

Position paper

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on the regulatory challenges and harmonization of regulations for hydrogen-powered non-road mobile machinery (NRMM) and their refuelling infrastructures in the European Union

Introduction

The European Union (EU) is pursuing ambitious climate targets and increasingly recognizes hydrogen technology as a key element to decarbonize sectors that are difficult to electrify, including non-road mobile machinery (NRMM) and their refuelling infrastructures. Hydrogen-powered NRMMs offer a promising alternative to fossil fuels and have the potential to significantly reduce greenhouse gas emissions. However, the integration of hydrogen technologies in the NRMM sector is hampered by regulatory discrepancies between Member States and the lack of a harmonized approach in the EU. This position paper analyses the regulatory challenges for hydrogen-powered NRMMs and their refuelling infrastructures and proposes a regulatory harmonization framework to facilitate the transition to hydrogen-powered NRMMs and their refuelling infrastructures in Europe.

Position papers already published or currently in progress from Germany (DIN, DKE, DVGW, NWB, VDA, VDI and VDMA), France (France Hydrogène) and the UK (Hire Association Europe) also emphasize the urgent need for uniform standards and norms.

Current regulatory landscape

The regulatory framework for NRMM in the EU is complex and fragmented. While the NRMM Regulation (EU) 2016/1628 already sets limits for pollutant emissions, there are hardly any specific provisions for alternative fuels such as hydrogen. Authorization and market surveillance regulations for hydrogen-powered NRMMs are largely absent or vary significantly between Member States, making access for new technologies difficult and hindering the EU's coherent market strategy.

In road transport, standards for the use of hydrogen are largely established; there are only a few gaps in standardization and regulation, as well as for hydrogen storage systems. For special vehicles such as hydrogen-powered NRMMs, however, existing regulations, such as those for road vehicles, must be used. The challenge here is to work out specific standardization requirements for NRMMs, as future developments are still unclear. Currently relevant norms, regulations and standards include MB FZMO 766, UNECE R134, UN

GTR No. 13, (EC) 2009/79 Annex I, (EU) 2010/406, ISO 23273:2013 Part 2 and ISO 14687-2:2012. In the field of hydrogen-powered NRMMs, there are still numerous gaps that need to be closed in order to develop all the necessary system and subsystem standards for safe hydrogen mobility.

A similar picture emerges in the area of hydrogen infrastructure. The lack of standardized regulations for the refuelling infrastructure is hindering the development of a nationwide network. There is a lack of general guidelines for the safety, construction, operation and, in particular, the approval of hydrogen refuelling stations for NRMM. Current technical standards include, for example, ISO 19880, ISO 13984, ISO 17268 and DIN EN 17268.

Harmonization challenges

1. **Definition and scope:** A precise and comprehensive definition of hydrogen-powered NRMMs is urgently needed. Current definitions vary, creating confusion and complicating compliance with EU directives and national regulations.
2. **Technical standards:** The lack of standardized technical requirements for hydrogen storage, fuel cells, H2 combustion engines and safety measures for NRMMs results in a patchwork approach that compromises safety and efficiency. High resource input and costs also impair the competitiveness of European manufacturers and suppliers.
3. **Certification and approval processes:** Certification and type approval processes for hydrogen-powered NRMMs and their refuelling infrastructures vary significantly between Member States, creating bureaucratic hurdles for manufacturers and operators. This increases costs and complexity, which discourages potential manufacturers.
4. **Infrastructure and support systems:** The lack of coordinated and standardized guidelines for the development of infrastructure, such as refuelling stations and maintenance facilities, limits the operational feasibility of hydrogen-powered NRMMs. The existence of a nationwide, public filling station network for compressed and liquid hydrogen is a basic prerequisite for both truck and H2-powered NRMMs.
5. **Regulatory framework for the import and trade of green hydrogen:** The regulatory conditions are often not yet fully developed. This concerns customs duties, taxes, environmental standards and certification of the sustainability of hydrogen.
6. **Promotion of hydrogen-based technologies:** Funding is not standardized within the EU. Funding models are fragmented and there is no coherent strategy to support research and development.

7. **Conformity basis for market entry of first-generation NRMM:** There is no or insufficient standardization and norms for the first generation of hydrogen-powered NRMM.

In summary, these regulatory differences, especially with regard to technical standards, certifications and approvals, hinder the market entry of new European suppliers and inhibit the scaling of infrastructure and mobility projects.

Proposed recommendations

1. **Standardized definition and classification:** Establish a clear and comprehensive definition of hydrogen-powered NRMM within EU legislation. This should include different types of machines and their respective applications.
2. **Common technical standards:** Development of EU-wide standards for integration and safety concepts for hydrogen storage systems, fuel cell systems and H₂ combustion engines. Adaptation to UN R134 and recognition of conformity with UN R134 in the Pressure Equipment Directive are crucial here.
3. **Simplified approval procedure:** Implementation of a centralized EU type-approval system for hydrogen-powered NRMMs, replacing national systems. This system would enable faster market entry and ensure high safety standards.
4. **Coordinated infrastructure:** Coordination of EU and national funding for the development of a hydrogen refuelling and maintenance infrastructure for NRMMs, as well as the accelerated implementation of a nationwide refuelling station network in accordance with AFIR requirements. Policy incentives should be provided to encourage investment in hydrogen infrastructure.
5. **Research and development (R&D):** Increase funding for R&D programs aimed at advancing hydrogen technology in the NRMM sector. Collaborations between academia, industry and government should be encouraged.
6. **Stakeholder engagement:** Establish a permanent stakeholder forum at EU level with representatives from industry, Member States and NGOs. This forum would promote best practices and ensure that the regulatory framework takes technological progress into account.
7. **Promotion of investment and operating costs in the NRMM sector:** Financial incentives in the form of subsidies and grants are required for the widespread introduction of hydrogen technologies in the mobile NRMM sector and its refuelling infrastructure.

8. **Transitional solutions for first-generation NRMM:** Creation of consolidated, cross-manufacturer expertise for conformity assessment based on UNECE R134 as an interim solution for a transitional period of at least five years or at least until the normative requirements and regulations to be created can be used. This will allow suitable safety concepts to be developed for specific machine types and ensure that the respective applications can be placed on the market safely.
9. **Binding standards:** European standardization institutions such as CEN should develop binding standards in cooperation with the industry in order to simplify the placing on the market of hydrogen-powered NRMM and refuelling systems and to be able to formally guarantee safety.

Conclusion

Harmonizing the regulatory framework for hydrogen-powered NRMMs and their refuelling infrastructures across the EU is crucial to unleash the potential of this technology for the EU's green transition. Addressing the above challenges and implementing the proposed recommendations can create an enabling environment for the deployment of hydrogen technologies in the NRMM sector, leading to a more sustainable and competitive economy. The implementation of these measures requires coordinated efforts and commitment at all levels of government to ensure a smooth transition and the achievement of long-term sustainability goals.

Key recommendations for action include the creation of uniform safety and environmental standards for hydrogen-powered NRMMs, the standardization of technical requirements and infrastructures for efficient cross-border use, the establishment of an EU-wide network for hydrogen refuelling for compressed and liquid hydrogen, the simplification and harmonization of certification, conformity assessment and approval processes, the promotion of R&D and vehicle and infrastructure procurement for end customers through uniform EU-wide funding programmes and financing models.

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