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Hydrogen with Carbon Capture and Cogeneration

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Abstract

Hydrogen (H_2) is considered to be a potentially disruptive technology for energy transition. Because of this, considerable attention has been directed to carbon capture and sequestration (CCS) as applied to large-scale H_2 production via steam methane reforming (SMR) of natural gas. This is sometimes known as "blue" H_2.

In this report, we examine the technology and economics of SMR-based H_2 production of 90 million standard cubic feet per day (MMscf/d), equivalent to 100,500 Nm^3/hr of the product, without and with CCS. Our CCS case assumes 90% capture of carbon dioxide (CO_2) emissions from the SMR process as well as the heat and power inputs required for carbon capture and compression, namely, Scope 1 plus Scope 2. This is achieved via an on-site noncondensing steam turbine and generation system.

We have conducted our analysis assuming new stand-alone plant construction for H_2 production. We found that by adding CCS and compression to an SMR unit, with 90% of CO_2 captured, adds $0.70/kg to the net production cost of H_2 from natural gas.

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