NexantECA

Technology and Costs

Biorenewable Insights: Renewable Natural Gas

Renewable Natural Gas is one in a series of reports published as part of NexantECA's 2019 Biorenewable Insights program.

Overview

Methane derived from renewable sources, or RNG, is a viable "drop-in" renewable fuel and/or feedstock that is growing in production and utilization globally. RNG can serve as a substitute or a switchover for its fossil fuels' equivalent without changing or even modifying the existing systems for distribution refueling, or utilization. RNG may not necessarily be accepted in all quarters as a bio-fuel(s) (e.g., if it is made from CO_2 as carbon source that emerges from a fossil fuel stack), but even as such, it is undeniably renewable. Similar to fossil natural gas, RNG may also serve as a feedstock for chemical processes. There is already a large production of RNG in North America, Western Europe, and elsewhere, primarily separated from landfill gas (LFG) and biogas from anaerobic digestion (AD) of food, agricultural, and other organic wastes. RNG is the largest volume cellulosic biofuel in North America. RNG from AD and LFG has vast additional potential, meets goals of distributed generation and grid resilience, and can be monetized via federal and state renewable fuel standards and mechanisms. The production, transportation, and distribution of RNG is actually a fairly "low-technology" technical and business model, with conventional acid gas and other gas cleaning operations employed.

The main drivers for RNG include energy security, environment, and green economy as well as emissions reduction, sustainability, and impact of peak oil. Political drivers consist of government programs, pollution, human health and safety, rural development, and assisting developing countries. Economic drivers are mainly waste-to-energy efforts in the United States and other countries.

Technologies

While the end result of the production of biogas and LFG is similar, a largely methane stream that is diluted by CO_2, H_2O, and other contaminants, the production method may differ due to the initial state of the feedstock. For AD, the microbial process where the first two steps are facultative (could be either aerobic or anaerobic) and the latter two are strictly anaerobic. For LFG, types of landfilling consist of composition, collection and related methods. Gas cleaning and upgrading is needed for meeting pipeline quality requirements including amine scrubbing, pressure swing absorption (PSA), membrane separation, water scrubbing, and cryogenic separation. If biogas and LFG are not upgraded and compressed for injection into a pipeline or hyper-compressed or liquefied for use as vehicle fuel, then they are used to generate heat or electricity via commercially proven combined heat and power (CHP) plants. AD plants and LFG collection plants commonly use some of their generated gas to provide both heat and power to the plant. Currently, biogas and LFG are most often used as fuel for both conventional boilers and CHP units for heat and electricity generation. Syngas-based RNG, on the other hand, starts with biomass gasification and the syngas can be used to make Fischer-Tropsch (FT) products as well as methane. Alternatively, biogas and LFG can be reformed to make syngas for chemical synthesis. For CO_2 methanation, there has been considerable interest from both industry and consumers in CO_2 utilization technologies. Audi and ETOGAS are one partnership focused on this market segment in Germany, while a consortium consisting of RISE, Södra, AkzoNobel Specialty Chemicals, and BillerudKorsnäs in Sweden is undertaking similar work.

Process Economics

Cost of production models for USGC, Brazil, Western Europe and China are shown for pipeline quality gas from:

- Anaerobic Digestion
- Landfill Gas
- CO_2 Methanation
- Syngas-Based (SNG)
- Electrofuel

Capacity

NexantECA has catalogued existing renewable natural gas production and capacity, as available, in major markets, and includes maps of biogas production.

For more information. please contact Technology@NexantECA.com or www.NexantECA.com

Biorenewable Insights: Renewable Natural Gas

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), 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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