Ammonia Europe

White Paper

Our Vision Post-2030

A competitive, resilient and decarbonised ammonia value chain in a stronger Europe

Introduction & Rationale

The ammonia sector produces and uses 25% of all hydrogen in Europe[1]. As such, the review of the Renewable Energy framework and EU Hydrogen Strategy provides a timely opportunity to reassess measures to support the ammonia sector's decarbonisation and its important role as a key industrial input, an enabler of the hydrogen economy and a strategic molecule for Europe's resilience and energy security.

Ammonia has been identified as a critical molecule by the Critical Chemicals Alliance and is one of the most established industrial chemical markets globally with 200Mt produced per year[2], with well-established handling infrastructure and clearly defined end uses in chemicals and agricultural sectors. Beyond its established uses, ammonia has significant strategic potential as an enabler of the clean hydrogen economy. It provides a practical means of transporting hydrogen over long distances and storing it at scale, can be used directly as a maritime fuel, and can help reduce Europe's dependence on imported fossil fuels when produced from renewable or low-carbon energy.

However, the decarbonisation of ammonia production[3] and its deployment in the wider ecosystem faces significant technical, economic and policy design challenges. Technical barriers include insufficient and intermittent renewable electricity generation capacity, limited deployment of electrolysers, difficulty in buffering energy supply with hydrogen or electricity storage, and slower build-up of dedicated hydrogen and ammonia infrastructure. Economic barriers remain substantial, with renewable European ammonia being significantly more expensive than conventional production, particularly with the lack of competitively priced renewable energy. In addition, the design of the RED III industrial target and RFNBO criteria present challenges for European industry, particularly in terms of cost, implementation and competitiveness. In response, several Member States have called for greater flexibility and a more technology-neutral approach to industrial decarbonisation[4].

This White Paper sets out Ammonia Europe's vision for a competitive and achievable transition of the European ammonia sector beyond 2030. The proposed framework recognises ammonia's strategic importance to the chemicals and food sectors, stimulates demand for renewable and low-carbon ammonia products, and supports the infrastructure needed for ammonia's growing role as a hydrogen carrier and maritime fuel.

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[1] The European hydrogen market landscape, European Hydrogen Observatory, November 2025
[2] IEA Global Hydrogen Review 2022
[3] Decarbonised ammonia production can be: RFNBO /renewable, using hydrogen produced from electrolysis powered by renewable energy (green); or low carbon, using hydrogen produced from electrolysis powered by nuclear (pink) or low emissions energy, or reducing CO_2 emissions by carbon capture and storage (CCS) both *in situ* or ex *situ*, or permanent carbon capture and utilisation (CCU) (blue)
[4] Non-paper Presented by Belgium, supported by Czechia, Hungary, Poland & Slovakia, on safeguarding our industrial competitiveness through a pragmatic & technology-neutral hydrogen approach under REDIII - 25 Feb 2026

Key policy asks across the value chain:

Competitive decarbonisation of ammonia production

- Redesign the RED industrial target as an indicative EU target, where the target calculation methodology recognises all decarbonised production pathways, with a mechanism, like a credit system, in place to incentivise RFNBO. In so doing, also allowing to reflect the continued need for CO2 as a feedstock for CCU and the wider chemical value chain when finalising the target's supporting criteria.
- Simplify RFNBO additionality and temporal correlation requirements, with additionality applying from 2035 and monthly temporal correlation continuing indefinitely.
- Establish a CAPEX and OPEX-based double-sided auction Contract for Difference (CfD) for decarbonisation, funded by ETS revenues via the Industrial Decarbonisation Bank.

Stimulating demand for renewable and low-carbon products

- Based on the conclusions of the Critical Chemicals Alliance, support the establishment of lead markets for renewable and low-carbon ammonia in fertilisers and chemicals, and drive demand in downstream end markets of food, feed, fuels and fibres. In so doing, establish links with the Industrial Accelerator Act.
- Support the development of a transformation fee set on chemical content of end-products, with revenue funding upstream decarbonisation.
- Maintain the RED RFNBO transport target, with flexibilities for statistical transfers and low-carbon electrolytic eligibility, reenforcing maritime use and aligned with IMO.
- Through SMAP allocate ETS revenues for maritime decarbonisation including alternative-fuel infrastructure, dual-fuel engines and vessels below 400GT on a voluntary basis.
- Establish CAPEX & OPEX-based double-sided auction CfD, using Decarbonisation Bank.

Accelerate technology and infrastructure deployment

- Designate key EU ports as Ammonia Hubs under TEN-T and TEN-E, covering import, export, cracking, storage, bunkering, industrial use and inland distribution.
- Make ammonia infrastructure and import facilities eligible for CEF Energy and Transport funding, including storage, port, inland and cross-border infrastructure.
- Strengthen ammonia bunkering in AFIR and provide AFIF funding for deployment in Ammonia Hubs and green shipping corridors.
- Allow flexibility from third-party access rules for first-of-a-kind ammonia infrastructure under the Gas and Hydrogen Directive.
- Prioritise ammonia technologies in the IAA and the future Horizon Europe, Clean Hydrogen Partnership and relevant innovation funding.
- Enable sustainability attributes of imported ammonia to transfer to recovered hydrogen without additional administrative burdens or loss of compliance value.

Enabling Conditions

Delivering the vision set out in this White Paper depends on a set of enabling conditions being in place across the ammonia value chain.

Enabling Condition	Description
Renewable and low-carbon energy availability and affordability	Sufficient additional renewable and low-carbon electricity generation is available and affordable, with priority or accelerated grid connections in place for electrolysers and associated industrial loads, with production able to flex in line with variability in renewables output and, additionally, availability of bio feedstocks is sufficient.
Demand creation	Demand for renewable and low-carbon hydrogen and its derivatives is established through demand-side mechanisms and targets.
Investment	Sufficient funding is available through EU, Member State, public and private mechanisms to bridge the cost gap of decarbonised production, including access to long-term renewable and low-carbon Power Purchase Agreements (including cross-border).
Permitting	Permitting processes for electrolysers, ammonia plants and associated renewable and low-carbon grid infrastructure and CO_2 storage facilities are fast enough to match project timelines.
Infrastructure	Hydrogen/ammonia pipelines, storage, terminals, ammonia cracking and bunkering infrastructure are in place; CO2 capture, transport and storage infrastructure is accessible; and import infrastructure is sufficient to handle larger ammonia volumes.
Certification / traceability	Simple, interoperable guarantees of origin and certification schemes exist for hydrogen and ammonia, including recognition and use of current voluntary schemes[5] during the scale-up phase.

[5] For example, Ammonia Europe's own GHG Certification scheme for ammonia

1. Competitive decarbonisation of Ammonia Supply

1.1 Reconciling decarbonisation and competitiveness – RED Industry Target

Combined with the ETS and CBAM, the RFNBO obligations on industry within the Renewable Energy Directive are hampering competitiveness and therefore hindering this hard-to-abate sector's ability to decarbonise. Therefore, a regulatory framework - RED, EU ETS, and CBAM -, that balances climate ambition with investment attractiveness by supporting technology-neutrality including multiple production pathways, will ensure that decarbonisation does not undermine European industrial competitiveness. Any targets on industry must go hand in hand with demand for clean molecules and funding support, thus ensuring that the renewable energy framework is realistic, scalable and predictable for economic operators.

Should the aforementioned enabling conditions be met, Ammonia Europe's preferred approach is to redesign the calculation methodology underpinning the industrial target so that it can be met via any decarbonisation pathway by counting all non-fossil based hydrogen – produced electrolytically via renewable or low-carbon energy or bio-based production – in the numerator, over total hydrogen use in the denominator deducting the hydrogen produced using carbon capture and storage (CCS).

$$\frac{(RFNBO\ hydrogen) + (Low\ carbon\ electroltyic\ hydrogen) + (Bio\ based\ hydrogen)}{(Total\ Hydrogen\ Consumption) - (Hydrogen\ produce\ via\ SMR\ with\ CCS)}$$

In turn, the target should be set as an indicative EU-level target rather than a binding Member State obligation. The current binding approach is not working- Member States are transposing it in widely divergent ways or not at all, and it does not reflect the different capacity of industrial sites and geographies to attain it. An indicative EU-level target, applying the calculation methodology above, would allow progress to be tracked across the Union while respecting these differences. It should be paired with a mechanism that incentivises the uptake of renewable hydrogen, like a credit mechanism, so that the investment signal for renewable hydrogen is preserved even as further decarbonisation pathways are recognised.

In parallel, the RFNBO Delegated Act should be simplified by postponing additionality until 2035 and retaining monthly temporal correlation beyond 2030. These adjustments would expand compliant electricity-sourcing options and provide producers with greater flexibility to operate electrolysers and integrated ammonia plants efficiently. They would not, by themselves, close the cost gap with conventional production, but would help avoid additional compliance costs and operational constraints during the sector's scale-up. Their effectiveness will ultimately depend on wider measures to increase the availability and affordability of renewable electricity and the realisation of the enabling conditions listed at the beginning of this paper. In parallel, CO_2 continues to play an important role as a commodity input for the extended chemical value chain, including

carbon capture and utilisation (CCU) applications like urea which is a key feedstock in the fertilisers and the chemicals sector. A full transition of ammonia production to RFNBO pathways alone would remove this input; while bio-based CO_2 offers an alternative, it is unlikely to meet demand at the scale and cost required. This consideration should inform the design of the target and its supporting criteria.

1.2 Funding instruments

In order to cover the green premium, a double-sided auction with a Contract for Difference (CfD) scheme is needed for long-term predictability. Covering both CAPEX and OPEX, the scheme should help bridge the cost gap between conventional and low-carbon ammonia, drawing on lessons learned from OPEX-based national precedents such as the Netherlands' scheme. Such a scheme should use the EU ETS revenues channelled through the Industrial Decarbonisation Bank, where Member States can additionally support their domestic projects with an Auctions-as-a-Service scheme, therefore linking to the EU ETS review proposal, which foresees the redirection of at least 50% of Member States' ETS revenues towards decarbonisation.

1.3 Policy Asks

- Redesign the RED industrial target as an indicative EU-level target with a calculation methodology to count all non-fossil hydrogen in the numerator against total hydrogen use in the denominator minus that of CCS-based hydrogen, therefore also allowing to reflect the continued need for CO_2 as a feedstock for CCU and the wider chemical value chain when finalising the target's supporting criteria.
- Simplify the RFNBO requirements additionality and temporal correlation criteria, which create unnecessary barriers to deployment, by delaying additionality requirements until 2035 and keeping temporal correlation at monthly level.
- Establish a CAPEX and OPEX-based double sided auction CfD scheme for industrial decarbonisation, funded via ETS revenues channelled through the Industrial Decarbonisation Bank.

2. Stimulating demand for renewable and low-carbon products

2.1 Conventional End-Uses

Ammonia is primarily consumed today as a feedstock for fertiliser production (approximately 80% of global use) and as a chemical intermediate. Decarbonising existing ammonia demand represents the most immediate opportunity for the EU, but only having obligations on the production side without demand for decarbonised ammonia products damages the business case.

To stimulate demand for renewable and low-carbon ammonia in these established applications, Ammonia Europe supports the establishment of lead markets using the specific support called for

under the Critical Chemicals Alliance to recognise ammonia as a strategic molecule and key for the foundation of lead markets identified in chemicals and for the fertiliser end markets such as food, feed, fuel and fibres. Where possible, the CCA conclusions should be translated into concrete EU policy measures that stimulate demand for low-carbon products and technologies (like the IAA).

For demand-side measures on fertiliser products, food and beverage companies and ingredient suppliers should be incentivised to source lower-carbon fertilisers, beyond voluntary markets. This could be particularly relevant for premium and branded products, where sustainability credentials and product carbon footprints increasingly influence purchasing decisions. Harmonised product carbon footprint (PCF) methodologies could enable companies to account for the embedded emissions of fertiliser in their agricultural supply chains, creating a market signal for low-carbon ammonia and fertiliser production without placing the burden directly on farmers.

For the chemicals industry, significant GHG reductions have been achieved through switching to renewable power and cost-efficient operational measures. The next steps of the green transformation require substantial investments in assets (e.g., cracker, ammonia) and a shift to non-fossil feedstocks to provide the raw materials required for 95% of downstream chemicals production. Both types of measures will increase production cost permanently due to greater (renewable) energy needs and additional processing steps required to convert new feedstocks to target molecules. Therefore, support should be given for the development of a demand mechanism for the decarbonisation of the chemical industry like the European Chemicals Carbon Transformation Instrument (ECCTI) under development as part of the European Chemicals Resilience Initiative (ECRI). The early design of the instrument is based on a transformation fee, building on the direction set by the European Chemicals Carbon Transformation Initiative, based on the average chemicals content of products per broad product group and factoring the needed decarbonisation investment of the upstream value chains. The fee would be applied to all consumer goods sold in EU27, and set as close to the end-user as possible, also covering imports. The revenues would be channelled through dedicated decarbonisation funding, available to European investors only.

2.2 New End-Uses

Ammonia is one of the most promising zero-emission fuels for deep-sea shipping. The ETS and FuelEU Maritime Regulations creates a regulatory framework that increasingly incentivises alternative fuels. The updated approach should align with and reinforce these regulatory drivers, supporting the development of an EU-based ammonia bunkering hub.

On ambition, the mandatory Member State-level RFNBO sub-target for transport under RED III should be retained. It is a key driver for building the RFNBO market, including imports, and is already being transposed into national legislation and provides regulatory certainty for investors. However,

it should be complemented by flexibilities, notably statistical transfers between Member States and the option for electrolytic low-carbon fuels to count towards compliance, so that Member States can meet the sub-target according to their national circumstances. Additionally, Member States should retain the flexibility to exceed the EU-wide minimum and be encouraged to assign a proportion of the target specifically to maritime transport where national circumstances allow. Consideration on any increase in ambition within the EU should be aligned with parallel discussions at IMO level and paired with the enabling conditions, like bunkering infrastructure and fuel supply.

On funding, Ammonia Europe supports earmarking a portion of the maritime EU ETS revenues to create dedicated demand-pull mechanisms for renewable and low-carbon ammonia bunkering. The EU ETS review proposal's provision to direct at least 110 million allowances alongside Sustainable Maritime Alternative Power (SMAP) provisions, should go further in the support provided for alternative fuel infrastructure, transitional technologies like dual-fuel engines, and allow vessels below the scope of 400Gt to voluntarily partake in the mechanism, this is especially relevant for port vessels of small weight but high power that will be part of the transition.

Post-2030, one of ammonia's greatest strategic values will also be its role as a hydrogen carrier supplying high-purity hydrogen to industrial users, ports and other consumers where hydrogen pipelines are unavailable or uneconomic. Therefore, it should be clearly outlined that renewable and low-carbon hydrogen recovered in Europe from compliant imported renewable or low-carbon ammonia retains its renewable or low-carbon status, subject to the applicable traceability, lifecycle-GHG and anti-double-counting requirements. More broadly, the future framework should remain technology-neutral between different hydrogen logistics pathways, avoiding any unintentional disadvantage to ammonia as a hydrogen carrier. In addition to this, a robust certification framework should be established, complementing compliance certification for regulatory recognition with voluntary certification schemes[6] to support market development and provide flexibility for early projects where regulation is not yet fully developed.

2.3 Funding Instruments

On the demand side, dedicated funding support should complement the production-side measures set out in Section 1.2, calibrated to the different risk profile and time horizon of demand-side investment. Longer-term investment predictability can be provided by a double-sided auction, with a Contract for Difference (CfD) on the supply side and for the demand-side support a CfD offering shorter-term, closer-to-market flexibility for off-takers transitioning to renewable and low-carbon ammonia. For both supply- and demand-side measures, CAPEX and OPEX support should be available through the Innovation Fund and the wider EU Industrial Decarbonisation Bank, ensuring a consistent and complementary approach across the value chain.

[6] Ammonia Europe's Own GHG Certification scheme for ammonia

2.4 Policy Asks

- Using the Critical Chemicals Alliance conclusions to support the establishment of lead markets for renewable and low-carbon ammonia in chemicals and fertilisers end markets (food, feed, fuel and fibres), and to drive demand by incentivising food and beverage companies to source lower-carbon fertilisers through harmonised product carbon footprint methodologies, rather than placing the burden on farmers. Where possible, the CCA conclusions should be translated into concrete EU policy measures that stimulate demand for low-carbon products and technologies (like the IAA).
- Support the development of a demand-support mechanism like the European Chemicals Carbon Transformation Instrument (ECCTI), a decarbonisation levy on chemical content, with revenues channelled into dedicated decarbonisation funding.
- Maintain the RFNBO transport target, complemented with flexibilities, notably statistical transfers between Member States, and eligibility of electrolytic low-carbon fuels, and increase uptake ambition for maritime transport by encouraging maritime provisions as part of the RED transport target, calibrated to fuel availability and aligned with FuelEU Maritime and the future IMO Net-Zero Framework. These provisions should apply equally to imported goods as well as domestically produced ones.
- Earmark a portion of specific maritime EU ETS revenues within the Sustainable Maritime Alternative Power (SMAP) provisions and go further in the support provided for alternative fuel infrastructure, dual-fuel engines, and voluntary opt-in of vessels below 400Gt.
- Mirroring the supply-side, establish a CAPEX and OPEX-based double sided auction CfD scheme for clean ammonia demand through the Industrial Decarbonisation Bank.

3. Accelerate infrastructure and Technology Deployment

3.1 Ammonia infrastructure and hubs

One of ammonia's principal advantages as an energy carrier is its existing industrial infrastructure. Ammonia can be stored and transported as a liquid at moderate pressures (approximately 10 bar at ambient temperature) or temperatures (approximately -30°C at ambient pressure) using well-established technologies adapted from the existing ammonia supply chains. This represents a significant cost and timeline advantage compared to the development of dedicated hydrogen infrastructure.

EU ports are critical nodes for ammonia import, export, and bunkering. Several major EU ports already handle conventional ammonia. However, significant investments are still required to expand capacity and adapt infrastructure for large-scale import, storage, bunkering and distribution of low-carbon and renewable ammonia.

Ammonia Europe's vision is for a network of "Decarbonised Ammonia Hubs": decarbonised ports combining full value-chain integration across import, storage, bunkering, ammonia cracking, hydrogen purification, hydrogen injection into the backbone, local industrial offtake and further transportation to industry. Key EU ports should be identified and designated as such hubs.

This requires consistent treatment of qualifying ammonia import and conversion projects throughout the TEN-E, TYNDP, CEF Energy and PCI process. Building on the existing category for hydrogen embedded in chemical substances, ammonia import terminals incorporating conversion should be properly represented in TYNDP submissions and assessments and, where they meet the applicable European and cross-border criteria, be able to progress through the PCI,CEF Energy and PCI process. For qualifying hydrogen reception projects, the recognised project boundary should cover the functional ammonia-to-hydrogen conversion system required to deliver hydrogen meeting the applicable network or end-user specifications, irrespective of whether cracking, separation and purification are integrated within one process or performed separately.

Ammonia bunkering deployment should be operationalised under TEN-T and AFIR through port-specific, demand-based plans identifying priority TEN-T ports, expected demand, capacity needs, investment timelines and maritime-corridor coverage. The Commission should accelerate harmonised technical interoperability requirements for ammonia bunkering, complemented by coordinated guidance on permitting, risk assessment, training and emergency response. Future CEF Transport and AFIF programmes should provide predictable and adequately funded support for the port-side infrastructure required to supply vessels, including transfer and bunkering equipment, storage linked to bunkering operations, metering, containment and safety systems. Funding for ammonia infrastructure should remain visible alongside mandatory onshore power supply investment, so that OPS deployment does not crowd out emerging sustainable maritime fuels.

Where ammonia is imported as a hydrogen carrier and converted back to hydrogen at the point of use, dedicated cracking infrastructure will be required at import terminals. Therefore, priority investment locations and support for the development of commercial-scale crackers, which are currently at pre-commercial stage, should be identified as a hydrogen demand-enabling pathway which will also broaden the ammonia market. In turn, clear rules for ammonia-derived hydrogen certification are needed if clean ammonia is cracked in Europe.

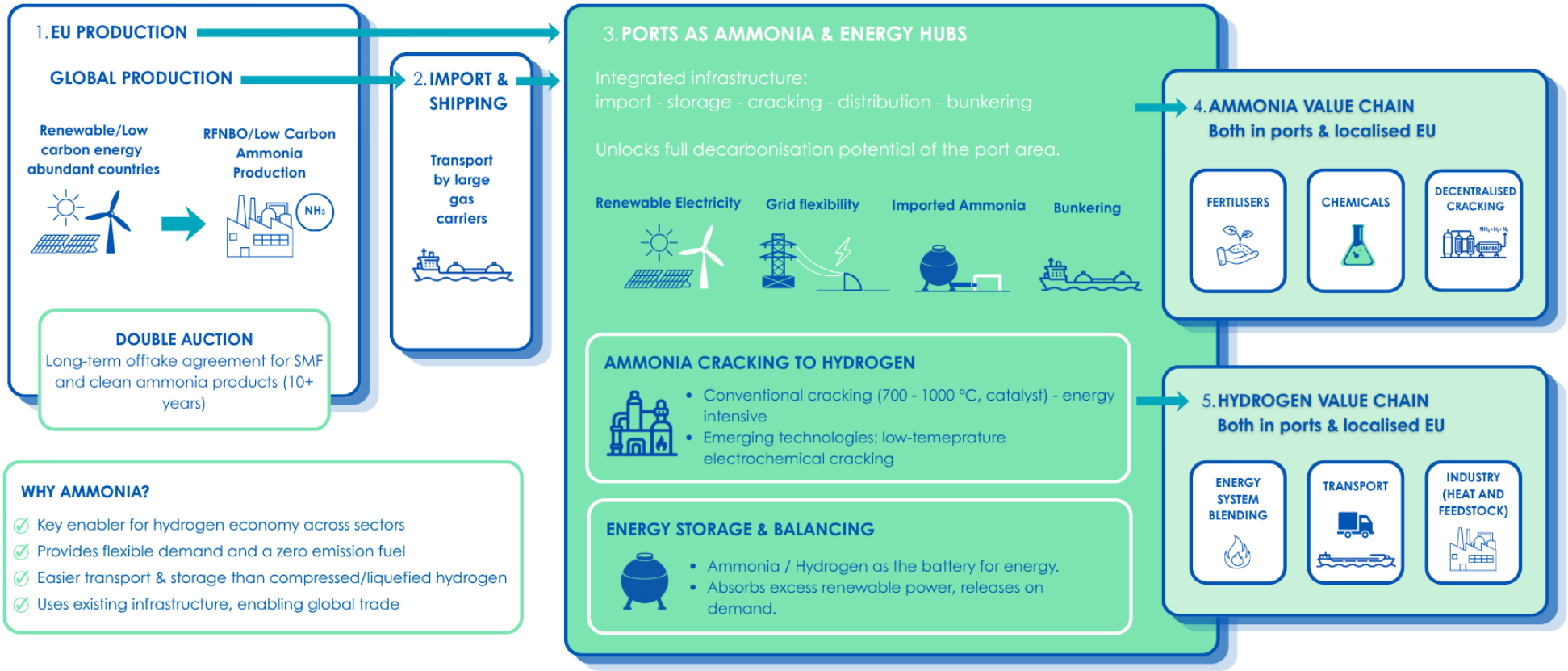
Additionally, the current "internal markets for renewable gas, natural gas and hydrogen" directive comprises a broad definition of hydrogen infrastructure which would bring ammonia cracking, associated hydrogen pipeline and storage assets within scope of mandatory third-party access. For infrastructure that has already been built, often at significant risk and cost to the first mover, a blanket third-party access obligation risks undermining the investment case that justified the

project in the first place and could discourage other companies from making similar early commitments.

Ammonia has a limited existing pipeline network in the EU. However, repurposing elements of the existing gas or LPG infrastructure for ammonia transport may be feasible in certain corridors. These options require engineering assessment.

All these options should be accompanied by a build-up of electricity grids and hydrogen pipelines to support renewable energy development, availability, and supply, as well as developing the readiness of ports for alternative fuels and the safety regulations for ammonia bunkering to be co-developed with the maritime sector.

Clean Ammonia Hub Concept



3.2 Technology Readiness and Priority R&I Areas

The core technologies for clean ammonia production, water electrolysis with Haber-Bosch synthesis, are mature at demonstration scale but require significant innovation to achieve cost competitiveness at gigawatt scale. Several adjacent technologies are at lower TRL and represent high-value R&I priorities.

- Production: Large-scale electrolysis integration with Haber-Bosch, dynamic operation of mid-range Haber-Bosch with variable renewable electricity inputs, off-shore low-carbon ammonia production at gas source with CO_2 stored in a geological formation on the same field.
- Hydrogen Carrier: Ammonia cracking at scale, development of efficient, low-cost catalysts and heat integration for ammonia-to-hydrogen reconversion at import terminals.
- Maritime: Ammonia fuel compatible ships including combustion engines or fuel cell, fuel handling, operational safety, retrofitting technology as well as bunkering technology i.e. ship-to-ship and port-ship bunkering technology requirements
- Energy: Ammonia fuelled gas turbines and fuel cells including for decentralised power
- Safety and sensing technologies: leak detection, dispersion modelling, and automated safety systems for ammonia handling at ports and industrial sites.

As the Critical Chemical Alliance has identified ammonia as a critical molecule, these supporting technologies for decarbonisation should be recognised within the IAA.

3.3 Policy Asks

- In line with TYNDP and hydrogen backbone infrastructure planning, identify and designate key EU ports as decarbonised Ammonia Hubs within the TEN-T and TEN-E regulations, supporting ammonia import, export, cracking, storage, bunkering, industrial use and onward distribution to inland demand centres, building on existing industrial clusters such as Antwerp.
- Explicitly recognise ammonia infrastructure within the Connecting Europe Facility (CEF energy and transport), ensuring eligibility for funding of strategic storage facilities, port infrastructure, inland transport connections, and cross-border ammonia value chain projects. The provision of CEF funding for import facilities should also be extended.
- Integrate ammonia bunkering infrastructure into the implementation of the Alternative Fuels Infrastructure Regulation (AFIR), ensuring adequate deployment of ammonia bunkering facilities along key European maritime corridors. This also includes allocated funding in AFIF for ammonia bunkering infrastructure deployment in Ammonia Hubs and along designated green shipping corridors.

- Increase flexibility in the application of third-party access rules as part of the Gas and Hydrogen Directive. This could take the form of a negotiated, rather than regulated, access model, or a time-limited exemption, recognising the higher risk profile and market-enabling role of first-of-a-kind investments like ammonia cracking.
- Ammonia-specific technologies (referenced in point 3.2) should be recognised within the IAA as supporting ammonia as a critical molecule and explicitly prioritised and funded in upcoming research, development and innovation funding instrument such as Horizon Europe, Clean Hydrogen Partnership and Innovation and Competitiveness Funds.
- Ensuring that the sustainability attributes of the imported ammonia can be transferred to the hydrogen produced without unnecessary administrative burdens or loss of compliance value.

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Transparency Register

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