hyperloop development program

POSITION PAPER

INPUT FOR EU REGULATORY FRAMEWORK FOR HYPERLOOP

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Key messages

- The Hyperloop Development Program fully supports the introduction of the EU regulatory framework for hyperloop by the European Commission, following the announcement in its 2023 work programme[1] and the ongoing impact assessment, and is grateful to the European Commission for this initiative.
- The EU regulatory framework should aim at achieving a well-functioning European hyperloop network in 2050. Hyperloop is currently being developed as a new transport mode. The first full-size hyperloop system for passengers and goods is on schedule to take off before 2030.
- Legislation should be introduced from the start. A legislative proposal of the European Commission can spur technological convergence of hyperloop technology on the short term, and ensure cross-border interoperability and safety on the long term.
- A gradual approach is required that does not undermine the development and implementation of hyperloop as a transport mode with prescriptive specifications from early on, but should instead start with facilitating a fast increase of the technical readiness level of hyperloop technology through performance based criteria focused on safety and accessibility.
- A proper consultation procedure for the EU regulatory framework for hyperloop must take place in which all major stakeholders are proactively consulted during the stage of the impact assessment.

New transport mode

Hyperloop is a new transport mode that is now being developed in Europe. Hyperloop vehicles use magnetic levitation and propulsion to travel through tubes that are brought to low air pressure. This allows for energy efficient and high-capacity transportation of passengers and goods. As part of a European network, hyperloop has the potential to unburden continental aviation by two thirds and reduce long-haul road transport with 20%.[2] Socio-economic benefits of hyperloop include better multimodal connections with reduced travel times, enabling improved access to education, health care and jobs across Europe. The new transport mode also strengthens the EU's strategic autonomy with a new industry and improved access to various existing and emerging industries across Europe. Therefore, we encourage the European

[1] European Commission work programme 2023, European Commission, 2022

[2] Hyperconnected Europe Report, Hyperloop Development Program, 2022

Union to pursue an active role in creating the right conditions for the development and implementation of hyperloop, including driving forward the creation of standards, the certification process, and the supervision and enforcement of regulations. Throughout these initiatives, we emphasize the necessity of a comprehensive consultation procedure, where all key stakeholders actively participate during the impact assessment phase.

Safety

Standardized requirements enhance safety by ensuring that all components of the hyperloop system, from the low air pressure environment to communications between vehicles and the infrastructure, operate cohesively. When different components of a system comply with standardized safety measures, it reduces the risk of accidents caused by incompatible or poorly integrated systems and optimizes emergency protocols. The Hyperloop Development Program strongly recommends the adoption of a EU regulatory framework for hyperloop that can help to reach a high level of safety with procedures and standardized methods that define performance criteria or specified desired outcomes. This is opposed to prescribing specifications, which will hamper innovation through restricting the industry in their freedom to design a new transport mode and related services.

Cross-border interoperability

Interoperability involves the development and adherence to common standards and is a key enabler of a European hyperloop network. Without timely introducing an EU regulatory framework, the risk exists that hyperloop will become non-interoperable and that the network technology will be unable to serve the whole continent effectively. Hyperloop corridors must be interconnected to ensure seamless connections for transport of passengers and goods. Standardized protocols and systems will ensure that operations are consistent regardless of the country, enabling cross-border connections and reducing inefficiencies.

Examples of required standardization for interoperability are most importantly related to the infrastructure, so that various operators can have access to the hyperloop network. Standardization requirements are required for amongst other elements: the safety level and safety systems, the position, type and number of the tracks in the tubes, the method of magnetic levitation, the guidance and propulsion, and the boarding and onboarding operations for passengers and goods.

Technological convergence

Developers, construction companies, transport operators, infrastructure managers, and other stakeholders are in the process of developing and contributing to hyperloop technology with their expertise. This is an incremental, innovative process that requires regulations. We welcome a regulatory framework that will provide clarity not only to the industry, but also to governmental bodies. As a result, a regulatory framework will help the private and public sector with requirements to better understand hyperloop technology and accelerate the increase of the

technical readiness level. Technological convergence by hyperloop developers and industry players is already taking place in open innovation test centers, such as the European Hyperloop Center and its partner organizations. The convergence process is also expected to continuously contribute to the EU regulatory framework in the coming years. In addition to the progress of technological development by the sector and the wider industry, we recommend that the European Commission encourages hyperloop developers and/or the CEN-CENELEC JTC-20 working group to introduce standards with specific requests whenever required at a certain stage of development.

We also suggest that the technological convergence will be facilitated through active collaboration within the broad value chain of organizations that are dedicated to bringing forward hyperloop technology and deployment, which includes the European hyperloop technology developers, transport service providers, infrastructure managers, and other required industry players. In 2024, EU-Rail launched a call for proposals with the objective to strengthen the collaboration of the different hyperloop promoters in the technological convergence of the hyperloop. The Hyperloop Development Program highly values such initiatives for facilitating the convergence and has initiated a collaboration with its partner organizations to achieve a standardized hyperloop testing infrastructure to actively work towards a single design.

Geo-economics

The emergence of hyperloop is an opportunity for the European Union to become a frontrunner and a global champion in its development and implementation. The advancement of hyperloop standards and the early introduction of an EU regulatory framework will further stimulate hyperloop development, allowing Europe to act as a first mover. Because of its high efficiency in energy use, transport capacity, and reliability, hyperloop can become of strategic importance for Europe's economy. Globally, the need for innovation in transport is increasing. This is due to the expected growth in transport demand and the energy transition from fossil fuels to renewable energy. Hyperloop can create additional capacity on railway networks by disentangling different speed regimes and allow to resolve traffic bottlenecks in key European areas. By being the first continent to bring hyperloop to the market, European industry and SMEs can gain a global competitive advantage. Furthermore, a European multimodal region-to-region transport system that is strengthened by hyperloop, will bridge distance with existing and emerging industry hubs to strengthen (re)industrialization in sectors that are key for Europe, such as batteries, solar photovoltaics, hydrogen electrolysis, and the semiconductor supply chain.

Gradual regulatory roadmap

In the first instance, it will be important to establish regulations for initiatives that are aimed at realizing hyperloop pilot routes. Stakeholders, including Member States, regional governments and cities, are seeking legislation that provide certainty about the safe implementation of hyperloop. We suggest that a hyperloop route or section is certified based on to be recognized standards through the EU regulatory framework, which are designed by hyperloop developers

and the wider industry. At a later stage of development, when hyperloop technologies are fully converging, the focus will shift to interoperability. In order to structure this process that is driven by technological development, we recommend setting up a regulatory framework that distinguishes at least two consecutive phases of standardization, as outlined below.

A. Innovation phase up to TRL 8

- Hyperloop is currently in the innovation phase. At this stage of collaborative innovation in various testing environments up to technology readiness level 8, the steps towards standardization should be taken through an introduction of:
  - a standardization methodology;
  - binding prescriptive safety and accessibility related performance criteria;
  - non-binding performance characteristics expected to be required for the effective deployment of, for instance, acceleration and environmental interfaces.
- In the innovation phase, certification of hyperloop technnology will be a shared responsibility of developers and industry partners. The regulatory frameworks for rail and aviation can act as guidelines due to the commonalities with the certification aspects of hyperloop. Lessons learned and best practices of the development of rules and regulations for rail and aviation should be thoroughly taken into account.

B. Implementation phase from TRL 9

- After technological convergence has materialized through the scaling up of research and development in the hyperloop industry to technology readiness level 9, interoperability interfaces and safety criteria need to be adequately introduced with legally binding EU rules.
- We strongly suggest designing the approval process in a way that avoids hindering the progression of technical readiness levels and the successful implementation of hyperloop as a mode of transport.
- The possible establishment of several national regulatory bodies for hyperloop will be against the principle of achieving interoperability. A new European regulatory body, similar to the European Union Agency for Railways (ERA) or the European Union Aviation Safety Agency (EASA), and tailor-made to the special needs for the safe and interoperable implementation of hyperloop as a transport mode, could become responsible for supervision of the implementation of hyperloop standards in the European Union. We nonetheless advise the European Commission to facilitate exchange of knowledge between industry partners and existing regulatory bodies to better grasp the exact needs for the successful implementation of hyperloop through a possible European regulatory body.

About the Hyperloop Development Program

The Hyperloop Development Program (HDP) is a collaborative ecosystem aimed at accelerating the development and adoption of hyperloop technology in Europe. The program consists of various innovative companies, research institutes, and industry leaders to drive progress in the hyperloop sector. One of its objectives is to establish a standardized hyperloop testing infrastructure, consolidating multiple testing facilities into a cohesive network. This unified approach facilitates technological breakthroughs and ensures the seamless integration of hyperloop systems as an interoperable transport mode. For more information, please visit www.hyperloopdevelopmentprogram.com.

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