

How to Develop an RNG Project for Success

If you are considering a Renewable Natural Gas (RNG) project from your landfill gas (LFG), there are many factors to evaluate before proceeding with the development of your beneficial use project. This article explores some of the most critical factors, including:

1. State of the RNG Market, Industry, and Long-Term Outlook
2. Challenges of Upgrading Landfill Gas
3. Typical Business Model of RNG Projects
4. Success Factors of an LFG-to-RNG Project

Additionally, we will provide best practices for a successful RFP process. The financial opportunities in RNG, along with its environmental benefits, align with many communities' goals for participating in the circular economy.

#1: The State of the RNG Market, Industry, and Long-Term Outlook

The RNG market continues to experience exponential growth across various biomass sectors, including Municipal Solid Waste, Agricultural Waste, Wastewater, and Food Waste. The financial drivers behind this growth remain strong, with key metrics suggesting continued long-term stability. Municipal Solid Waste leads the RNG market in terms of volume due to the sheer quantity of biogas generated by landfills compared to other biomass sources. Currently, there are 123 operational landfill RNG facilities, 26 facilities under construction, and 7 planned projects, with dozens more in the RFP and due diligence phases.

Despite the vast potential of biogas from municipal solid waste facilities, much of it remains untapped. While the number of RNG facilities is increasing across North America, most of these projects are at digesters, which are typically smaller and widely distributed. Significant opportunities still exist, and a large portion of the market remains unexploited (Figure 1).

The U.S. Environmental Protection Agency (EPA) has set a long-term goal for the Renewable Identification Number

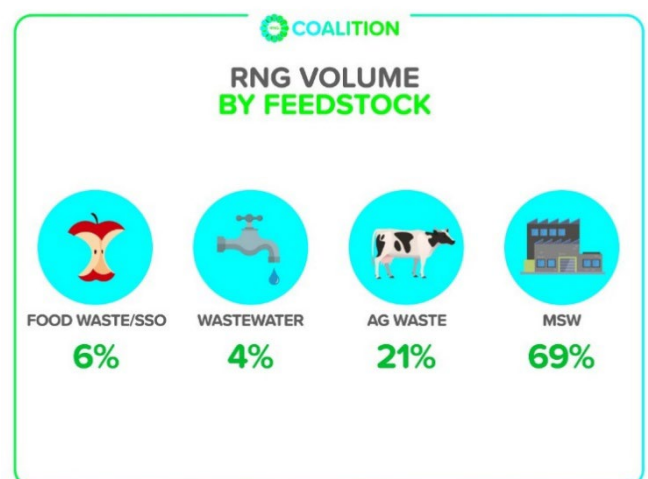


Figure 1: RNG Volume by Feedstock. Source: [Renewable Natural Gas Projects & Policy | RNG Coalition](#)

(RIN) value to be approximately \$2.50, moderated by volume obligations. At the time of this article, the RIN value is in line with this target. Industry analysts predict that voluntary markets, increasing volume obligations, and rising energy demand from growing industries such as data centers, could drive the long-term average above \$3.25 (Figure 2).

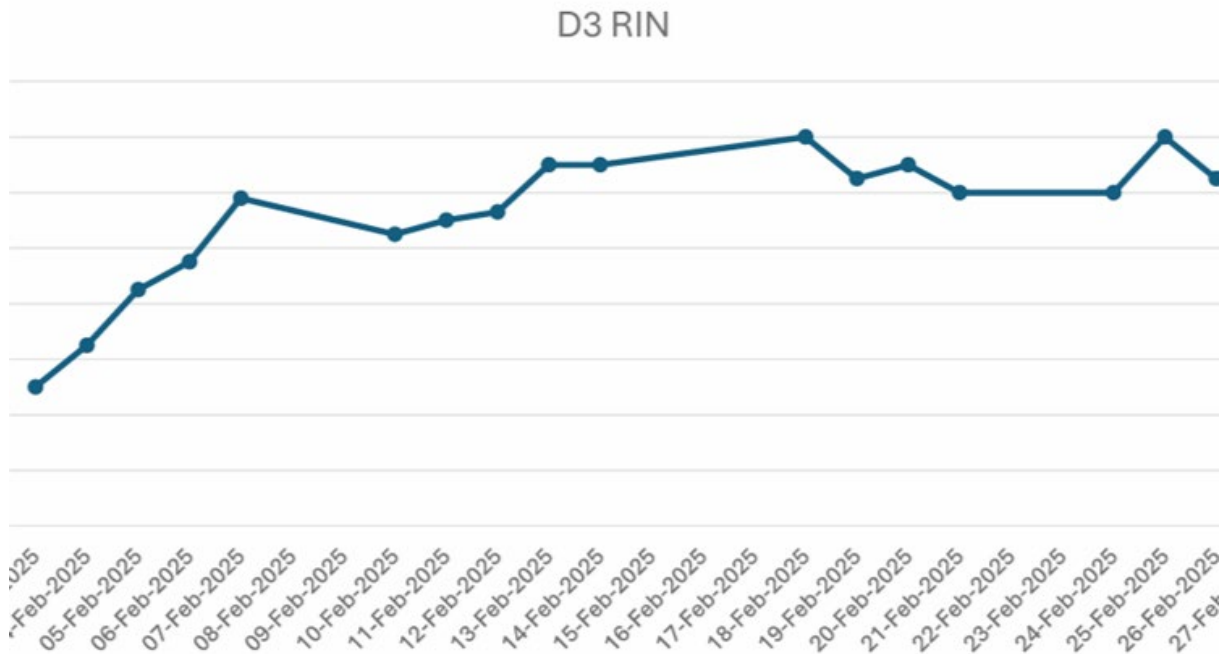


Figure 2 : D3 RIN. Source: [U.S. Environmental Protection Agency | US EPA](#)

#2: Challenges of Upgrading Landfill Gas

Developing an RNG project presents several challenges, but selecting the right technology and partners can help mitigate these issues. Key challenges include the following.

Permitting and Compliance

First and foremost, when considering a beneficial use project, landfill operations must be the priority over RNG operations. Regulatory requirements vary by state and region, but share common elements:

1. When landfill emissions exceed a certain threshold, the gas must be captured and treated to prevent environmental harm.
2. Minimizing community impact is essential, with odor being one of the most common concerns.

Some RNG technologies impose restrictions on landfill gas management and collection strategies, potentially causing emissions and odor issues. It is essential that the landfill management choose a technology that aligns with the landfill's operations and has gas processing standards compatible with the landfill's gas characteristics.

Stakeholder Engagement

RNG projects involve multiple stakeholders, including landfill operators, community members, pipeline operators, utility providers, permitting agencies, and technology providers. Clear communication and goal alignment among all parties are critical for ensuring project success.

Collaboration with Local Engineers

Engineering and permitting firms help RNG developers navigate regulatory requirements, particularly in regions with limited RNG experience.

Gas Collection Maximization

Landfill gas is both a pollutant and a valuable resource. Maximizing gas collection ensures regulatory compliance and financial viability. The selected technology should be capable of upgrading landfill gas regardless of its composition.

Processable Gas Standards

Understanding landfill gas composition is critical when selecting a technology. Common constraints include:

- Methane: Some developers contractual agreements require methane concentrations above 50%, yet many landfills gas composition averages only 40 to 50% methane.
- Nitrogen: Some technologies restrict nitrogen levels to 8%, while many landfills gas composition contain 12 to 18% nitrogen. These restrictions are due to technological limits in methane recovery rates as nitrogen concentrations increase in the landfill gas.

Strategies to manage gas that cannot be processed (flaring or selective wellfield tuning) can impact project economics and compliance.

Wellfield Maintenance and Operations

A well-maintained wellfield is crucial for RNG project success. Close collaboration between landfill operators and developers ensures optimal gas collection and system performance.

Pipeline Proximity and Specifications

RNG is injected into natural gas pipelines, making pipeline distance and interconnection costs key feasibility factors. Pipeline operators should be engaged early to validate project viability and define gas quality specifications.

Projecting Electricity Costs

Many RNG technologies require substantial electricity for operation. Since RNG projects typically operate for 20+ years, long-term utility cost projections should be factored into feasibility studies.

Pollution Abatement and Odor Management

RNG projects must complement, not compromise, landfill operations. Compliance and community relations should remain top priorities in project contracting and execution from both the landfill's and the RNG developer's standpoint.

#3: Typical Business Model of RNG Projects

Most RNG projects follow a public-private partnership model, where a landfill (public entity) collaborates with a private developer. Responsibilities are generally divided as follows:

The Landfill's Responsibilities

- Gas Collection and Control System (GCCS): Ensuring regulatory compliance while maintaining operational control. Some developers may request control of the GCCS which could lead to a conflict of interest for the landfill, if the priority is that of the RNG project versus the landfill's operational compliance.
- Permitting and Compliance: Adapting solid waste and air permits to accommodate the RNG project.

The Developer's Responsibilities

- Development: Managing engineering, permitting, and utility interconnections.
- Financing: Covering all capital and operational expenses.
- Manufacturing and Construction: Procuring and installing equipment.

- Operations and Maintenance: Ensuring uptime and performance guarantees.
- RNG Sales: Marketing the gas and environmental attributes effectively.

#4: Success Factors for an LFG-to-RNG Project

Landfill Predictability

Reliable landfill gas flow and quality data are essential for project success. The chosen technology should offer:

- Flexibility in gas quality acceptance
- Proven uptime and methane recovery rates
- Appropriate capital investment for project size

Gas Offtake and Distribution

Pipeline operators are critical partners. Their interconnection costs and gas quality requirements should align with project feasibility. Some pipeline operators may also purchase RNG as part of their sustainability commitments.

Best Practices for a Successful RFP Process

1. Consider issuing a Request for Qualifications (RFQ) first. This narrows the field to experienced developers.

2. Select developers with landfill-specific RNG expertise. Ensure they have successfully executed projects with similar gas quality and flow rates and is offering a technology that can upgrade the quantity and gas composition that matches the landfill gas in your landfill without imposing restrictions on GCCS management.

3. Request financial offers based on accurate landfill gas data. This should include detailed flow projections and pricing assumptions:

- o Current gas flows and future gas flows based on a specific percentage of increase year over year. Historical data should be used to create future gas flow predictions versus just a LandGEM. No matter what the model used is, it is recommended that the gas flows be quantified, and the financial offer should reflect them.
- o The RFP should specify the required gas quality, and financial offers should reflect both that quality and the expected quantity of RNG (in MMBtu) that will be recovered and sold as a result. It is recommended that a detailed calculation be requested for how this quantity is derived.

- o Market conditions for both environmental attributes and brown gas should be provided in the RFP. This will provide the evaluators with clear details for the financial basis of the offer.

4. Evaluate offtake strategies carefully. RNG sales strategies vary. Developers can use both fixed and floating sales strategies, as well as various percentages of each for the marketing of the environmental attributes. Currently the best value for RNG environmental attributes is to participate in the transportation market through the EPA's RFS. Alternative markets include voluntary thermal markets, state specific renewable procurement markets, and international emissions markets. These options can vary in risk profile and the landfill entity should be clear on their risk appetite and which markets they prefer the RNG be marketed to.

5. Obtain performance guarantees. These should include:

- o Commercial operation guarantees (date when gas injection begins)
- o Operational performance guarantees (minimum uptime requirements)

Conclusion

A well-executed RNG project provides significant environmental and economic benefits. By selecting the right partners, ensuring regulatory compliance, and following best practices, communities can maximize the advantages of turning landfill gas into a sustainable revenue stream.