

SPEAKER: GRANT BUDGE

TITLE: The Value of Closed Carbon Loops in Steel

ABSTRACT: Closed carbon loop systems offer a promising and potentially superior approach to decarbonizing foundation industries (e.g. cement, steel, glass, ceramics, chemicals) by reusing carbon emissions as a resource rather than treating them solely as a waste product. These systems capture carbon dioxide (CO₂) emitted during industrial processes and convert it into useful products or fuels, which are then re-used in the same or adjacent industrial cycles—creating a circular carbon economy.

PeroCycle is one such technology. Through use of a thermochemical reactor and proprietary active material, CO₂ is converted at low cost to CO for reuse within a blast furnace of DRI unit as a reductant, with the O₂ being produced, being available for sale or use within the Basic Oxygen Furnace. A prototype has been fully tested and demonstrated performance in a laboratory setting; and the company is now developing a pilot plant for testing onsite (at steel mills).

There are several potential benefits to the closed carbon loop approach above other decarbonisation pathways:

1. Carbon as a Resource, Not Waste: Closed loop systems valorise carbon, turning it into products that create economic value and supports circularity, reducing reliance on fossil carbon inputs.
2. Reduced Infrastructure and Storage Risks: Closed loop systems can often be deployed on-site or regionally, minimising infrastructure needs and risks associated with CO₂ leakage.
3. Industrial Integration and Process Compatibility: Closed loop systems can integrate directly into industrial processes, capturing CO₂ at the source and converting it into materials for reuse.
4. Energy Efficiency and Flexibility: Some closed carbon loop pathways can be more energy-efficient when paired with renewable electricity (e.g., CO₂ electrolysis), and can be scaled modularly; thus offer greater flexibility in industrial settings that are not yet ready or suitable for full hydrogen conversion.
5. Enhanced Sustainability and Circular Economy Alignment: By enabling material recirculation, closed carbon loops align closely with net-zero and circular economy strategies—promoting resource efficiency and reducing raw material extraction.

While CCUS and hydrogen have vital roles to play in decarbonising industry, closed carbon loop systems offer distinct advantages by turning emissions into value, minimising long-term liabilities, and addressing both combustion and process emissions. Their integration into foundation industries can unlock both environmental and economic benefits, accelerating a transition to low-carbon production models without the full infrastructure burden of CCUS or hydrogen-based systems.