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Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council

amending Regulation (EU) 2016/1628 as regards the inclusion of hydrogen as a reference fuel for the testing of an engine type or engine family

{COM(2026) 523 final}

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1. EXECUTIVE SUMMARY

This Staff Working Document (SWD) accompanies a proposal to amend Regulation (EU) 2016/1628 to include hydrogen as a reference fuel for non-road mobile machinery (NRMM) engines. By aligning EU regulations with exisiting international standards, the initiative is set to foster sustainability and boost market competitiveness within the NRMM sector.

1.1. Overview of the initiative

Hydrogen is a key part in the EU's decarbonisation strategy[1], offering considerable potential to reduce CO_2 emissions across various sectors, including NRMM. The proposed amendment addresses the need to harmonise EU standards with those of the UNECE[2]. This alignment will ensure the consistent application of rules across the Union, facilitating the seamless movement of goods within the internal market and strengthening the global competitiveness of EU industries. By incorporating hydrogen as a reference fuel, the EU is advancing its commitment to the European Green Deal's[3] climate neutrality goals, transforming the NRMM sector away from fossil fuel reliance, especially in sectors where electrification is difficult such as the inland waterway transport (IWT) sector. The IWT is essential for the transport of goods and passenger in Europe and the modal split is planned to increase in IWT and short sea shipping by 25% by 2030 and 50% by 2050. The sector is also in a challenging energy transition towards zero-emission by 2050. The use of alternative fuels such as hydrogen in internal combustion engines (ICEs) of inland waterway vessels would help to reach the goals but they are not reference fuels in Regulation (EU) 2016/1628. Without including hydrogen as reference fuel, the approval of ICEs running on hydrogen is only possible by using the clauses for innovation (Article 35 of the Regulation (EU) 2016/1628), but that approval is only valid in the territory of the Member State which issued the approval. The sector needs a harmonised solution given its international nature. Removing legal bottlenecks would facilitate and encourage the sector to promote the deployment of sustainable drivetrains including inland vessels.

1.2. Key objectives and expected outcomes

The primary objective of this amendment is to **close existing regulatory gaps, promote technological advancement, and enhance environmental sustainability**. The integration of hydrogen as a reference fuel is expected to drive significant environmental benefits, including improved air quality and reduced health risks associated with air pollution. Economically, it will incentivise innovation, stimulate industrial growth, and foster technological advancements in hydrogen technology.

The amendment supports the EU's strategic objectives of sustainability, innovation, and market harmonisation by ensuring the role of hydrogen within the NRMM sector.

[1] COM(2018) 773 final
[2] UNECE Regulation No. 96, Revision 04
[3] COM(2019) 640 final

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1.3. Necessity of EU action

The proposed EU action provides substantial added value by ensuring regulatory harmonisation, enhancing market access and competitiveness, achieving collective environmental objectives, and fostering innovation and economic efficiency across Member States. These benefits underscore the indispensable role of coordinated EU action in addressing complex, cross-border challenges within the internal market.

The EU NRMM sector is not only a major global producer but also one of the Union's most export-driven industrial segments. Out of the total annual production value, 42% is shipped to non-EU markets. Production is heavily concentrated in a few Member States, while demand is dispersed across the EU as well as the global market.[4]

The nature of the NRMM market, fuel standards, and emissions regulations requires a harmonised approach across all Member States to ensure a level playing field, prevent fragmentation, and facilitate the free movement of goods within the internal market. Under the current rules, Member States only allow the placing on the market of engines that have a valid EU type-approval, and no other standards can be adapted and applied, therefore the lack of possibility to type-approve hydrogen fuelled engines may create barriers to trade, inefficiencies, and compliance challenges for businesses in the sector.

2. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

This SWD outlines the proposal to amend Regulation (EU) 2016/1628 to include hydrogen as a reference fuel for internal combustion engines used in NRMM. The initiative represents a significant step to align EU regulations with international standards, particularly those outlined in UNECE Regulation No. 96, Revision 4, which now includes hydrogen as a recognised reference fuel.

The amendment follows the application submitted by the Dutch type-approval authority, RDW, on July 10, 2024, which sought authorisation to grant EU type-approval for hydrogen-fueled engines[5], acknowledging hydrogen's effiency as a decarbonisation technology for the NRMM sector. Currently absent from Regulation (EU) 2016/1628 as a reference fuel, the proposal incorporates hydrogen following its recognition under the updated UNECE Regulation No. 96, Revision 4, as well as UN Regulation No. 49 07 series.

The certification tests conducted by the designated technical service, UTAC, verified compliance with the environmental protection standards, leading to the EU type-approval granted by RDW. These advancements necessitate integrating hydrogen within EU regulatory norms, ensuring consistency with the latest UNECE standards. Correspondingly, the Commission is undertaking the necessary adjustments to the regulatory framework pursuant to Article 36 of the Regulation, officially incorporating hydrogen as a reference fuel and aligning testing and evaluation methodologies with the latest UN standards.

[4] SWD(2023) 65 final
[5] C(2025) 1153 final

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This SWD provides thorough analysis to accompany the Commission’s proposal for amending the Regulation, highlighting the initiative's importance for fostering innovation, ensuring regulatory coherence, and advancing the EU's environmental objectives.

3. PROBLEMATIC ISSUES WITH THE CURRENT REGULATION

3.1. Issues the amendment aims to address

The initiative to amend Regulation (EU) 2016/1628 by including hydrogen as a reference fuel for NRMM addresses several issues, aligning with both EU and international regulatory developments.

- **Issue 1: Regulatory Gap for Hydrogen Fuel and inconsistency with international standards**

Currently, Regulation (EU) 2016/1628 does not recognise hydrogen as a reference fuel. Although hydrogen fueled internal combustion engines are covered by UNECE standards for both NRMMs and heavy-duty motor vehicles, EU regulations on NRMM, unlike those on motor vehicles, have not yet incorporated these adjustments. This lack of alignment prevents the EU from fully recognising and supporting hydrogen engine type-approvals, creating a barrier to the further uptake of this fuel technology.

As the updated UNECE Regulation No. 96 , Revision 4 now recognises hydrogen as a viable fuel, EU regulations lag behind, potentially hindering EU manufacturers for accessing the EU market and thus affecting their global competitivness. Without this amendment Member States may only grant type-approval with the authorisation of the Commission, after having followed the exemption procedure as described in Article 35 of Regulation (EU) 2016/1628.

Discrepancies between EU and international standards lead to fragmented regulatory landscapes, creating hurdles for cross-border trade and market operations. Aligning EU regulations with UNECE standards ensures uniformity, facilitating smoother market access for hydrogen technologies within the EU and internationally.

- **Issue 2: Environmental and Decarbonisation Challenges, Energy Security**

The absence of hydrogen as a reference fuel in the EU regulatory framework limits the NRMM sector's ability to transition towards more sustainable, low-emission technologies. Addressing this obstaclewill contribute to its full potential to EU's broader goals of achieving carbon neutrality by 2050 and reducing reliance on fossil fuels, crucial objectives under the European Green Deal.

Hydrogen is a promising solution to incentivise renewable energy alternatives for industry and public institutions and to strengthen energy security and independence. Specifically, for IWT, hydrogen offers a feasible pathway to achieving carbon neutrality, given the sector's unique constraints that make electrification challenging.

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- **Issue 3: Barriers to Innovation and Market Access**

The current regulatory framework restricts the development and market entry of hydrogen-powered NRMM within the EU, stifling innovation and economic opportunities within the sector. By not allowing hydrogen to be used as reference fuel for the testing of internal combustion engines for NRMM, the EU risks missing out on technological advancements and potential growth in the hydrogen economy.

3.2. Significance for single market harmonisation

The single market is one of the EU's core achievements, aiming to ensure the free movement of goods, services, capital, and labour across Member States. Harmonisation of regulations is essential to remove barriers and create a seamless operating environment for businesses and citizens. The inclusion of hydrogen as a reference fuel within Regulation (EU) 2016/1628 is significant for several reasons.

- **Consistency across Member States**: By adding hydrogen to the reference fuels, the amendment ensures that all Member States adhere to a unified regulatory framework. This eliminates discrepancies that could arise from approvals with limited geographical validity, providing a consistent set of rules that all manufacturers and operators must follow, thereby simplifying cross-border transactions and trade.
- **Facilitating Innovation and Competition**: A harmonised approach fosters a level playing field, encouraging competition and innovation among manufacturers. It enables companies to develop and market hydrogen-powered NRMM across the entire EU and fostering competitive expansion within the single market.
- **Reducing Technical Barriers to Trade and enhancing competitiveness**: Provisional approvals create a fragmented market that impede the movement of goods. By adopting harmonised requirements for NRMM, the EU facilitates smoother intra-EU trade. Manufacturers can produce for a single, scalable market rather than multiple fragmented markets, optimising supply chains and production efficiency. This facilitates economies of scale, which drive down costs and increase competitiveness of EU manufacturers.
- **Boosting Economic Integration**: Regulatory harmonisation supports deeper economic integration by removing internal market barriers, ensuring the free movement of goods and establishing a more integrated market for NRMM. This is critical for achieving the EU's broader economic goals, including growth and job creation.
- **Legal Certainty and Regulatory Predictability**: Uniform technical regulations provide legal clarity and predictability, reducing uncertainties for businesses planning investments or R&D in new technologies. This legal certainty is crucial for industries making long-term strategic decisions regarding the adoption of hydrogen technologies.
- **Support for Strategic EU Policies**: Harmonisation aids in the consistent implementation of the EU's strategic policies, such as the Green Deal, Hydrogen

Strategy[6], and the Industrial Maritime Strategy[7] across all Member States, aligning national efforts with broader EU objectives to drive sustainability and innovation.

4. WHY SHOULD THE EU ACT?

The primary objective of amending Regulation (EU) 2016/1628 to include hydrogen as a reference fuel for internal combustion engines used in NRMM is to close the existing regulatory gap between the current EU regulations and the UNECE regulations, thereby facilitating the transition to cleaner energy solutions. The proposal aims to promote technological advancement and environmental sustainability within the sector. By addressing the regulatory alignment with international standards, the initiative ensures cohesion and consistency in the Union's approach to climate change, innovation, and market harmonisation.

Current rules allow a Member State to issue a provisional EU type-approval which is valid only in the territory of the Member State. After informing the Commission and other Member States, any Type-Approval Auhority may decide to accept it by informing the Commission and the relevant Type-Approval Authority.

The Netherlands has been authorised to grant an EU type-approval under the provisions set out in Article 35 of Regulation 206/1628[8], which refers to exemptions for new technologies or new concepts. Given the constraints outlined in Regulation (EU) 2016/1628, it is necessary to ensure consistency and equity across the EU.

Maintaining the existing regulatory framework without any amendments is not feasible due to Article 36 of the Regulation, which requires the Commission to adapt delegated or implementing acts following an exemption under Article 35.

Therefore the only option is to establish the legislative adaptation as this is required by the legal obligations under Article 36 of Regulation (EU) 2016/1628.

4.1. Legal basis

The present initiative is based on the harmonisation objectives set out in the Treaty on the Functioning of the European Union (TFEU), in particular on Article 114.

Article 114 TFEU authorises the European Union to adopt measures for the approximation of national laws and regulations that have as their objective the establishment and proper functioning of the internal market. This provision serves as the primary legal basis for initiatives aimed at preventing fragmentation and ensuring uniform market conditions across all Member States.

The inclusion of hydrogen as a reference fuel addresses existing regulatory gaps by aligning EU standards with those established at the international level, notably under UNECE regulations. By creating a harmonised regulatory framework, the amendment ensures that

[6] COM(2020) 301 final
[7] COM(2026) 111 final
[8] C(2025) 1153 final

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manufacturers and operators across the EU adhere to a single set of standards, supporting the free movement of goods and a level playing field.

While Article 114 primarily focuses on market harmonisation, it also supports the inclusion of complementary environmental policies. This amendment contributes to the EU's environmental objectives by promoting the adoption of low-emission hydrogen technologies, thus aligning with the Union's broader decarbonisation goals as specified in strategic policies like the European Green Deal.

4.2. Subsidiarity: Added value of EU action

In accordance with Article 5 of the Treaty on European Union (TEU), the principle of subsidiarity ensures that action at the EU level is only taken when objectives cannot be sufficiently achieved by Member States individually and can be better accomplished at the Union level. The proposed amendment to Regulation (EU) 2016/1628, which includes hydrogen as a reference fuel for NRMM, justifies EU-level intervention through the following considerations:

Given the **cross-border nature of the NRMM market**[9], approvals with different geographical validity could lead to market fragmentation. Relying on provisional type-approvals of hydrogen fuelled NRMM engines would create technical barriers to trade and inefficiencies for companies operating across multiple countries. An EU-wide approach to include hydrogen as a reference fuel for pollutant emission testing of internal combustion engines of NRMM is required to uphold the free movement of goods and maintain market integrity across Member States. An EU-level amendment **ensures a uniform regulatory framework**, simplifying compliance and fostering fair competition within the single market.

In summary, the necessity of EU action is clearly justified by the need to harmonise standards for the effective functioning of the internal market and to enhance environmental outcomes and technological innovation, thereby maximising benefits for all Member sSates. This approach aligns with the subsidiarity principle as enshrined in Article 5 TEU, ensuring an efficient and consistent regulatory framework across the Union.

4.3. Proportionality: Minimised Regulatory Burden

The proposal is aligning EU regulations with established international standards (UNECE), and aims to promote innovation by creating consistent, predictable regulatory conditions.

The initiative integrates hydrogen fuel within existing processes, **leveraging international standards that have already undergone thorough examination and consensus**. This ensures that any costs or administrative efforts required from businesses are minimised. It establishes legal certainty for manufacturers and enables benefits in terms of environmental sustainability and competitiveness.

[9] SWD(2023) 65 final

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In summary, the proposal respects the subsidiarity principle by addressing cross-border regulatory needs that benefit from EU intervention, while proportionality is maintained by aligning with existing frameworks and applying changes that are necessary and conducive to achieving strategic EU objectives regarding climate action and technological innovation.

5. LEGISLATIVE CONTEXT

The proposal to amend Regulation (EU) 2016/1628 concerning the inclusion of hydrogen as a reference fuel for NRMM is rooted in the necessity to align EU regulations with evolving international standards and to support the Union's environmental goals. The legislative context is shaped by several legislative acts and related policies:

Regulation (EU) 2016/1628:

This regulation establishes the requirements for pollutant emissions and type-approval procedures for internal combustion engines in NRMM. It aims to ensure high levels of environmental protection while facilitating the free movement of NRMM products within the EU. The proposal seeks to update this regulation to include hydrogen as a reference fuel, accommodating technological advancements and international regulatory developments.

UNECE Regulation No. 96, Revision 4:

The United Nations Economic Commission for Europe (UNECE) Regulation No. 96 sets international standards for emission levels in NRMM. Revision 04 now includes hydrogen as a reference fuel, thus necessitating EU regulations to adapt accordingly to remain in harmony with global standards. This alignment is crucial to maintaining the competitiveness of EU manufacturers and promoting consistent regulatory practices.

UNECE Regulation No. 49 07 Series:

This regulation outlines the type-approval requirements for hydrogen combustion engines, ensuring that emissions and performance standards are met. The EU Member States recognise these standards when granting type-approvals, as evidenced by the Netherlands' application and provisional approvals for hydrogen engines.

Protocol on Ireland/Northern Ireland:

Under the EU - UK Withdrawal Agreement, Northern Ireland remains aligned with a select set of EU rules to maintain a seamless internal market on the island of Ireland. With both Northern Ireland, as part of the United Kingdom, and Ireland adhering to UNECE Regulation No. 96, the inclusion of hydrogen as a reference fuel facilitates a coherent regulatory landscape. This consistency helps avoid trade disruptions caused by differing standards and ensures smooth cross-border transactions. By ensuring that Northern Ireland's regulations remain aligned with updated EU standards, the potential for trade barriers is minimised, reinforcing Northern Ireland's role within the Single Market for goods under the terms of the Protocol.

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Related EU Policies:

The amendment interacts with broader EU policy frameworks, including the European Green Deal, the EU Hydrogen Strategy, and the EU Industrial Maritime Strategy where hydrogen as reference fuel for NRMM engines is specifically mentioned under Pillar IV – Access to innovation. All of them advocate for cleaner technologies and emissions reductions.

6. STAKEHOLDER CONSULTATION PROCESS

The stakeholder consultation process on the proposal included a number of discussions. The proposal was discussed and supported by Member States and stakeholders at the meetings of the **NRMM Expert Group (GEME)** held in September 2024 and October 2025.

It is important to note that the proposal is based on the amendments to UNECE Regulations Nos 49 and 96 and that the technical elements for the approval of hydrogen-powered internal combustion engines had been already discussed in detail by the **UNECE Working Party on Pollution and Energy (GRPE)** prior to the meetings of GEME. These consultations ensured that different perspectives were heard and taken into account as EU Member States are Contracting Parties of the UNECE 1958 Agreement, and industry stakeholders were also present during the discussions at GRPE.

By actively participating in and supporting the development of international harmonisation at UNECE level, the EU demonstrated its commitment to collaborative global governance in environmental policy and technological innovation. The EU's adoption of UNECE regulations showcases its role in fostering harmonised standards that enhance sustainability efforts worldwide. This collaborative approach **reinforces the EU's leadership** and encourages alignment with global practices, promoting widespread adoption of sustainable solutions across regions.

7. EXPECTED OUTCOMES

The amendment is expected to yield positive environmental and economic outcomes, supporting EU strategic goals in sustainability and market integration. While initial large-scale application is not expected, long-term benefits in terms of innovation, competitiveness, and environmental protection are expected, as shown by the fact that two requests have already been submitted for approval of engines using hydrogen.

Environmental dimension:

The integration of hydrogen as a reference fuel is expected to enable **reductions in greenhouse gases and potentionally pollutants** such as nitrogen oxides (NO_X) and particulate matter. By removing obstacles for cleaner fuel technologies, the amendment supports EU climate goals outlined in the European Green Deal to achieve climate neutrality by 2050.

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Potential improvements in air quality resulting from reduced emissions can have **positive effects on ecosystems and public health**, diminishing health risks associated with air pollution and supporting overall environmental sustainability.

Economic dimension:

The transition can catalyse innovation within the NRMM sector, creating opportunities for new products, jobs, and economic growth. Increased research and development efforts are expected to enhance the EU's competitive advantage in green technology, which supports **innovation and market growth**.

Market and Trade dimension:

By aligning with global standards, the amendment facilitates **easier access to international markets**, supporting EU manufacturers in exporting hydrogen-fuelled NRMM globally. Harmonisation supports market expansion opportunities within and outside the EU, promoting robust competition and growth.