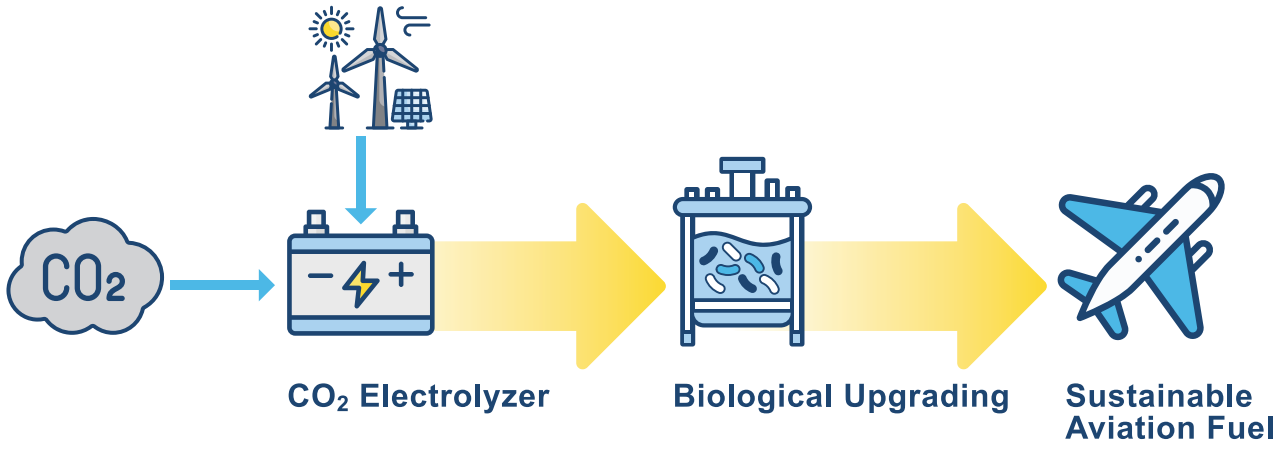
U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

CO_2 Reduction and Upgrading for e-Fuels Consortium



An example process of how waste CO_2 from ethanol fermentation can be upgraded to sustainable aviation fuel. *Image from the National Renewable Energy Laboratory (NREL).*

Developing and De-Risking Technologies To Convert Waste Carbon Dioxide Into Fuels and Chemicals

The CO_2 Reduction and Upgrading for e-Fuels Consortium (CO_2RUe) is a collaboration of industry advisors and five national laboratories funded by the U.S. Department of Energy (DOE) Bioenergy Technologies Office.

CO_2RUe develops an integrated portfolio of technologies that use renewable electricity, catalysts, and microorganisms to upgrade waste carbon dioxide (CO_2) into e-fuels (a shorthand for electrofuels) and commodity chemicals.

CO_2RUe Approach

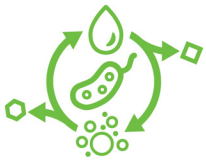
Millions of tons of waste CO_2 are emitted annually from biorefineries and industrial sites across the United States. CO_2RUe is focused on applying renewable electricity to convert waste CO_2 into climate-friendly e-fuels and chemicals, which have dramatically lower land, water, and greenhouse gas (GHG) emission footprints compared to fossil fuels.

By implementing these methods, the consortium advances solutions for decarbonizing key economic sectors, such as aviation, marine, chemical manufacturing, and heavy industry.

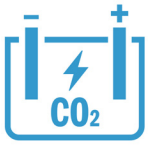
CO_2RUe Research Areas

CO_2RUe organizes its research and development (R&D) into three areas to lower technical and economic barriers to commercial-scale CO_2 reduction and upgrading technologies.

Analysis and Modeling
Understand how CO_2 conversion technologies might save water, reduce GHG emissions, and unlock social and economic opportunity.



Biological Upgrading
Research biological technology to upgrade carbon monoxide, hydrogen, and formate into chemical intermediates.



CO_2 Electrolysis
Study CO_2 electrolysis technology to improve the design, efficiency, and effectiveness of electrochemical conversion technologies.

CO_2RUe Goals

With support from industry, academia, and DOE national laboratories, CO_2RUe developed the following goals to guide this research:

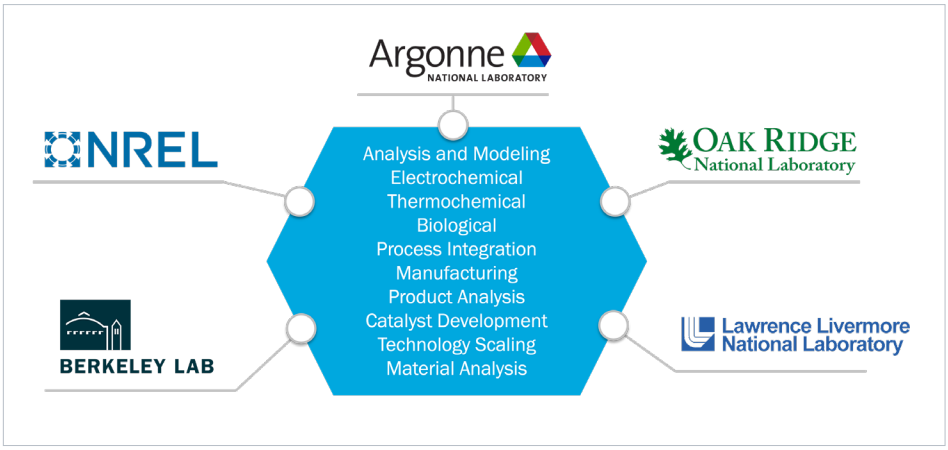
- Support the Sustainable Aviation Fuel Grand Challenge goal of supplying 3 billion gallons of cost-competitive sustainable aviation fuel by 2030 and 35 billion gallons by 2050.
- Provide a strategic R&D vision for CO_2-to-fuels efforts and an integrated portfolio of relevant technologies.
- Enable CO_2 chemical production strategies capable of reducing 70% of GHG emissions.
- Enable efficient CO_2 conversion to intermediate streams via renewable electricity.
- Develop strategies for converting one-carbon (C_1) and two-carbon (C_2) intermediates to fuels and chemicals.
- Incentivize waste CO_2 utilization to increase carbon efficiency in the bioeconomy.
- De-risk technologies toward piloting and eventual commercialization.

A CO_2RUe molecular biologist works with an electrolyzer and fermentation reactor.
Photo by Werner Slocum, NREL.

- Develop project target metrics based on techno-economic analysis and life cycle assessment.

National Laboratories and Capabilities in CO_2RUe

The following DOE national laboratory capabilities are employed to reduce and upgrade waste CO_2 to e-fuels and commodity chemicals.



Learn More About CO_2RUe

Learn more about the CO_2 Reduction and Upgrading for e-Fuels Consortium, its partners, and its impact on the bioeconomy at www.energy.gov/eere/bioenergy/co2-reduction-and-upgrading-e-fuels-consortium.

For any inquiries about the consortium or how you can get involved please contact:

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CO_2RUe
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For more information, visit: energy.gov/eere/bioenergy

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