argusmedia.com

Argus Insight: Hydrogen Taxonomy

Executive Summary

This white paper is a follow-up to Hydrogen: awash in colours, in search of definition, released in November 2021. We received extensive feedback spanning the supply chain and have made amendments to the proposed taxonomy to reflect this.

Building on the premise that hydrogen (H2) categorisation should be by carbon intensity rather than process (colour), Argus launched 155 costs of production across the world, sorted by the Scope 1 and 2 emissions associated with their production. This offers the market a way to view the evolution of production costs through the prism of carbon dioxide (CO2) – the fundamental basis on which the hydrogen economy is based.

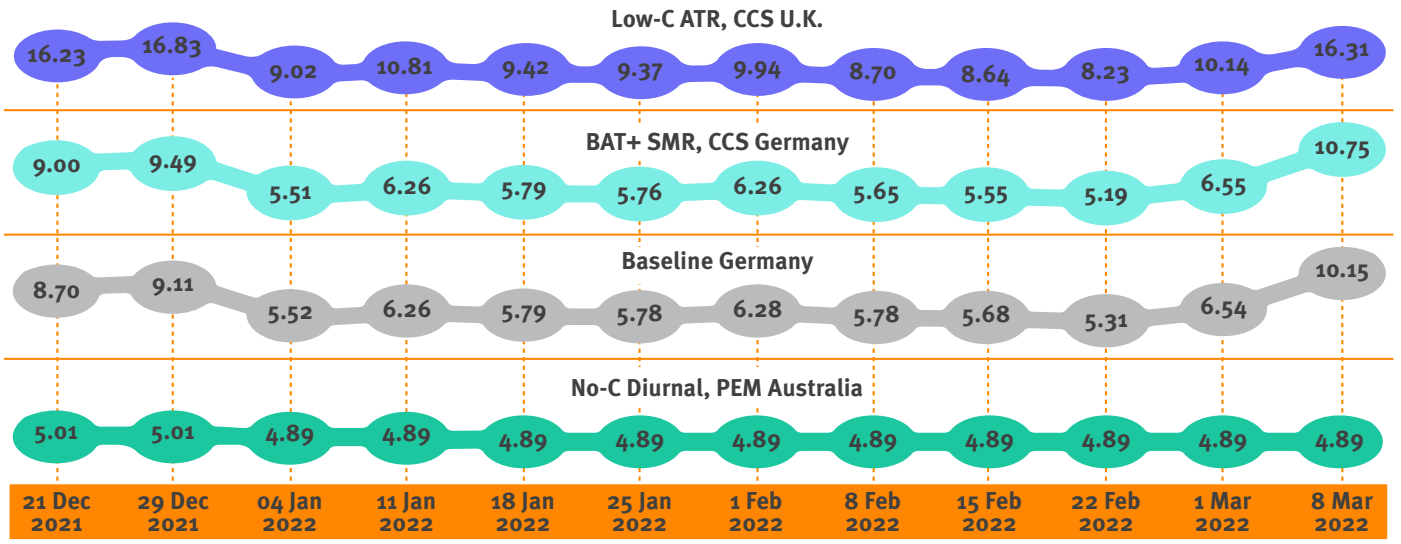
From hydrocarbons to hydrogen and carbon

The energy transition will be a dance between the elements H2 and CO2 and their respective costs. This interplay and expectations of how they develop will shape global policy, industry and supply chains over the next three decades.

Their interconnectedness makes discussing the gas in isolation incoherent. Its rise up political and business agendas stems from the externalities of carbon-based energy. As the industry looks to build-out production infrastructure, looking at both is crucial. This reality is already becoming clear.

As carbon costs have risen (see figure 1) in 2022, production costs from a new unabated steam methane reformation (SMR) plant in Europe have risen above those from producing from that same plant with carbon capture and storage facilities attached. This is precisely the outcome envisaged by the scheme.

Hydrogen Production Cost US$/kg *(figure 1)*



Source: Argus Media 2022

Jera Japan this year announced the world's largest tender for ammonia decarbonised by at least 60pc. A largely unabated ammonia production plant in Australia that planned to use carbon offsets, rather than directly abating CO2 will be excluded from tendering for supply.

Both examples are clarion market signals for investment in decarbonised production assets.

A common language

Argus aims to raise transparency around the industry's production cost structure evolution. But doing so without adding a framework to quantify carbon intensity will be a poor offering, particularly when several companies are explicitly basing strategic planning around this and committing huge budgetary resources to achieve a net zero status.

Price reporting agencies such as Argus occupy a unique niche in global commodity industries, forming a common touchpoint where intermediaries, buyers, sellers and industry service providers gather impartial daily intelligence on market-moving information.

Classifying and sorting production around associated emissions serves to group a diverse range of production routes according to this standard. We hope this framework will move the conversation across the supply chain away from colours.

Our initial proposal has been modified into the revised taxonomy (see figure 2).

Argus Hydrogen Taxonomy *(figure 2)*

	H2 Purity	CO2e kg/kg of H2*	Pressure	Example Colours	
Baseline	99.9%	<11.3, >8.0	30 bar	Grey	Yellow
BAT+	99.9%	<2.88, >1	30 bar	Blue (SMR+CCS retrofits)	
Low-C	99.9%	<1, >0.5	30 bar	Blue (ATR+CCS),	Turquoise
No-C	99.99%	<0.01	30 bar	Green	Purple

Source: Argus Media 2022

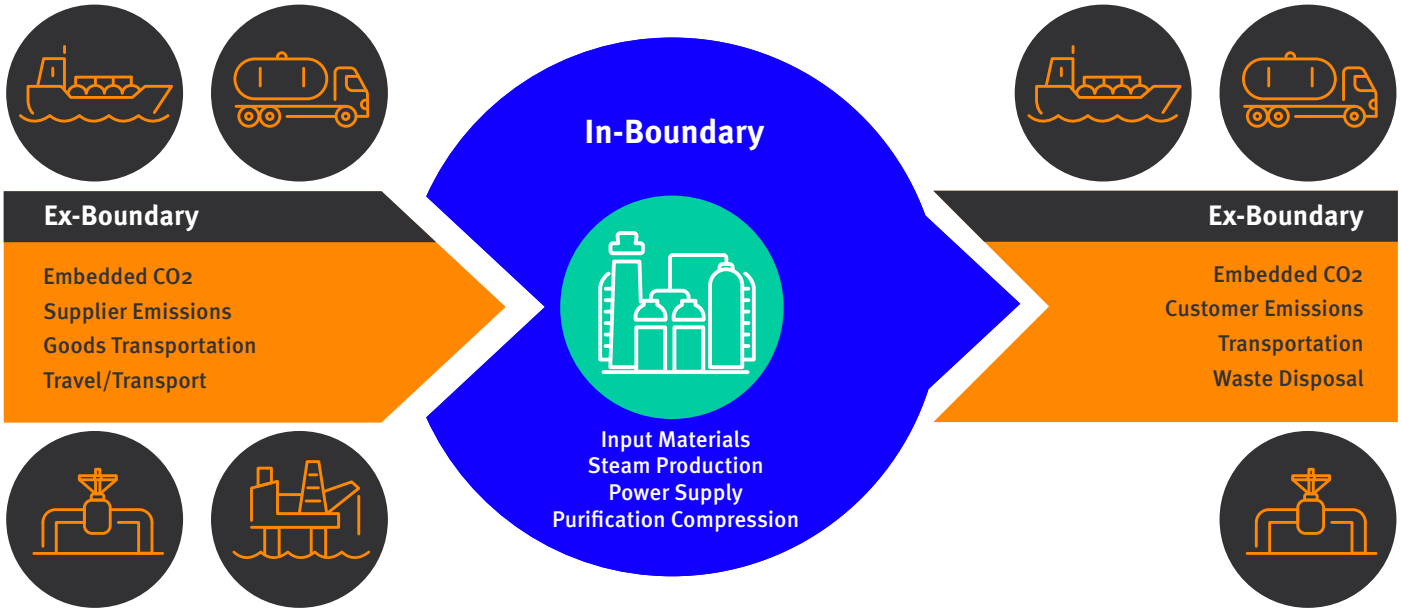
Since the last white paper, several of the applicable CO2e bands have been tightened, pressure harmonised at 30 bar and No-C purity raised to reflect the bar being set by electrolytic hydrogen.

Argus is not working in opposition to organisations looking to define standards, certification or chain-of-custody solutions for the industry, but along with them. We anticipate these may be developed along national, regional and international boundaries, with fungibility key to the latter. As industry regulations solidify, we will align with them. Until that point of clarity is reached, the above will be employed.

System boundary

Argus is defining carbon intensity limits around a gate-to-gate basis (see figure 3). In other words, we are looking at carbon emissions created directly in the manufacture of H2: Scope 1 and 2. This includes raw material feed into the production plant, steam production, power supply, CO2 compression for pipeline injection and ancillary services such as water and hydrogen purification. It excludes onwards transportation from the plant of product and by-product and indirect emissions from fossil fuels produced and despatched to the plant.

Gate-to-gate System Boundary *(figure 3)*



Source: Argus Media 2022

While Argus is aware that many are looking toward 'full system accounting' (i.e. well-to-wheel/well-to-wake basis), the establishment of testing and certification is a necessary precondition for that.

Yet capital decisions to meet 2030 and 2040 decarbonisation goals need deployment now and offtake industries seek to understand how suppliers' production routes will fit with their own goals.

As the industry transitions from planning to implementation, carbon emissions association will be essential to regional and global markets. With that carbon footprint primarily generated upstream, embedding a supply chain-wide understanding of emissions at point of production is paramount.

To see what Argus, is doing in this sector, a contact form is available **here**. To discuss anything covered in this white paper, please contact **Hydrogen@argusmedia.com**. We would love to hear from you.

For more information:

contact@argusmedia.com +44 20 7780 4200 www.argusmedia.com @argusmedia