NexantECA

Technology and Costs

Biorenewable Insights: Hydrogen

Hydrogen is one in a series of reports published as part of NexantECA's 2020 Biorenewable Insights program.

Overview

Bio-renewable hydrogen is an avenue to "greening" a variety of processes in the chemicals and fuels sector as both a drop-in sustainable feedstock and as an enabler of clean fuels and chemicals technology. Although transportation fuel and home applications remain under serious threat from acceleration of electrification, hydrogen will remain a critical component of a sustainable future in refinery, chemical and other industrial operations.

This report focuses on assessing the future sources of bio-renewable hydrogen from the perspective of cost, application, and technology. Key questions addressed include:

- What technologies are available for renewable hydrogen production, and how technically mature are they?
- How do the difficult logistics associated with hydrogen affect potential applications?
- What is the current commercial status of the renewable hydrogen sector?
- What are the costs of sources of renewable hydrogen given current market conditions?
- How do costs and ideal technologies differ by scale and application?
- What is the market potential and current market penetration of renewable hydrogen?

Technologies

This report covers renewable hydrogen production in depth from a variety of current and innovative major technologies including biomass gasification, reforming of methane from renewable feedstocks, and electrolytic production from non-fossil fuel-derived electricity. Major conventional hydrogen sources from reforming, gasification, chlor-alkali and conventional electrolysis are examined for contrast. In addition, the report analyzes innovative process routes including electrocatalysis, photocatalysis and artificial photosynthesis, thermocatalytic processes, and other major developmental routes for technical maturity and business developments.

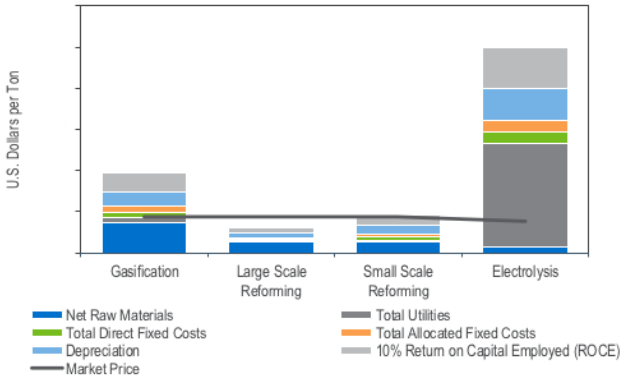
Process Economics

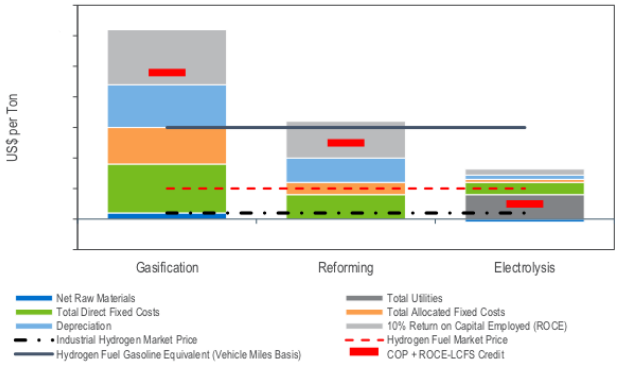
This report assesses cost of production of four major routes to renewable hydrogen: biomass gasification, reforming of bio-based methane at small and large scales, and renewable electricity-based electrolysis. These processes are assessed on a multi-region basis including the United States, China, Brazil and Western Europe. Additionally a 25 percent operating rate use case is also examined for applications with highly discontinuous uses.

Commercial Impact

This report presents implications for conventional technology in terms of price competitiveness vis-à-vis conventional hydrogen prices by region and examines current market penetration given commercial ventures.

Cost of Production Comparison of Renewable Hydrogen Technologies, 100 percent and 25 percent operating rate





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The BI program (sister program to the world renowned TECH program, formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging of interest to the renewable energy and chemical industries.

BI's comprehensive studies include detailed technology analyses, process economics, as well as capacity analysis and impacts on conventional industry. Reports typically cover:

- Trends in technology
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- Process Technology:
- Chemistry
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- Capacity tables of plants and analysis of announced capacities
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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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