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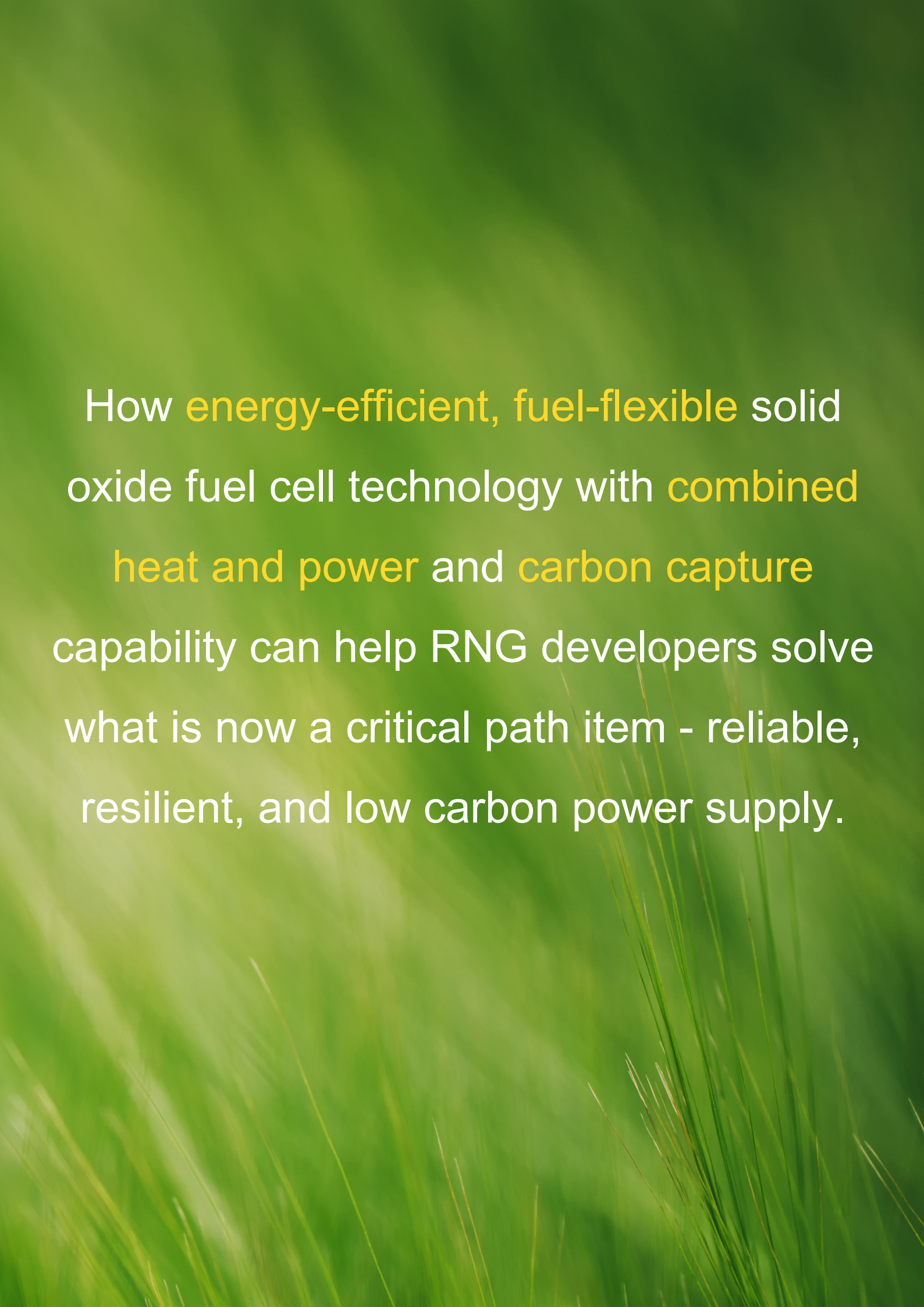
THE POWER CRUNCH: MEETING CRITICAL PATH RNG POWER DEMANDS WHILE DECARBONIZING


How energy-efficient, fuel-flexible solid oxide fuel cell technology with combined heat and power and carbon capture capability can help RNG developers solve what is now a critical path item - reliable, resilient, and low carbon power supply.

Introduction

Renewable natural gas (RNG) presents society with a unique opportunity to change the paradigm for waste. Utilizing waste to produce RNG creates a clean and reliable energy resource that is fully compatible with current infrastructure. RNG project development is, and will, play a significant role in the clean energy transition.

However, reliable and resilient power supply is increasingly becoming a critical path item for RNG project development and a risk to unlocking the full decarbonization potential of RNG. New intermittent resources present a challenge to aging grid infrastructure from managing generation capacity, transmission congestion and managing long and slow moving interconnection queues. Growing demand from the electrification of transportation, continued digital growth in data centers and Artificial Intelligence (AI) and from decarbonization technologies (renewable fuel production, carbon capture, H_2 production via electrolysis) present additional challenges. **Power availability at sufficient quantity and quality is no longer a given when developing RNG projects - it is now a critical path item driving project viability.**

Bloom's fuel cell technology **turns power supply from a critical path risk to a value creating opportunity**. Bloom's platform is deployed quickly and supplies reliable, resilient and low Carbon Intensity (CI) electricity and low CI heat through Combined Heat and Power (CHP) to accelerate RNG production and lower CI scores.

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Meeting Power Demands with a Complex Grid

The U.S. power grid is facing an unprecedented confluence of threats and challenges. Record demand, lack of supply, a failure to upgrade infrastructure, and rising rates jeopardize the grid's ability to serve customers. Moreover, all indications are that the underlying trends that have created this crisis will continue to worsen. Customers already feel these pain points, but it is only the beginning.

Supply Chain Logjam & Logistic Challenges.

Over **19 GW** of capacity planned to come online in 2022 was delayed

Interconnection Backlog

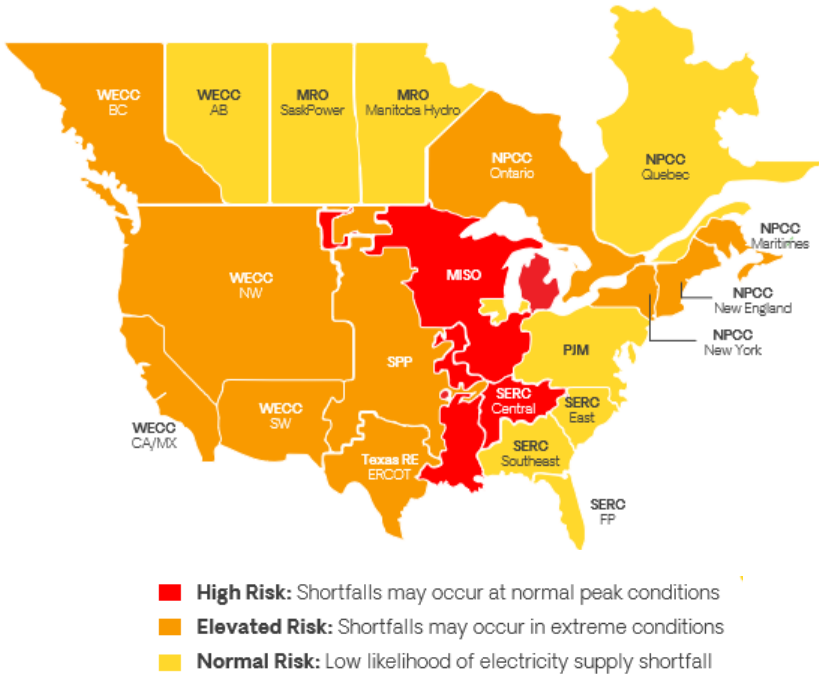
Less than **6%** of solar & wind capacity makes it through the interconnection queue

Power Plant Retirement

Coal-fired electricity generation in the USA declined from over **280 GW** in 2014 to **195 GW** in 2023 and is set to reduce to **~90 GW** by 2035

According to The North American Electric Reliability's (NERC) 2023 Long-Term Reliability Assessment, every states in the US is under some risk (high, elevated or normal) of insufficient electricity supply over the next five years[1] (2024-2028).

This complex issue is driven simultaneously by power plant retirements, supply chain logjams & logistics challenges, the variability and challenges to build out renewables, and Interconnection backlogs. Also, the demand growth from data centers, AI, transportation electrification, and other decarbonization technologies, such as carbon capture and electrolysis, exacerbate power generation, and weather-related issues drive this issue.



Expected electricity/power consumption trends in the US

EVs are expected to increase total electricity consumption by **8% to 13%**

In 2022, data center capacity is **5,319 MW**; By 2029, it is expected to be over **24,000 MW**

The median duration from interconnection request to acceptance has doubled from <2 years for projects built in 2000-2007 to nearly 4 years for those built in 2018-2022.

[1] NERC: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2023.pdf

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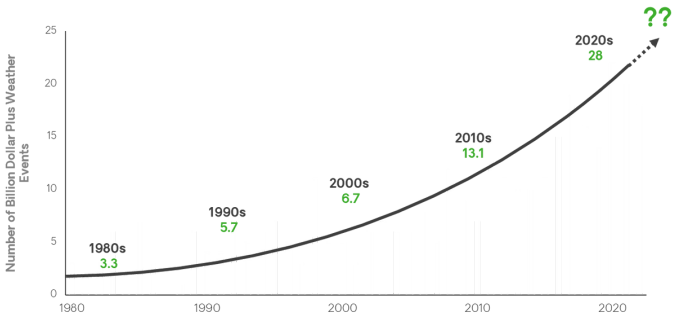
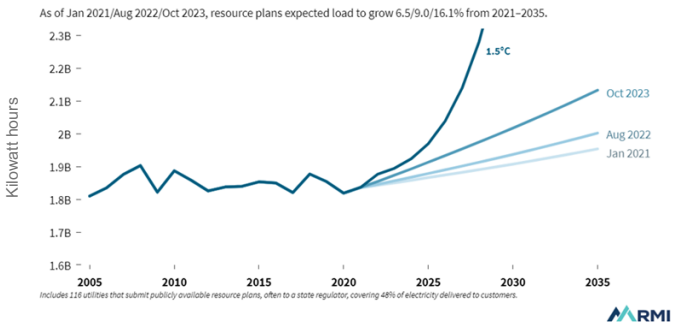
U.S. Billion Dollar (Inflation Adjusted) Weather Events by Year & Type, 1980 - 2023



Load Growth Will Dramatically Outpace Historical Growth



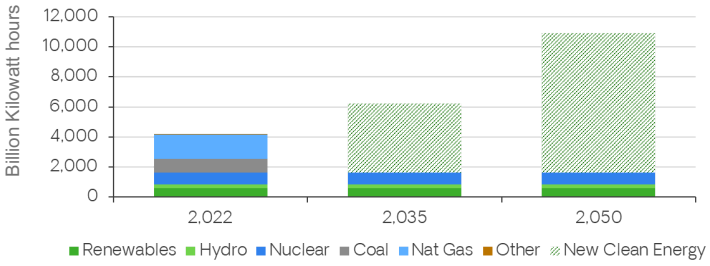
Frequency and duration of outages are increasing

Outages cost the economy **$150B** annually

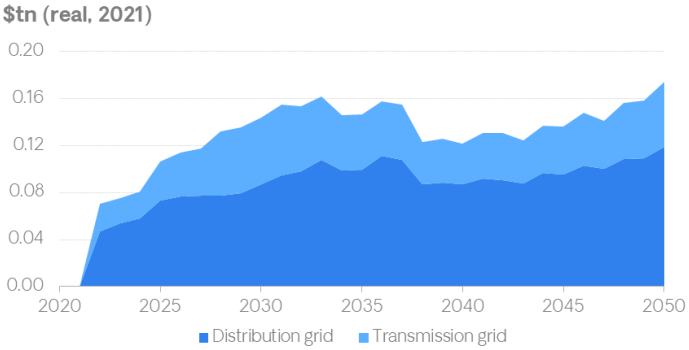
Grid Planners expects peak demand to grow **38 GW** through 2028

Forecasted Demand and Needed Generation[2]

US Forecasted Electricity Generation by Sources



Annual Investment in Grid Infrastructure for Net Zero



In addition to generation needs, grid deployment is also challenged. The U.S. Department of Energy's Grid Deployment Office (GDO) National Transmission Needs Study, 47,300 miles of new transmission lines will be required by 2035[3].

In 2021, expansion-related transmission capital expenditures by Investor-owned utility were forecast at **$9.2B** but declined to **$8.8B** for 2023

$3.9TN in Grid Infrastructure investment is needed from now till **2050**

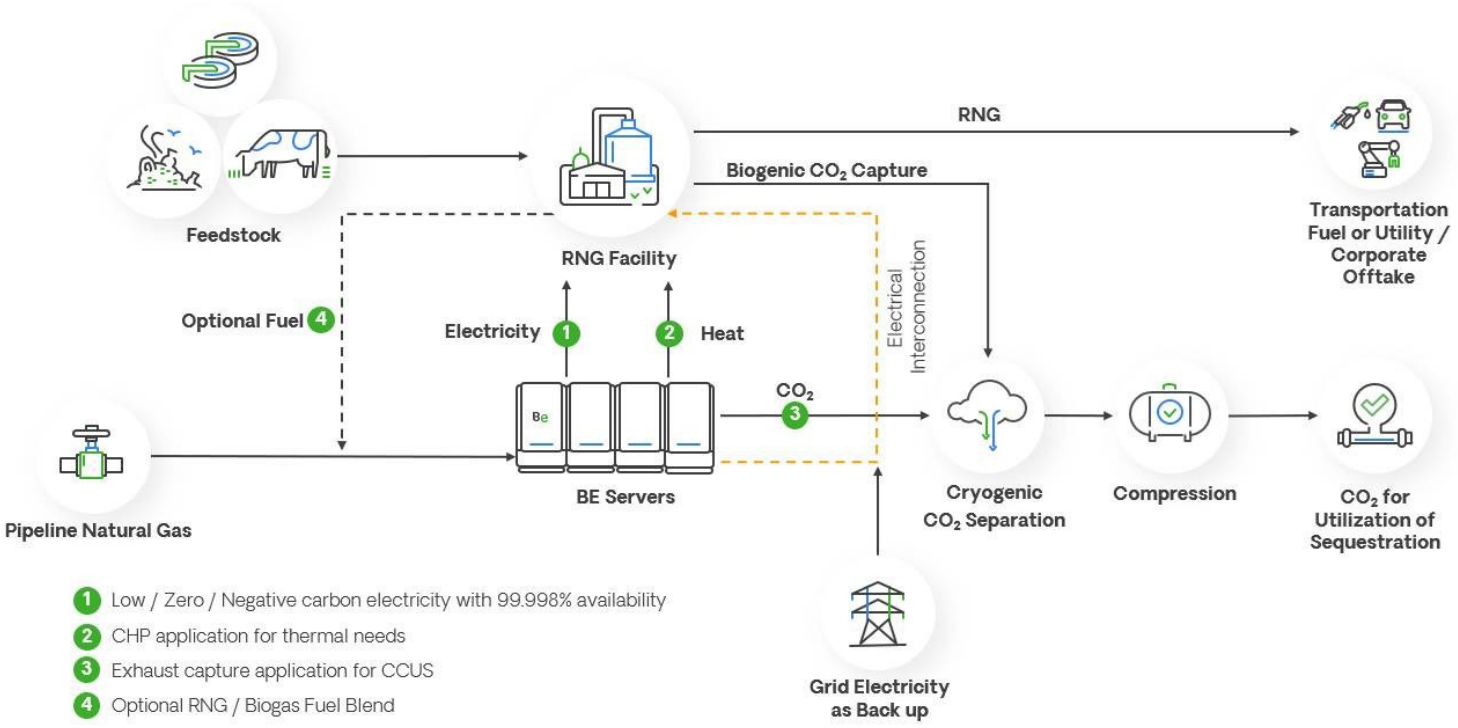
A cumulative capital expenditure of **$12TN** is required on clean energy in North America to meet 2050 net zero targets

With these macro headwinds, RNG project developers should not take grid power for granted and must turn to onsite reliable power solutions to meet project goals.

Transmission line projects take 7 years to be federally permitted.
In 2022, only 670 miles of transmission lines were completed.

[2] US EIA https://www.eia.gov/todayinenergy/detail.php?id=50818#:~:text=We%20expect%20U.S.%20utility%2Dscale,of%202021%20(6.9%20GW)
[3] https://www.utilitydive.com/news/doe-study-transmission-clean-nergy/646589/#:~:text=This%20appears%20unattainable%20when%20it,transmission%20were%20built%20in%202021

RNG Project Integration



Solving the Power Crunch & Lowering Carbon Intensity

Bloom's system can solve the power crunch, avoid costly utility upgrade fees, avoided utility electricity costs and avoid utility related project delays to allow an RNG project to achieve the earliest possible commercial operations date while simultaneously lowering CI scores and enhancing project returns.

Electricity from Bloom's system is not only more resilient and reliable, it also has a CI ~25% lower than the grid average[4]. When providing heat to the RNG facilities digester or biogas upgrading system, process energy CI savings are ~40% lower on average. Advantageous project CI scores are achieved when powered by a Bloom system.

Optimizing carbon monetization via CI score is becoming increasingly important as the average CI score in the CA LCFS program continues to decline and as a result of CI based incentives within the IRA, such as 45Z. Bloom's system allows the project to achieve an advantaged CI score and associated revenue.

RNG Growth Opportunities

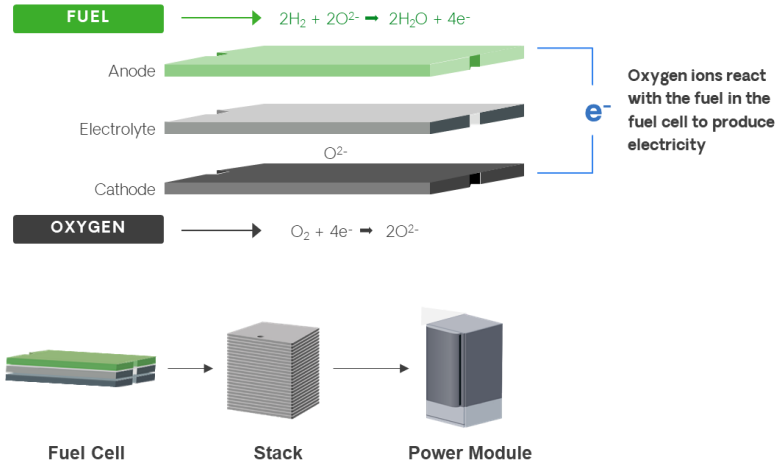
The high purity of CO_2 from the gas upgrading process means biogenic CO_2 capture is a growth area for RNG and an opportunity to further increase the decarbonization impact of the drop in fuel. At a macro level, carbon capture will also play an important role in achieving climate outcomes. However, carbon capture is power intensive and is one of the drivers that will compound the power crunch going forward.

[4] Grid average emissions taken from CA LCFS GREET Model

Bloom can play an important role for RNG projects in two ways with respect to carbon capture. One, power the biogas upgrading and CO_2 capture equipment with reliable, resilient and low carbon power in the face of constrained power supply from the conventional electric grid. Two, due to Bloom's non-combustion and electrochemical electricity generation technology the system emits a small amount of CO2 per kWh at a high CO_2 purity. This CO_2 can be combined with CO_2 from the biogas upgrading process and capture alongside it using proven and off the shelf technology creating a path to near zero carbon process electricity and heat (85% reduction in process energy CI) and additional carbon monetization in state level transportation markets (e.g. CA LCFS) and federal programs (e.g. 45Z and 45Q)

Bloom Technology Overview

The Bloom Energy Server uses solid oxide fuel cell (SOFC) technology that creates electricity out of oxygen and any hydrogen-based fuel. Bloom's system architecture can be configured to operate in parallel with the electricity grid, reducing or eliminating consumption from the grid, or configured to operate in a microgrid solution which adds the ability to power critical loads independent from grid operation,



Example Projects

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Conclusion

Bloom's architecture accelerates RNG production and commissioning by deploying distributed power generation to energize RNG projects materially faster than the centralized electricity grid. This enables RNG developers to maintain project schedules, maximize RNG production, minimize emissions, and accelerate cashflows.