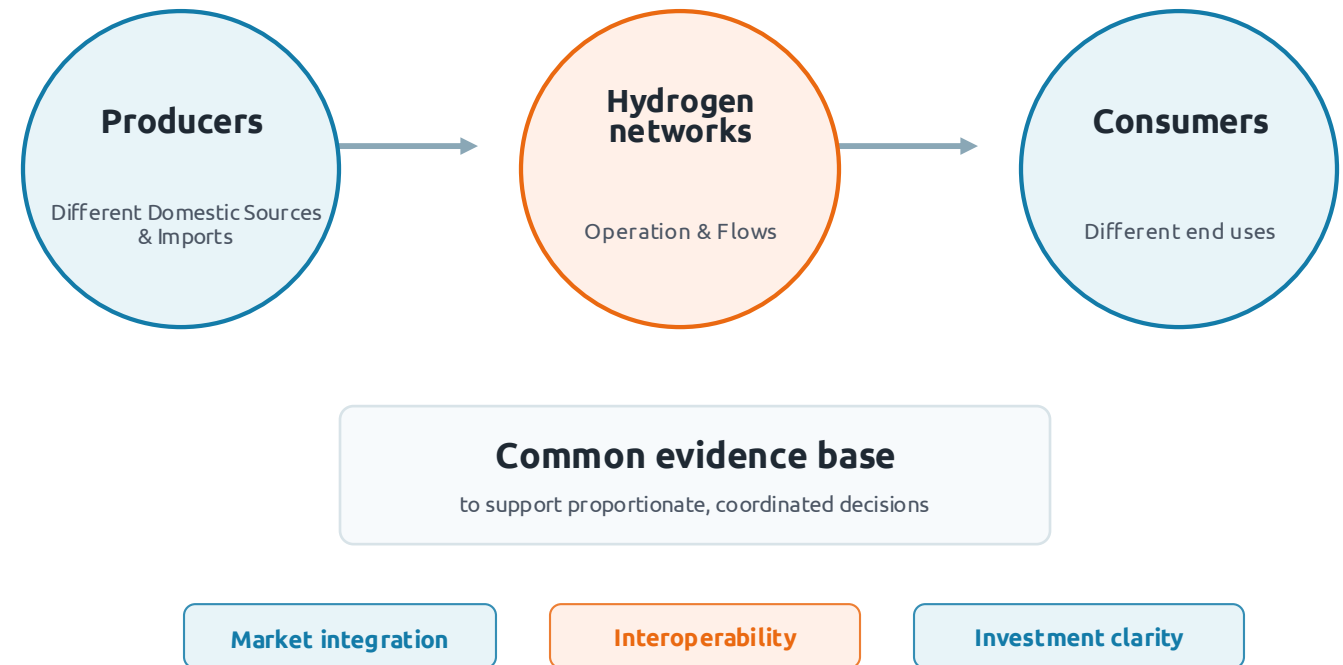
01 Opening remarks



Abel Enríquez
Director

A technical parameter with strategic market implications

The quality question sits between supply, networks and demand



1 An emerging market

Projects are developing at different speeds, with different national assumptions and end-use needs.

2 A cross-border issue

Quality requirements will shape interoperability, infrastructure planning and market integration.

3 A fragmentation risk

If unmanaged, quality differences may become operational barriers rather than enablers of trade.

14h30	Start of the webinar	Speakers
14h30 – 15h30	1. Welcome & opening remarks 2. Report presentation 3. EU Institutions and Stakeholders' reactions 4. Q&A 5. Closing remarks & next steps	Abel Enríquez (ENNOH) Daniel Bonnici (ENNOH) Ruta Baltause (European Commission) Dionisis Tsimis (Clean Hydrogen Partnership) Peter van Wesenbeeck (EASEE-gas) Ulrich Duda (H2eart for Europe) Daniel Bonnici (ENNOH) Daniel Bonnici (ENNOH)
15h30	End of webinar	

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Password:
hydrogenforgood



02 Report presentation



Daniel Bonnici
Head of System Operation & Transparency

Regulatory framework

Article 59 of the Regulation (EU) 2024/1789

“Adopt a hydrogen quality monitoring report and every 2 years thereafter, including developments and forecasts for the expected developments of hydrogen quality parameters, as well as information on cases related to differences in hydrogen quality specifications and how such cases were settled”

- Hydrogen quality definition (Article 2 of the Directive (EU) 2024/1788): “hydrogen purity and contaminants in line with applicable hydrogen quality standards for the hydrogen system”
 - > Need to overcome the dilemma purity/contaminants thresholds

Report drafting process overview

Work done in close cooperation with ENNOH members (System Operation & Transparency WG)

Public Consultation held from 30 January to 30 March
Workshop took place on 12 February (>200 attendees)

- Report refers to the most recent state-of-the-art, including studies and position papers:
 - DG ENER study on hydrogen quality in dedicated infrastructure and standardization.
 - EASEE-GAS study conducted by Kiwa Technology and DNV on the optimum hydrogen purity in Europe.
 - Position paper of GIE on Hydrogen Quality Specifications.
- EU DSO entity input, required by the regulation, will be able to be provided for next report.

Public Consultation feedback

25 responses received coming from stakeholders of the whole value chain (producers, infrastructure operators, consumers, traders, etc.)

Bilateral meetings held with IFIEC, HDF Energy and Euromot

- ***Key points raised:***
 - Need for establishing representative standards: take advantage of the emerging market to harmonise
 - Monitoring needs: monitor contaminant's contents as soon as possible
 - Safety
 - Think backbone without distinctions between hydrogen types or grades, facilitate cross-border and trade, optimize costs
 - Repurposing: related purification costs incurred are temporary and should not be interpreted as recurring expenses

Structure of the report

1. Introduction/regulatory framework
2. Public consultation feedback
 - 2.1. General principles raised
 - 2.2. Respondents' perception of the role of operators
 - 2.2.1. Storage facilities
 - 2.2.2. Transmission networks
 - 2.2.3. Distribution networks
 - 2.2.4. Terminals
 - 2.2.5. Production facilities
 - 2.2.6. End users
 - 2.3. Overcoming the dilemma purity level/contaminants thresholds
 - 2.4. Standardisation
 - 2.5. Data monitoring priorities
 - 2.6. Needs for developments related to hydrogen quality. Possible hydrogen purification costs reduction ways
 - 2.7. Cost allocation and possible incentive mechanisms
 - 2.8. Bilateral meetings held with ENNOH related to the public consultation
3. Conclusion – ENNOH recommendations

ANNEX I: Summary of the points raised in the questions posed to stakeholders
ANNEX II: Responses to the public consultation
ANNEX III: Presentations made at the workshop held on 12th February 2026

Conclusions

- **We are in an emergent stage of the H2 market: let's take no-regret options**
- **Keep in mind the aim of establishing a pan-European interconnected transmission network: all decisions should therefore serve this objective**
- **Monitoring the quality of hydrogen contributes to the market confidence**
- **Main purpose of H2 quality monitoring: establishing trust, stability and predictability for the market**
- **Monitoring H2 quality contributes to establish hydrogen as a standardized commodity**
- **Future works on H2 quality should focus on contaminant thresholds, as the purity level of hydrogen will derive from this**

Recommendations

i. Initiate the monitoring of hydrogen quality data as soon as possible.

- ✓ Next report will have to be based on reliable operational data
- ✓ To be processed in the most cost-effective way for operators
- ✓ This will facilitate the drafting of the forthcoming INT NC

ii. Provide an official endorsement for European standardisation work relating to hydrogen quality.

- ✓ Drawing up specifications recognised by all MSs
- ✓ In accordance with 2026 annual Union work programme for European standardisation
- ✓ Reaching a consensus on contaminant's content (e.g. CH₄, etc.)

iii. Call for the Network Code on Interoperability and Data Exchange to be included as soon as possible in the priority list of the European Commission.

- ✓ Could be a first phase of INT NC addressing some initial requirements needed for interconnection agreements

03 Stakeholders' reactions



03 European Commission



ENNOH H2 Quality Monitoring Report 2026

Ruta Baltause, DG
ENER

Webinar on 9 June 2026

Key follow-up conclusions for the hydrogen quality standardisation request after the ENNOH workshop of 12 February 2025 and the publication of the H2 Quality Monitoring Report 2026

- ❑ Achieving at early stage a unified set of specifications - how to reach consensus as quickly as possible in a situation of structural differences of interests and needs?
 - ❖ Important: hydrogen quality = **impurities** and **contaminants**,
not *grades*, not *allocation of purification costs*
- ❑ Stability:
 - ❖ Broad agreement: **no gradual** specification changes
 - ❖ Question: **How long the transitional phase** – repurposing – **to be**?
- ❑ The same quality at entry- and exit points of hydrogen networks:
 - ❖ What about pipeline-, storage-, equipment **standardisation**, **contamination detection** and **management**, safety (odorization), cooperation between TSOs, DSOs and the “last mile” infrastructure operators?
- ❑ Reliable operational data in the ENNOH 2028 report:
 - ❖ Important to cover the developments of the **quality needs**, **contaminant tolerance** and **no-regret infrastructure options** for specific end-users in hard-to-decarbonize sectors – industry and mobility - **including fuel cells**
- ❑ Needs and constraints of storage facilities to be taken into account and setting realistic specifications
 - ❖ Question: **centralised** or **decentralised storage solutions** (sites, hubs, clusters, national-, regional specifics)?



03 Clean Hydrogen Partnership





ENNOH H2 Monitoring Report 2026

Michael Sostmann – Chair of EASEE-gas Board of Directors

Peter van Wesenbeeck – Chair of EASEE-gas Gas Quality Harmonization Working Group

ENNOH Webinar – 9 June 2026



ENNOH Process (lookback)

A stakeholder-driven process to draft the H₂ Quality Monitoring Report

- Structured process
- Public consultation & workshop
- Extensive questionnaire
- Broad stakeholder participation
- Representative & balanced outcomes

Summary

- Reflects a wide range of stakeholder positions across the value chain
- Differences between stakeholder groups remain clearly visible (producers, TSOs, SSO's, end-users)
- Provides a strong basis for discussion, but does not yet lead to a harmonised hydrogen quality specification



Comparing ENNOH outcome - EASEE-gas position

Common view

- Shared strategic end goal: pan-European hydrogen backbone
- One interconnected hydrogen transmission system
- Avoid hydrogen grades (to prevent cross-border barriers and additional costs)
- Contaminants-first approach
 - Contaminants are the main drivers for safety, infrastructure integrity and end-use compatibility
- Hydrogen purity as a derived parameter (typically ~98–99.5%), not a primary design target
- Need for a European standard (CEN/CENELEC)

Remaining differences

- Level of detail: monitoring (ENNOH) vs specification (EASEE-gas)
- No single agreed optimal hydrogen purity level (depends on infrastructure and end-use)

CBP Hydrogen Trace Components (sneek preview)

A first practical step towards a European hydrogen quality framework

Parameter ^A	Unit	Value	Analytical method ^B	
Ammonia (NH ₃)	μmol/mol ^C	≤ 13	ISO 21087 / ASTM D 7941	^{A)} Limits apply on a molecular basis unless specified otherwise. ^{B)} The analytical methods are provided as guidance only. They reflect any standard or recommended analytical techniques or standards, where available. They do not impose mandatory measurement requirements, nor do they restrict the flexibility of two generations of laboratories. ^{C)} Concentrations expressed in μmol/mol are equivalent to ppm on a molar basis. ^{D)} These components most likely have their source in the previous use of the infrastructure. ^{E)} The hydrocarbon dew point should be distinguished from solid or liquid particles. Hydrocarbons may be dissolved in the gas and, under certain conditions, condense into a liquid phase (retrograde condensation). In addition, liquid hydrocarbons may already be present as a separate phase in the gas system, for example due to oil contamination or condensation. ^{F)} It is recognised that certain hydrocarbon classes, such as aromatic, cyclic and olefinic hydrocarbons, may require more stringent control due to their specific physical and chemical properties. ^{G)} Sum of the Nitrogen, Helium and Argon content. Analysis of a single inert component is acceptable, provided it can be demonstrated that no other inert components are expected in the hydrogen at concentrations exceeding 10 μmol/mol. ^{H)} The limit value of 10 μmol/mol is defined as a 24-hour rolling average. ^{I)} Non-odorized hydrogen.
Carbon dioxide (CO ₂)	μmol/mol	≤ 20	ISO 21087 / ASTM D 7941	
Carbon monoxide (CO)	μmol/mol	≤ 20	ISO 21087 / ASTM D 7941	
Halogenated compounds (halogen ion equivalent)	μmol/mol	≤ 10	ISO 21087	
Hydrocarbon dewpoint ^{D,E}	°C at 1–70 bar	≤ -40	ISO 21087	
Hydrocarbons other than methane (C _x H _y) ^D	mol%	≤ 0.5	ISO 21087	
Inerts (N ₂ , He, Ar) ^G	mol%	≤ 0.5	ISO 21087	
Oxygen (O ₂)	μmol/mol	≤ 10 ^H	ISO 21087 ASTM D 7941	
Particles (solid equivalent) ^E	mg/kg	Technical free		
Total sulfur (Sulfur atom equivalent)	μmol/mol	≤ 7 ^I	ISO 21087	
Water (H ₂ O)	μmol/mol	≤ 50	ISO 21087	

Thank you for your attention



ENNOH H2Monitoring Report 2026: Feedback from H2eart for Europe

The Hydrogen-Purity Trade-Off

Higher standards enable more end-users to rely on network hydrogen directly, reducing need for additional purification



System costs increase with higher standards and are borne by all users, while benefits materialise only to a small share

A fit-for-purpose approach to hydrogen quality regulation



Establish a European framework, harmonising limits for critical impurities while allowing flexibility for non-critical components within a defined bandwidth

Considerations along the Hydrogen Value-Chain:

Hydrogen Production



- Purification can be most cost-efficient at the production stage
- Create targeted incentives to reduce more costly purification elsewhere

Storage



- UHS indispensable for balancing supply and demand
- Can affect hydrogen quality and will introduce impurities from short chained hydrocarbons
- Very high purity requirements lead to disproportionate costs and feasibility constraints

Transmission



- Can affect hydrogen quality and introduce impurities
- Clearly assign responsibility for maintaining hydrogen quality along network

End-users



- Additional purification should be targeted at end-users with higher purity needs

04 Q&A



05 Closing remarks & next steps



Daniel Bonnici
Head of System Operation & Transparency



Thank you for your attention



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