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Argus Insight: Hydrogen from coal gasification



Argus launches costs for hydrogen from coal gasification with CCS

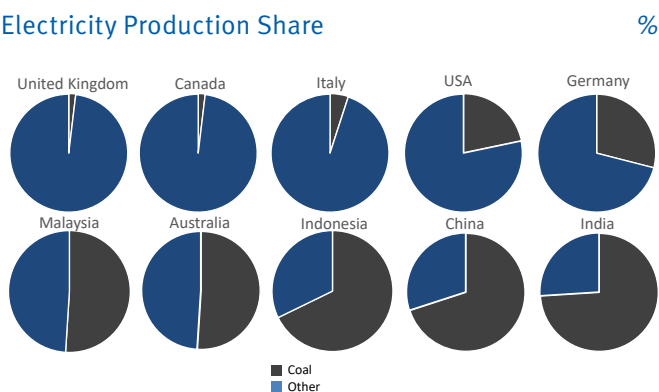
Think energy transition and coal does not immediately spring to mind. But in some parts of the world coal-based hydrogen production using carbon capture and storage (CCS) could well play a role. Indeed, the widely varying role of coal in various economies means that, for some, it may offer a cost-effective route to reducing emissions.

Coal may not have much of a future in Europe, where phase-out commitments draw closer, despite the short realpolitik-induced reprieve for coal-fired power generation. But in North America there remains an active lobbying presence for its use in hydrogen production, despite US electricity production from the coal halving since 2008. Developed northeast Asia's Japan and South Korea rely on coal for around a third of their power generation but have plans to decarbonise coal generation by co-firing with ammonia, a key demand pull for hydrogen (H₂) developers.

Coal usage varies substantially

But in the largest emerging markets old 'King Coal' reigns supreme accounting for 63% and 74% of China and India's power generation respectively. Coal-rich Indonesia's share is 61%. So it's unsurprising that these regions are drawn to incorporating the black stuff in their hydrogen plans.

Electricity Production Share



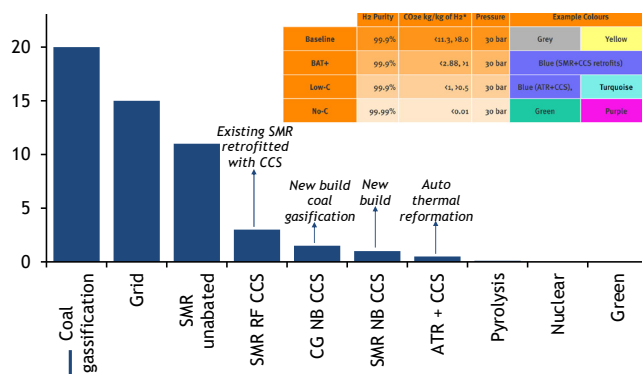
Coal-derived "brown" H₂ is already a major source of global hydrogen production, forming close to a third of what is currently produced globally. In this unabated format, 20kg of carbon dioxide (CO₂) are produced for every 1kg of brown hydrogen. Applying CCS can shrink that to a more palatable 1.5kg/t on a scope one and two emissions basis.

For context, this reduced footprint is around half the CO₂ produced by a legacy unabated steam methane reformer, retrofitted with CCS technology. The addition of abatement to coal gasification transmutes the resulting hydrogen from brown to "blue" on the informal colour schemes historically referred to by industry.

Argus use a carbon intensity taxonomy rather than colours and coal gasification with CCS (CG+CCS) fits firmly in the BAT+ category below, which refer to best available technology routes, paired with CCS.

Key metrics for traded markets in future will be cost (price) and carbon intensity. On the latter CG+CCS can outcompete the installed natural gas production base, even after CCS upgrades.

Application of CCS leapfrogs retrofitted SMR for C.I.



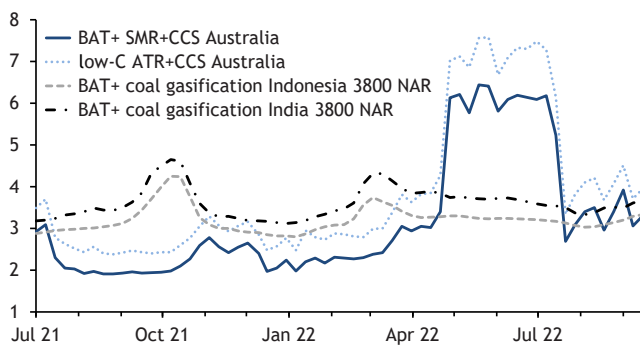
Blueshift: Can CCS aid decarbonisation and supply chain resilience?

For countries such as Indonesia, the world’s largest coal exporter, the commodity is not only a source of export income, as it holds a commanding share in its domestic generation mix. Do low-carbon hydrogen and derivatives such as ammonia offer a suitable substitution for the resource?

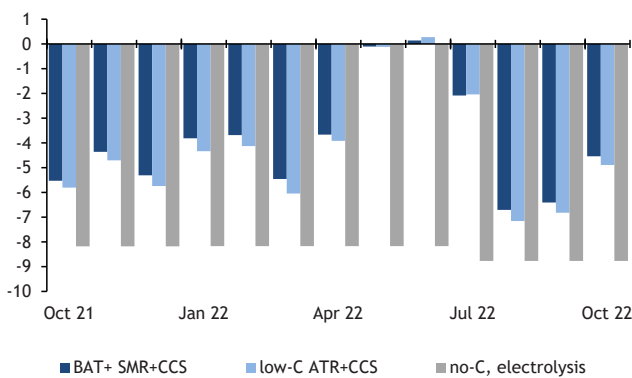
Co-firing ammonia with coal is a route that others are looking at to pull down at carbon intensity and the country is already exploring CCS. Producing more than it consumes could play a key balancing role in regional supply chains, given methane’s volatility.

Northeast Asia is a natural importer, with Japan and South Korea’s net short of energy and having relatively unfavourable domestic hydrogen production economics. If it imports blue hydrogen, a diversity of supply offers options.

CG+CCS could ease natgas price spikes



Persistent cost disadvantages force imports



Indonesian CG+CCS costs were notably unmoved during the surge in production costs from natural gas. In such cases, CG+CCS could offer swing supply to those with flexibility in their supply arrangements.

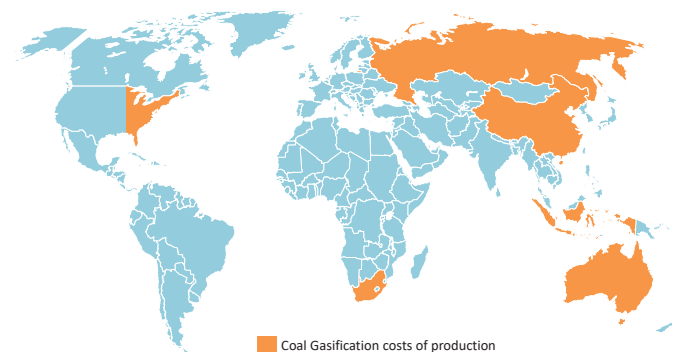
This pre-supposes traded H₂ markets where offtakes are not 100% of volume, allowing switching.

Compare and contrast

Comparing the economics of hydrogen produced via different pathways requires a range of data points. To track the costs of producing hydrogen from coal gasification using CCS, Argus has launched blue hydrogen costs from the CG+CCS route covering China, India, Indonesia, Russia, South Africa and the US.

While potential producers weigh options, new CG+CCS costs allow Argus Hydrogen and Future Fuels users to look holistically at cost evolution across grid, coal, gas and renewable production modes.

Argus initiate hydrogen from coal coverage



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