Dairy Renewable Natural Gas: A Scalable Solution for Decarbonizing Steel Production

Introduction

Steelmaking is one of the world's most carbon-intensive industries. Traditional processes fueled by fossil natural gas generate significant Scope 1 emissions, creating both regulatory and reputational challenges for producers. To date, few scalable solutions have been available to reduce these emissions without costly infrastructure overhauls. Dairy renewable natural gas (RNG) offers an immediate, commercially viable pathway.

Produced through anaerobic digestion of manure, upgraded to pipeline quality, and injected into the U.S. gas grid, dairy RNG is chemically identical to fossil natural gas yet uniquely carbon negative. This makes it one of the few fuels capable of not just offsetting but reversing greenhouse gas (GHG) emissions.

The Case for Dairy RNG

Unlike fossil natural gas, which carries a carbon intensity (CI) of roughly +62 gCO_2e/MJ, dairy RNG has an average CI of about -250 gCO_2e/MJ. This negative score reflects the avoided methane emissions from manure lagoons, where methane is 28 times more potent than CO_2.

For steelmakers, this is transformative. One MMBtu of dairy RNG offsets emissions equivalent to almost four MMBtus of fossil gas. In practice, this means blending even a small percentage of dairy RNG into a steel plant's fuel supply can yield disproportionate carbon reductions, pushing the facility toward its net-zero goals faster and at lower cost.

Application in Steel Production

Consider a steel facility producing 500,000 tons of steel annually. It consumes nearly 1.9 million MMBtus of natural gas each year, resulting in more than 120,000 tons of CO_2e emissions.

Substituting just 2% of that gas with dairy RNG reduces emissions by 10%. Achieving the same reduction with landfill RNG would require blending nearly 30%. The cost impact is equally stark: dairy RNG achieves the reduction for ~$1.6 million in incremental energy spend per year, compared to more than $8 million with landfill RNG.

For an industry seeking practical decarbonization strategies that do not disrupt operations or require large capital retrofits, dairy RNG stands out as a cost-effective, high-impact solution.

Environmental Attribute Efficiency: Pipeline vs. Physical Delivery

A central advantage of RNG lies in how its environmental benefits are transferred. Unlike liquid fuels that must be physically consumed at the point of use, RNG is fully fungible with fossil gas. Once injected into the natural gas grid, its environmental attributes can be contractually allocated to end users through environmental attribute credits (EACs).

This displacement model provides clear benefits:

- **No infrastructure overhaul**: Steel facilities use existing burners, pipelines, and controls.
- **Operational reliability**: Gas is delivered as usual, without reliance on RNG producers for physical commodity.
- **Efficient carbon crediting**: EACs avoid the cost, complexity, and emissions of trucking RNG to facilities.

Importantly, the contractual use of EACs is conceptually like renewable energy certificates under **power purchase agreements (PPAs)** and **virtual PPAs (VPPAs)**, mechanisms already widely accepted in the steel industry for decarbonizing electricity. Just as PPAs and VPPAs enable claims of renewable electricity without direct delivery of electrons, RNG EACs enable auditable, market-recognized claims of carbon reductions from gas consumption.

This stands in contrast to systems requiring “physical delivery” of RNG. Truck transport adds cost, emissions, and operational complexity. Pipeline injection ensures steelmakers can claim reductions seamlessly, leveraging the highly integrated U.S. gas network.

Comparative Advantage of Dairy RNG

Not all RNG sources offer equal decarbonization benefits. RNG derived from landfills or wastewater typically has positive CI scores, meaning it reduces emissions but cannot deliver true neutrality. Dairy RNG is the only major RNG category that is carbon negative.

For steel producers, this yields three advantages:

1. **Lower blend requirements** – smaller volumes achieve targets.
2. **Reduced cost per ton of abatement** – dairy RNG delivers deeper reductions at lower incremental spend.
3. **Enhanced ESG positioning** – carbon-negative fuels differentiate producers in investor reporting and customer supply chains.

Scaling to Meet Industrial Demand

Novilla RNG is actively scaling to meet industrial demand. Across nine projects in the Midwest and Northeast, the company expects to produce nearly **1 million MMBtus annually** by 2026, with an average CI of -230. This output equates to almost **950,000 short tons of fully decarbonized steel each year**.

Projects such as **Three Petals (WI)**, **Red Leaf (MI)**, and **West Branch (IA)** are already injecting RNG into regional pipelines, with additional capacity from **Bellevue (VT)** and **Moccasin Creek (SD)** scheduled to come online by 2026. This growing supply base ensures dairy RNG can scale alongside industrial decarbonization commitments.

Conclusion

The decarbonization of steelmaking demands solutions that are immediate, scalable, and economically viable. Dairy RNG meets all three criteria. With a negative CI, it delivers carbon reductions more effectively and at lower cost than alternative RNG sources. Through pipeline injection and displacement, its environmental attributes are transferred seamlessly and like the way PPAs and VPPAs are already accepted in the industry for electricity decarbonization.