

**BLACK HILLS ENERGY BIOMETHANE SPECIFICATIONS**  
**GENERAL TERMS AND CONDITIONS FOR QUALITY,**  
**CONSTITUENT TESTING AND PROCEDURES**

1) DEFINITIONS

- a) **BIOGAS:** Biogas refers to gas that is produced from the anaerobic decomposition of organic material. Biogas can be produced by a landfill gas management facility, waste water treatment plant, anaerobic digester, or by other methods and sources. Biogas is a mixture of methane, carbon dioxide, and other constituents, and must be conditioned into Biomethane prior to receipt into the natural gas pipeline system.
- b) **BIOMETHANE:** Biomethane refers to biogas that has been conditioned and conforms to the specifications contained herein for injection into a common carrier pipeline. Biomethane must be free from bacteria, pathogens and any other substance injurious to utility facilities, or other constituents that would cause the gas to be unmarketable. Biomethane must conform to all other tariffs and standard utility operating practices and guidelines.
- c) **BRITISH THERMAL UNIT (Btu):** The standard unit for measuring a quantity of thermal energy.
- d) **Ccf:** The standard unit for a volume of gas equivalent to one hundred cubic feet of gas under Standard Conditions.
- e) **CONSTITUENT:** A chemical or compound that may impact the merchantability of gas.
- f) **DEKATHERM (Dth):** Means one million (1,000,000) British Thermal Units.
- g) **DELIVERY POINT(S):** The point(s) on Black Hills Energy's pipeline system where Black Hills Energy delivers natural gas that it has transported to the Customer.
- h) **GRAIN:** The standard unit of weight equivalent to one seven-thousandth of one pound.
- i) **HAZARDOUS WASTE LANDFILL:** All contiguous land and structures, and other appurtenances and improvements, on the land used for the treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous waste. The facility may consist of one or more treatment, transfer, storage, resource recovery, disposal, or recycling hazardous waste management units, or combinations of these units.
- j) **Mcf:** The standard unit for a volume of gas equivalent to one thousand cubic feet of gas under Standard Conditions.
- k) **MMcf:** The standard unit for a volume of gas equivalent to one million cubic feet of gas under Standard Conditions.

- l) PPB (Parts per Billion): Standard unit for the concentration of a gas constituent relative to one billion parts.
- m) PPM (Parts per Million): Standard unit for the concentration of a gas constituent relative to one million parts.
- n) RECEIPT POINT(S): The place(s) where Customer delivers, or has delivered on its behalf, natural gas into the Black Hills Energy pipeline system.
- o) RENEWABLE NATURAL GAS: Renewable Natural Gas (RNG) refers to Biomethane.
- p) SHUT-IN: The action of not allowing the Supplier to inject Biomethane into the Black Hills Energy pipeline system.
- q) STANDARD CONDITIONS: Conditions of temperature and pressure that are used as a basis for volumetric measurement of a gas equivalent to 60 degrees Fahrenheit and 14.73 PSIA.
- r) BIOMETHANE SUPPLIER (SUPPLIER): A producer of Biomethane seeking to deliver gas to the Black Hills Energy pipeline system.
- s) TESTING ACTION LEVELS:
  - i) Lower Action Level: The Lower Action Level is used to screen Biomethane during testing.
  - ii) Upper Action Level: The Upper Action Level establishes the point at which an immediate shut-off of the Biomethane supply occurs.
- t) THERM means one hundred thousand (100,000) British Thermal Units

## 2) QUALITY OF GAS

- a) Gas delivered to Black Hills Energy for transportation to the Delivery Point(s) shall conform to the following Quality specifications:
  - i) Carbon dioxide: The gas shall contain no more than two percent by volume of carbon dioxide.
  - ii) Oxygen: The gas shall contain no more than 0.2 percent by volume of oxygen.
  - iii) Hydrogen sulfide: The gas shall contain no more than 0.25 grains of hydrogen sulfide, measured as hydrogen sulfide, per one hundred standard cubic feet.
  - iv) Total Sulphur: The gas shall contain no more than 20 grains of total sulfur, measured as sulfur, per one hundred standard cubic feet.

v) Water vapor: The gas shall contain no more than six pounds of water vapor per million standard cubic feet.

vi) Hydrocarbon dew point: The gas shall have a hydrocarbon dew point of no more than minus 40 degrees Fahrenheit.

vii) Liquids: The gas shall contain no liquids at, or immediately downstream of, 3 the Receipt Point(s).

viii) Merchantability: The gas shall not contain objectionable odors, solid matter, dust, gums and gum-forming constituents, biologicals, heavy metals, or any other substance which might interfere with the marketability of the gas, or cause injury to or interference with proper operation of the lines, meters, regulators, or other appliances through which it flows.

ix) Temperature: The gas shall not be delivered at more than 120 degrees Fahrenheit.

x) Gas interchangeability: The gas shall be interchangeable with the gas in the receiving pipeline. Interchangeability shall be determined in accordance with the methods and limits presented in Bulletin 36 of the American Gas Association (AGA).

xi) Heating value: The gas shall have a heating value of greater than or equal to 950 Btu per standard cubic foot.

xii) Any other gas quality standard approved by the American Gas Association (AGA) and adopted by Black Hills Energy as part of its gas quality requirements, including Wobbe Index, now or as may be changed from time to time in the future.

xiii) Any other industry standard approved and adopted by Black Hills Energy as part of its gas quality requirements, now or as may be changed from time to time in the future.

b) The Biomethane shall be tested for the Quality specifications at the interconnection.

i) Black Hills Energy will determine the testing requirements, frequency of the testing, and equipment used for testing the Biomethane.

(1) Appendix A contains the limits, testing methods and frequency of testing as currently adopted by Black Hills Energy.

ii) Black Hills Energy reserves the right to approve and adopt other gas quality testing requirements, testing methods, frequency of testing, and testing equipment, now or as may be changed from time to time in the future.

c) Black Hills Energy reserves the right to Shut-In a Supplier whose Biomethane repeatedly violates the Quality specifications until such time Supplier can provide evidence that the Biomethane consistently meets the Quality specifications.

d) Black Hills Energy will not accept Biomethane from a hazardous waste landfill.

### 3) TESTING

a) Testing requirements may be modified according to the source feedstock and shall be by methods approved by Black Hills Energy.

b) Responsibility for Testing 4

i) Any testing involving an outside laboratory will be performed by the Supplier using independent certified third party laboratories, and results will be shared with Black Hills Energy.

ii) Black Hills Energy will conduct continuous real-time testing on the Biomethane.

(1) Black Hills Energy will be responsible for operating, maintaining, calibrating and replacing the equipment used for continuous real-time testing the Biomethane that is injected into Black Hills Energy's pipeline.

(2) The results of Black Hills Energy continuous real-time testing will not be shared with the Supplier for the purpose of process control.

c) Pre-Injection Testing Procedure

i) Supplier will conduct testing on the Biomethane for all Constituents listed in Appendix A. These gas quality tests will be performed using independent certified third party laboratories, and results shared with Black Hills Energy.

ii) If during the pre-injection testing, all Constituents listed in Appendix A are below the Lower Action Level, the Biomethane may be injected into the pipeline subject to the Biomethane Start-up Procedure and Periodic Testing.

(1) The Supplier shall make necessary modifications to lower any Constituent concentration at or above the Lower Action Level and restart pre-injection testing.

d) Periodic Testing

i) Supplier will conduct periodic testing on the Biomethane for all Constituents listed in Appendix A. These gas quality tests will be performed per the indicated frequency and by an independent certified third party laboratory, and results will be shared with Black Hills Energy.

(1) The Supplier shall make necessary modifications to lower any Constituent concentration at or above the Lower Action Level and restart the testing.

### 4) BIOMETHANE START-UP PROCEDURE

- a) The Biomethane start-up shall be scheduled with Black Hills Energy.
  - i) Black Hills Energy Load Control and Engineering shall be notified at least forty-eight (48) hours prior to injection of the Biomethane into the pipeline.
- b) The Supplier shall have performed pre-injection testing no more than 30 days prior to start-up.
- c) Black Hills Energy will conduct continuous real-time testing on the Biomethane. All Quality specifications shall be below the Lower Action Limit for a minimum of two (2) readings or ten (10) minutes prior to injection of the Biomethane into the pipeline.

## 5) SHUT-IN

- a) Black Hills Energy will conduct continuous real-time testing on the Biomethane.
- b) If any Constituent concentration that is tested on a continuous basis is at or above the Lower Action Level during two (2) subsequent tests or for five (5) minutes, the Biomethane shall be Shut-In and injection into the pipeline refused.
- c) If any Constituent concentration that is tested on a monthly basis is at or above the Lower Action Level, the monthly test shall be repeated. If any Constituent concentration continues to be at or above the Lower Action Level, the Biomethane shall be Shut-In and injection into the pipeline refused.
- d) If any Constituent concentration is at or above the Upper Action Level, the Biomethane shall be immediately Shut-In and injection into the pipeline refused.
- e) Notification
  - i) If Shut-In occurs as a result of Black Hills Energy testing, Supplier shall be immediately notified by Black Hills Energy.
  - ii) If Shut-In occurs as a result of Supplier testing, Black Hills Energy Load Control and Engineering shall be immediately notified by Supplier.

## 6) BIOMETHANE RESTART

- a) If Shut-In of the Biomethane was caused by Constituent concentration that is tested on a continuous basis being at or above the Lower Action Level:
  - i) The Supplier shall make necessary modifications to lower any Constituent concentration at or above the Lower Action Level.
  - ii) The Quality specifications must be below the Lower Action Limit for two (2) subsequent tests or a minimum of ten (10) minutes before Biomethane injection into the Black Hills Energy pipeline system will be allowed to resume.

b) If Shut-In of the Biomethane was caused by Constituent concentration that is tested on a monthly basis being at or above the Lower Action Level:

i) The Supplier shall make necessary modifications to lower any Constituent concentration at or above the Lower Action Level.

ii) The Quality specifications must be below the Lower Action Limit before Biomethane injection into the Black Hills Energy pipeline system will be allowed to resume.

c) If Shut-In of the Biomethane was caused by any other issue not related to the Quality specifications:

i) The Constituent concentration that is tested on a continuous basis must be below the Lower Action Level before Biomethane injection into the Black Hills Energy pipeline system will be allowed to resume; and

ii) The Constituent concentration that is tested on a monthly basis must be below the Lower Action Level before Biomethane injection into the Black Hills Energy pipeline system will be allowed to resume

**APPENDIX A  
GAS CONSTITUENTS, ACTION LEVELS, AND TESTING METHODS AND FREQUENCY**

Constituent	Lower Action Level	Upper Action Level	Test method	Frequency*
Carbon dioxide	2%	2.50%	On-site analytical instrument/laboratory testing	Continuous
Oxygen	0.2%	0.30%	On-site analytical instrument/laboratory testing	Continuous
Hydrogen sulfide	0.25 grains/Ccf	0.31 grains/Ccf	On-site analytical instrument	Continuous
Total Sulphur	20 grains/Ccf	25 grains/Ccf	Laboratory testing per ASTM D-5504	Continuous/monthly
Water vapor	6 Lb./MMcf	8 Lb./MMcf	On-site analytical instrument/laboratory testing	Continuous
Hydrocarbon dew point	-40 F	-20 F	Calculation based on-site analytical instrument	Monthly
Liquids	None	None	Observation at the filter separator	Monthly
Temperature	120F Max	130F Max	On-site temperature sensor	Continuous
Heating value	950 Btu/cf min	940 Btu/cf min	On-site analytical instrument/laboratory testing	Continuous
Non Methane VOC's	50 PPM	75 PPM	Laboratory testing per EPA TO-15	Monthly
Total Siloxanes:	1 PPM	2 PPM	Speciated siloxane analysis for: Trimethylsilanol, TMS Hexamethyldisiloxane, L2 Octamethyltrisiloxane, L3 Decamethyltetrasiloxane, L4 Dodecamethylpentasiloxane, L5 Hexamethylcyclotrisiloxane, D3 Octamethylcyclotetrasiloxane, D4 Decamethylcyclopentasiloxane, D5 Dodecamethylcyclohexasiloxane, D6	Monthly

\* Monthly testing must be performed each calendar month and not to exceed forty (40) days between tests.