

## Solid Oxide Technology for the Distributed Production of Blue Hydrogen

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North America's inexpensive natural gas and its existing pipeline networks favor the use of natural gas to produce onsite hydrogen for non-industrial users. Investors do see a profitable business model in the distributed production of hydrogen. Indeed, the opportunity exists now to provide the hydrogen at low cost and low emissions. Bayotech is one of several companies offering onsite hydrogen to customers based on steam methane reforming (SMR) technologies. SMR has the advantage of being a mature technology. However, with the target of blue hydrogen production with minimal carbon dioxide emissions, the SMR technology has several inherent disadvantages.

Solid oxide technology provides a different pathway to produce hydrogen using natural gas. In its case, the natural gas provides the molecules that are oxidized in the anodes of the solid oxide cells to drive the electrolysis of steam into hydrogen in the cathodes of the solid oxide cells. Low cost thermal energy is used to power the reactor rather than high cost electricity. The use of solid oxide technology to produce hydrogen with the aid of natural gas has several advantages over competing technologies. For example, the technology is thermally more efficient than SMR due to inherent heat integrations within the solid oxide reactor. The technology is more amenable to carbon capture for the production of blue hydrogen since the reactor system can be designed such that effluent containing carbon dioxide is only in mixture with steam. Another important advantage for the solid oxide technology using natural gas is the high utilization rate to better offset the high capital cost of the solid oxide cells. Solid oxide technology using renewable electricity in conventional electrolysis does not have this advantage. Thus, solid oxide technology using natural gas provides a pathway to commercialize this solid oxide technology at scale to drive down cost for all uses.

