

Collective Ambitions of HMI Members

December 2024

**Paper 2/3 in a series of briefing papers by
Hydrogen Mobility Ireland**



Introduction

In ‘The Need For and Vision Of Hydrogen Mobility in Ireland’, Hydrogen Mobility Ireland (HMI) determined that 700MW of hydrogen production capacity is required to satisfy EU mandates by 2035. Developing hydrogen production at this scale will achieve significant economic benefits, bring energy security, and deliver emissions reductions.

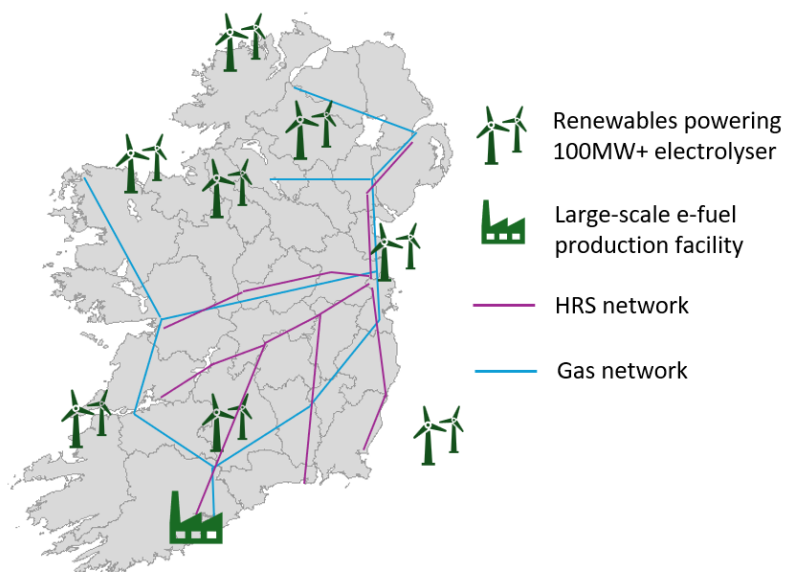
To achieve the target of 700MW of electrolysis capacity by 2035, HMI members have developed a clear roadmap for the development of hydrogen production and offtake. Irish hydrogen expertise and supply chains will be built from the ground up through demonstration projects, before projects are scaled up across road, rail, aviation, and maritime mobility. HMI members have the capability and willingness to deliver these projects with the support of Government.

Achieving EU targets for hydrogen in mobility by 2035 will create an Irish hydrogen energy system combining renewable power supply, hydrogen production, and end-use

HMI members aim to achieve the 2035 targets set by RED II (road and rail), ReFuelEU (aviation), and Fuel EU Maritime (maritime) – requiring 700MW of hydrogen production capacity.¹ Hydrogen production will be deployed together with upstream renewable capacity, downstream green chemical production facilities, and end-uses of hydrogen and green fuels in mobility.

The components of the future energy system will include:

- Large-scale electrolyzers and major e-fuel production facility for Sustainable Aviation Fuel (SAF) & e-methanol/green ammonia for shipping
- Local green hydrogen production hubs
- Hydrogen used to decarbonise the gas network
- Network of hydrogen refuelling stations, serving road mobility



Key message to Government: HMI members are willing to deliver the upstream renewable capacity, hydrogen and green chemical production facilities, fuel supply chains, and offtake to enable the scaling of a hydrogen and green chemical-based mobility system across Ireland.

¹ ‘The Need For and Vision of Hydrogen Mobility in Ireland’, Hydrogen Mobility Ireland, 2024

Hydrogen mobility will be deployed in three phases: ‘Demonstration’, ‘Early Commercial’, and ‘Industrialisation’

To enable the industrialisation of hydrogen mobility by 2035, hydrogen expertise and supply chains must be successfully scaled-up through time. HMI considers that this will occur through three consecutive phases, from today, when Irish hydrogen projects are in their infancy, to full industrialisation by 2035. The deployment of each of these phases increases in scale, with economies of scale, new learnings, and technological improvements allowing the level of public support to be reduced over time. These phases are:

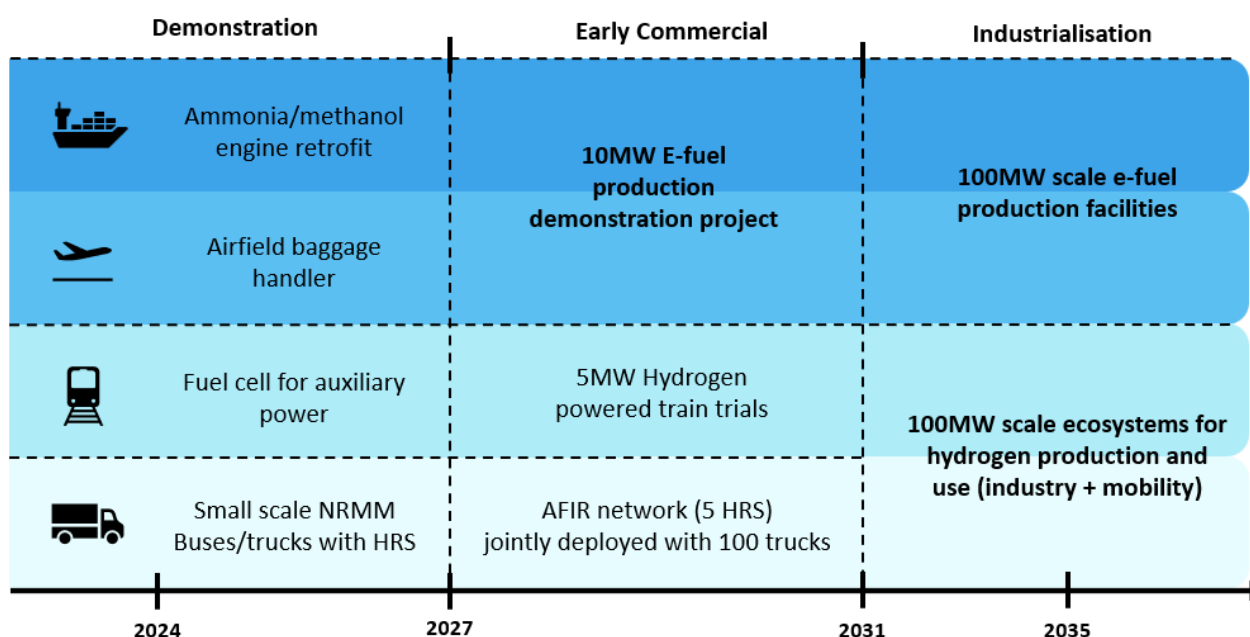
- **A ‘Demonstration’ phase from 2024 to 2026, allowing Irish expertise and supply chains in the hydrogen industry to develop and instilling confidence in investors.** Demonstration projects will be delivered by groups of industrial players, bringing together hydrogen and green chemical suppliers, equipment providers, and hydrogen mobility end-users. A number of small-scale demonstration projects (kW- to MW-scale) covering a diverse range of end uses will be delivered. Knowledge gained during the Demonstration phase will be of high value to industrial players, who will gain the technical expertise required to scale-up hydrogen mobility projects, and end users, who will be able to build their confidence in the reliability and readiness of the technology. Direct capital subsidies for these projects will enable a wider variety of use cases to be tested and end-users to gain experience with the technology.
- **An ‘Early Commercial’ phase from 2027 to 2030** where hydrogen production projects will be deployed at the 10MW+ scale. **Projects of this scale will make green hydrogen available to the market, catalysing further demand by allowing the build-up of downstream infrastructure and end uses.** The Early Commercial phase will require high levels of investment and will also incur the highest risk, leading to the greatest need for financial support. Policy support measures during this phase are expected to transition from direct capital subsidies to operational cost support due to opex-heavy hydrogen production, and the need for end-user operational cost parity. In parallel with increasing incentives for renewable hydrogen and green derivatives, policies disincentivising carbon emissions in mobility can be progressively increased as the hydrogen ecosystem is built out.
- **An ‘Industrialisation’ phase from 2031 to 2035:** sufficient operational cost support and increasing carbon penalties will create demand for renewable hydrogen and enable the deployment of hydrogen production in the 100s of MWs, allowing Ireland to achieve its 2035 policy targets. Economies of scale will reduce costs across the supply chain and the confidence built among industry and investors will allow larger-scale projects to reach commercial operation. Successful implementation of sustainable, long-term policy measures will enable the transition towards renewable solutions and the development of the Irish hydrogen ecosystem.

Achieving this vision will require the collaboration of hydrogen and green chemical producers, hydrogen infrastructure providers, equipment providers, and end-users, to coordinate the deployment of hydrogen mobility and limit the risk placed upon each separate player. As well as industrial players collaborating

amongst themselves, industry and Government must work together to establish the policy landscape that will enable the scale-up of hydrogen mobility.

Roadmap to the industrialisation of hydrogen mobility in 2035 through HMI member projects

HMI members have collated a list of example Demonstration and Early Commercial projects across road, rail, aviation, and maritime mobility that show a clear roadmap to the industrialisation of hydrogen mobility in Ireland by 2035. **HMI members are willing to deliver these projects with the correct support from Government** - showing the industry’s ambition to move towards a zero-carbon mobility system.



Roadmap to the industrialisation of hydrogen mobility in Ireland

The projects that HMI members will deliver align with the deployment phases of hydrogen mobility in Ireland:

- Demonstration projects:** Demonstration projects will be delivered at small scale across road, rail, maritime, and aviation sectors, requiring a cumulative electrolysis capacity of less than 10MW, allowing learning and derisking prior to larger-scale deployment. Demonstration projects currently in progress include the hydrogen valley [SH2AMROCK](#), which will seek to invest €80M in Ireland’s first multi-modal hydrogen transport hub in Galway.
- Early Commercial projects:** Early Commercial projects will use the expertise gained from Demonstration projects to deploy around ten road and rail mobility projects at the 5MW to 30MW scale, requiring a cumulative capacity of around 100MW, and commercial e-fuel production demonstrations at the 10MW+ scale. Planning for Early Commercial projects must begin in the Demonstration phase, allowing projects to enter commercial operation by 2027.

- **Industrialisation projects:** hydrogen projects will be delivered at the 50MW+ scale, achieving the economies of scale that allow policy support to be reduced and the deployment of the Irish hydrogen ecosystem.

Scaling-up road mobility in Ireland

Hydrogen road mobility in Ireland can be progressively scaled-up through:

1. **Mobile refueller and first equipment demonstration:** A mobile refueller can be deployed within 6 months and will spend time in different locations across the island to develop skills and encourage use of hydrogen vehicles. These uses will include hydrogen bus, coach, and truck demonstrations, non-road mobile machinery (e.g., construction equipment), and mobile power applications. The mobile refueller will bring hydrogen for mobility to the forefront of the decarbonisation effort in Ireland, showcase the capability of HMI members, and build demand for and confidence in the use of hydrogen to decarbonise various mobility applications. This will build a strong case for obtaining the necessary funding for the AFIR network.



2. **Construction of a planned AFIR network:** Building the AFIR network will require five 1 tonne/day HRS with 20-40 heavy-duty vehicles per station to create sufficient initial demand. HMI members expect that linking these first HRS to anchor demand from heavy-duty fleets such as public transport or logistics will provide business case security for infrastructure providers. Previous HMI research estimates only five 1 tonne/day HRS are needed to meet AFIR requirements, adding one for Belfast provides sufficient initial coverage for the entire island. These refuelling stations will be supplied by a network of hydrogen production facilities, strategically located to take advantage of low-cost renewable power (directly connected and/or via the grid), and providing sufficient redundancy to ensure reliable hydrogen supply in the event that one of the production facilities goes offline. This Irish AFIR network is necessary to enable Ireland to continue its strong trading links with the rest of Europe, as other member states develop similar infrastructure and convert vehicle fleets to zero emission options.



3. **Organic expansion in response to demand:** Once the minimum viable refuelling infrastructure is in place, demand for hydrogen road mobility is expected to grow organically, and hydrogen production and refuelling infrastructure will expand in response to this demand, with new 1 tonne/day+ scale HRS on motorways, in cities, and linked to demand centres such as logistics hubs and public transport depots. The hydrogen refuelling network must reach 100MW of hydrogen capacity by 2030 to meet the RED II target for RFNBO usage, equivalent to 31 tonnes/day.¹

E-fuel production in Ireland

The Whitegate refinery in County Cork is Ireland's only refinery. This facility supports 230 jobs and is well-positioned to transition to producing sustainable fuels for the aviation and maritime industries. Using existing process equipment, skilled workers, and downstream infrastructure, the Cork refinery can be efficiently expanded and transformed into a biofuel and e-fuel production facility, meeting Ireland's aviation and maritime transport fuel needs while contributing to energy independence and decarbonisation goals. This will require substantial renewable hydrogen production capacity (in addition to the supporting upstream renewables) as an input to producing SAF for aviation and e-fuels for maritime applications.

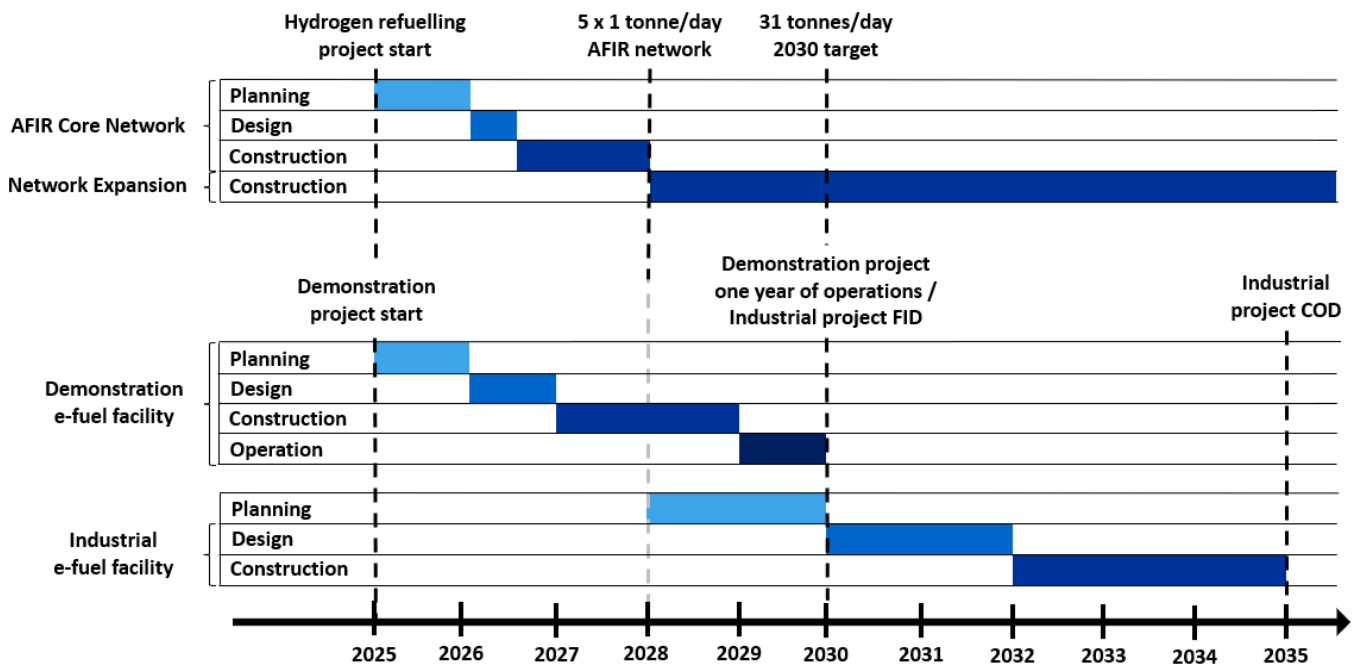
Policies stimulating demand for decarbonised aviation and maritime fuels are required in order to unlock investment in these facilities. For SAF, Whitegate can rely on its current downstream infrastructure to distribute the fuel to Irish airports thanks to the drop-in nature of the fuel. For renewable maritime fuels such as ammonia and methanol, end-users will need to transition away from very low sulphur fuel oil (VLSFO) which is most commonly used for bunkering. Support for e-fuel bunkering facilities at major ports and retrofitting vessels with multi-fuel engines during the early commercial years will secure the full fuel supply chain and enable early demonstration of feasibility.

The production of e-fuels at the Whitegate refinery is expected to start with commercial demonstrations at the 10MW+ scale between 2027 and 2030, enabling investment into large-scale production during the Industrialisation phase. 580MW of e-fuel production capacity is required to meet the demand implied by ReFuelEU Aviation and Fuel EU Maritime policies in 2035.¹

Critical timing of hydrogen and e-fuel projects

Projects must begin in 2025 to reach the 31 tonnes/day target required by RED II in 2030 and 580MW of e-fuel production capacity required by ReFuelEU and Fuel EU Maritime in 2035. Planning, design, and construction form critical paths for project deployment, which are very challenging to further accelerate – HMI members are already starting work that will deliver on 2030 and 2035 targets.

Urgency to achieve long-term stability of Irish transport networks and infrastructure also drives the need to begin the delivery of hydrogen and e-fuel projects as soon as possible. Investing in hydrogen mobility projects in 2025 will ensure projects become operational within an acceptable timeframe.



Critical path for the development of hydrogen and e-fuel projects in Ireland

Conclusions

HMI members are willing and able to deliver a range of green hydrogen projects across road, rail, aviation, and maritime with the correct level of policy support. These projects will scale up from temporary demonstrations until 2026, to Early Commercial projects building the AFIR network and demonstrating the viability of the e-fuel supply chain for maritime and aviation, to Industrialisation from 2031 onwards. At this stage, road refuelling for hydrogen is expected to grow organically based on the AFIR network, and a large-scale e-fuel production facility at Whitegate refinery will allow Ireland to meet its aviation and maritime policy targets.

HMI members have provided a clear roadmap to the industrialisation of hydrogen mobility in Ireland and are willing to deliver the projects that will build the necessary specialist expertise, supply chains, and investor confidence to achieve industrialisation. Urgent implementation of these projects is required to meet policy targets and ensure Irish trading capability is not impacted.

HMI’s third briefing paper ‘Policy Support Required in Ireland’ shows a clear view of the support needed to activate the hydrogen mobility market in Ireland, the available EU funding for hydrogen mobility in Ireland, and where national policy support can enable companies in Ireland to access EU funding.