



# Michigan Renewable Natural Gas Study

ANNOTATED REPORT OUTLINE

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**Submitted to:**  
Michigan Public Service  
Commission

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**Executive Summary**.....  
RNG Potential and Costs .....  
GHG Emission Reductions from RNG .....  
GHG Abatement Cost Comparison .....  
Opportunities and Barriers.....

**1. Introduction**.....  
Renewable Natural Gas .....  
Anaerobic Digestion.....  
Thermal Gasification.....

**Section 1 Notes:**

- This section will provide a brief introduction to renewable natural gas (RNG), and approaches to producing RNG from biomass-based feedstocks.

**2. RNG Feedstock Inventory (Theoretical Scenario)**.....  
RNG Feedstocks .....  
Inventory Methodology & Data Sources .....  
RNG: Anaerobic Digestion of Biogenic or Renewable Resources .....  
Animal Manure.....  
Food Waste .....  
Landfill Gas.....  
Water Resource Recovery Facilities .....  
RNG: Thermal Gasification of Biogenic or Renewable Resources .....  
Agricultural Residues.....  
Energy Crops.....  
Forestry and Forest Product Residues.....  
Municipal Solid Waste .....

**Section 2 Notes:**

- This section will identify the waste stream sources and feedstocks for RNG, and estimate the RNG supply that captures the potential for each feedstock in Michigan.
- The section will be clearly structured around the two main production technologies and eight biomass-based feedstocks, and will provide background detail on data sources and methodology.
- The section will outline the maximum theoretical scenario for RNG potential in Michigan, split out by feedstock and sub-state geographies (10 Michigan Prosperity Regions). No constraints or limitations will be applied to the theoretical scenario, and will represent a complete inventory of RNG feedstocks.

**3. RNG Supply Scenarios** .....  
Supply Scenario Methodology .....  
Summary of RNG Potential by Scenario.....  
Theoretical Scenario.....  
Feasible Scenario.....  
Achievable Scenario.....  
RNG: Anaerobic Digestion of Biogenic or Renewable Resources .....



Animal Manure.....

Food Waste .....

Landfill Gas.....

Water Resource Recovery Facilities .....

RNG: Thermal Gasification of Biogenic or Renewable Resources .....

    Agricultural Residues.....

    Energy Crops.....

    Forestry and Forest Product Residues.....

    Municipal Solid Waste .....

**Section 3 Notes:**

- This section will show the results for two supply scenarios: Achievable and Feasible. Results will be presented by feedstock, time and geography.
- These scenarios will be based on an assessment of resource availability, with different constraints and limitations applied to the scenarios.
- The Achievable scenario will represent a lower level of feedstock utilization, while the Feasible scenario will apply more optimistic assumptions around feedstock utilization, although still capturing a relatively low proportion of the overall theoretical maximum.

**4. Cost Assessment .....**

Cost Methodology .....

RNG from Anaerobic Digestion.....

    Animal Manure.....

    Food Waste .....

    Landfill Gas.....

    Water Resource Recovery Facilities .....

RNG from Thermal Gasification.....

Combined Supply-Cost Curve.....

**Section 4 Notes:**

- This section will show the results for the production cost assessment for RNG in Michigan, based on operational costs and capital expenditures across the available feedstocks.
- RNG production costs will be shown in \$/MMBtu, and characterized based on a series of assumptions regarding the production facility sizes, gas upgrading and conditioning and upgrading costs, compression, and interconnect for pipeline injection.

**5. GHG Emission Reductions and Cost-Effectiveness .....**

RNG and Decarbonization .....

GHG Accounting Framework and Methodology .....

    RNG and GHG Accounting.....

Scenario GHG Emission Reductions.....

RNG Abatement Cost-Effectiveness.....

GHG Abatement Cost Comparison.....

    Emission Reduction Measures.....

**Section 5 Notes:**

- This section will estimate the GHG emission reductions (in metric tons of carbon dioxide equivalent, tCO<sub>2</sub>e) for each production potential scenario outlined in Section 3.
- Using the emission reduction potential and production costs outlined in Section 4, this section will present range of abatement costs for RNG (in \$/tCO<sub>2</sub>e), differentiated by feedstock.
- These RNG abatements costs will be compared to the abatement costs of other emission reduction strategies, including renewable hydrogen, building electrification, renewable electricity generation and transportation electrification. The abatement cost estimates for abatement measures used in the comparison will be sourced from existing research, studies and sources.
- The section will also include a discussion of RNG in the context of decarbonization strategies, GHG accounting methodologies, and different accounting approaches relevant to RNG.

**6. Opportunities and Barriers .....**

Review of RNG End-Use Markets.....

- Electricity Generation .....
- Transportation.....
- RFS Program and RIN Prices .....
- California LCFS Program and Credit Prices .....
- RNG Consumption in Transportation .....

Pipeline (Stationary) .....

Interconnection and Gas Quality .....

Opportunities and Barriers .....

- Environmental Impacts .....
- Equity and Environmental Justice Impacts .....
- Condition and Interconnection Tariffs.....
- Voluntary and Mandatory Programs.....
- Renewable Gas Standard (RGS) .....
- Complementary Measures .....

**Section 6 Notes:**

- This section will identify and discuss opportunities and barriers associated with RNG production and deployment in Michigan, including the environmental impacts of RNG production facilities, equity and environmental justice impacts (e.g., as they relate to disadvantaged populations and rural communities) related to RNG facilities, the role of gas quality and interconnection requirements, and existing regulatory frameworks.
- Opportunities and barriers will be structured around three areas: technical, market and regulatory.
- The section will include an economic forecast of relevant programs, such as the Federal RFS, and state-based low carbon fuel standards in California and Oregon.

**Appendix .....**