



## Biorenewable Insights: Carbon Dioxide to Chemicals and Fuels

Carbon Dioxide to Chemicals and Fuels is one in a series of reports published as part of NexantECA's 2020 Biorenewable Insights program.

### Overview

Transformative uses of carbon dioxide have been given new interest by a combination of popular and regulatory pressure to displace and sequester greenhouse gases. Carbon dioxide thus used becomes both a platform for new products and a method of reducing environmental impact of the chemicals industry. Unlike pure sequestration initiatives, these processes have the potential to be sustainable both from a revenue perspective and an environmental perspective.

Multiple producers have begun developing technologies for inserting carbon dioxide into existing value chains and for developing new products with carbon dioxide. However, the economic viability of large-scale transformative uses of carbon dioxide remains unclear, as does the technical maturity of major options and their potential carbon dioxide impact.

This report aims to answer the following strategic questions:

- What transformative carbon dioxide technologies are available, and what is their current status?
- Which transformative carbon dioxide technologies are the most profitable?
- What is the potential impact of available carbon dioxide transformation technologies?

### Technologies

This report covers uses of carbon dioxide across many different value chains, including both drop-in applications and novel products, such as:

- Dry reforming and syngas
- Methanol
- Methane
- Ethanol
- Algae Technology
- Polycarbonates, Polyols and Polyurethanes
- Cement and Concrete
- Salicylic Acid

### Process Economics

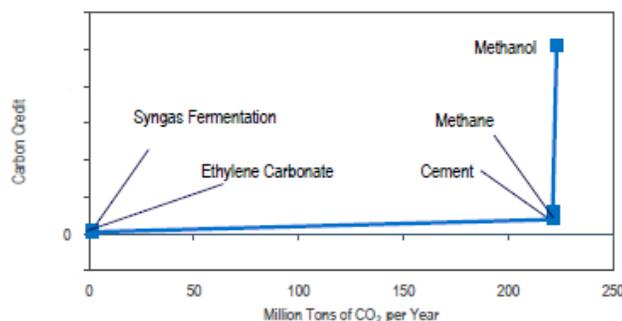
NexantECA assesses the cost of production of carbon dioxide when used as a feedstock for ethanol, ethylene carbonate, methane, and methanol, reflecting current developmental technologies. Additionally, this report includes a speculative economic model of cement production using flue gas-derived carbon dioxide.

Economics are covered both on a conventional cost of production basis and on the basis of a required carbon dioxide emissions displacement credit required to achieve a 10 percent return on capital employed, and are covered for technologies in the United States, Western Europe and China.

### Commercial Impact

While no conventional technologies are available to compare to carbon dioxide utilization technologies, the report assesses the potential impact of these technologies with respect to displaced carbon dioxide emissions based on current world markets.

Carbon Dioxide Utilization Potential vs Required Carbon Credit, Western Europe – 2020 Economic Basis





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- Trends in technology
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- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
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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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