Biomethane Quality Standard

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This document represents the collective perspective of the four local gas distribution companies (LDCs) that serve Washington State including Avista Utilities, Cascade Natural Gas Corp., NW Natural and Puget Sound Energy.

Williams NW Pipeline and TC Energy GTN System contributed to the development of this framework. They acknowledge that the LDCs are subject to a different regulator and confront different operating circumstances than interstate pipelines and therefore may require different quality standards.

1. Scope: This Standard applies to biomethane intended for receipt by Local Distribution Companies within the State of Washington.

2. Definitions
   - 2.1. Biogas: untreated gas produced from the anaerobic digestion of organic material.
   - 2.2. Biomethane: cleaned and conditioned biogas that meets the gas quality specifications identified in this document and is interchangeable with natural gas; a type of Renewable Natural Gas (RNG).
   - 2.3. Receipt Point Facilities: all components required to receive Biomethane from the Producer's facility.

3. All Biomethane delivered to (i.e., received by) the natural gas company ("Company") by the producer of the Biomethane ("Producer") shall conform to the applicable gas quality specifications set forth in this Biomethane Quality Standard ("Standard"). Quality monitoring will be divided into two categories consisting of Continuous Monitoring and Periodic Sampling.

4. Continuous Monitoring. Gas monitoring equipment including but not limited to gas chromatographs and all related equipment, applicable communications facilities and associated software will be installed, operated, and maintained to monitor each parameter listed in Table 1. Each parameter listed in Table 1 will be measured, calculated, evaluated, and enforced either on a continuous basis, or at a frequency based on the normal cycling time of the applicable instrument(s).
   - 4.1. The Company shall decide whether the gas monitoring equipment will be installed, operated and maintained by the Company or by the Producer.
   - 4.2. The responsible party (as determined by the Company per Section 4.1) will measure, calculate and evaluate the gas to determine, either on a continuous basis or at a frequency based on the normal cycling time of the applicable instrument, whether it meets the specification listed in Table 1.
   - 4.3. If it is the responsible party (as determined by the Company per Section 4.1), the Producer will be responsible to prevent biomethane that does not meet the

specifications in Table 1 from being delivered to the Receipt Point Facilities using controls that automatically respond to the monitoring equipment.

4.4. The Company may require specific gravity measurements at its discretion.

4.5. Continuous Monitoring will begin at startup and commissioning of the Receipt Point Facilities and will continue until permanent disconnection of the Receipt Point.

4.6. If the Producer is the Responsible party as identified in Section 4.1, the Company will determine the conditions and parameters for monitoring under which it will accept gas for delivery.

4.7. If the Company is the responsible party as identified in Section 4.1, or if there are multiple gas quality monitoring devices providing information for the same constituents, the Producer will accept the measurements provided by the Company's gas monitoring equipment for the purpose of distinguishing between biomethane that does and does not meet the specifications listed in Table 1.

4.8. The Company may utilize data generated from the Producer's on-line gas quality monitoring equipment to decide whether to accept delivery in the case the Company's data is unavailable, under the following conditions:

4.8.1. The Producer's monitoring data is shared with the Company and transmitted real time to the Company continuously, and

4.8.2. The Company verifies that data from the Producer's equipment has accuracy and measurement frequency equivalent to the Company's equipment.

Table 1 Gas Quality Specification

Parameter	Value	
	Min	Max
Heating Value (BTU[a]/SCF[b])	985	*
Wobbe Number (BTU/SCF)	1290	*
Temperature (°F)	35	100
Carbon Dioxide (%)		2
Nitrogen (%)		2**
Total Inerts[c] + Oxygen (%)		3**
Oxygen (%)		0.20[f]
Hydrogen Sulfide (grain/CCF[d])		0.25
Total Sulfur (grain/CCF)		5
Moisture (lb/MMSCF[e])		7
Hydrocarbon Dew Point (°F) at delivery pressure.		15

Notes:
* The Company may establish maximum heating and Wobbe number values if biomethane is enriched with other hydrocarbons.
** The Company may establish higher nitrogen and/or total inert levels at its discretion.
a. BTU – British Thermal Units
b. SCF – Standard Cubic Feet
c. Inerts – Nonhydrocarbon gases including, but not limited to, carbon dioxide, nitrogen, and oxygen
d. CCF – 100 Standard Cubic Feet
e. MMSCF – One Million Standard Cubic Feet
f. All parties agree to exercise every reasonable effort to keep the gas completely free of oxygen

5. Periodic Sampling. The Producer shall procure and furnish all materials, equipment, supplies, services, and labor required to test the Biomethane for the constituents identified in Table 2.

5.1. Samples will be extracted, sealed, and transported by the Producer, using established and customary sampling procedures, and sent for analysis to an independent certified third-party laboratory with accreditation by the Washington State Department of Ecology ("ELAP certified") for the applicable analyte and method. The costs for Period Sampling and analysis shall be borne by the Producer.

5.1.1. The Company may require the Producer to submit a sampling plan for review and approval. If the Company requires a sampling plan, it will also determine the details to be included in said plan.

5.1.2. The independent certified third-party laboratory must be approved by the Company in writing in advance of sample collection.

5.2. The Producer shall provide the Company with a minimum of five (5) business days' advance notice of the Biomethane sampling and the Company shall have the option to have a representative present to observe the samples being taken.

5.3. Periodic Sampling frequency will be weekly (once every seven calendar days, not to exceed twelve days) during start-up and commissioning, lasting a minimum of four weeks. Once regular operation commences, the sampling frequency will be established at the discretion of the Company.

5.4. If a constituent measures above the Allowable Level as listed in Table 2, the Biomethane may not be accepted, subject to the sole discretion of the Company.

5.5. The Company may, at its discretion, modify the Periodic Sampling frequency as necessary to ensure the constituent levels are not injurious to pipeline facilities, or present a health and/or safety hazard to employees and/or the general public. The Company will provide written notification of modifications of the testing frequency a minimum of thirty (30) calendar-days prior to the effective date.

Table 2 – Constituents for Periodic Sampling

(Acceptance criteria will be the lower of listed values or other tariff requirements)

Constituent	Allowable Level mg/m^3 (ppm_v)	Landfill	Dairies	POTW[b]
Health Protective Constituents – Carcinogenic				
Arsenic	0.48 (0.15)	X		
P-Dichlorobenzene	140 (24)	X		X
Ethylbenzene	650 (150)	X	X	X
n-Nitroso-di-n-propylamine	0.81 (0.15)	X	X	
Vinyl Chloride	21 (8.3)	X		X
Health Protective Constituents – Non-Carcinogenic				
Antimony	30 (6.1)	X		
Copper	3.0 (1.2)	X		
Lead	3.8 (0.44)	X		
Methacrolein	53 (18)	X		
Mercaptans (Alkyl Thiols)	N/A (610)	X	X	X
Toluene	45,000 (12,000)	X	X	X
Pipeline Integrity Protective Constituents [d,e]				
Ammonia	5 grains/CCF (10)	X	X	X
Biologicals	$4x10^4$ / SCF[f]	X	X	X
Hydrogen	0.10%	X	X	X
Mercury	0.08 ug/m^3	X	X	X
Siloxanes	0.1 mg Si/m^3	X		X

Notes:

a. The first number is in milligrams per cubic meter of air (mg/m^3), while the second number in parenthesis is in parts per million volume (ppm_v), unless otherwise specified

b. Publicly Owned Treatment Works

c. qPCR per Acid-producing Bacteria (APB), Sulfate-reducing Bacteria (SRB), Iron-oxidizing Bacteria (IOB), group and commercially free of bacteria > 0.2 microns

6. The Biomethane shall also have the following qualitative measures:

   6.1. The Biomethane shall be commercially free from foreign odors, solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended merchantability of the Biomethane or the Company's ability to properly odorize, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.

   6.2. Toxic or Hazardous Substance: The Biomethane shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the Biomethane, may be hazardous to health, injurious to pipeline facilities, limit merchantability, or be contrary to applicable government standards.

   6.3. Biologicals: The Biomethane, including any associated liquids, shall not contain microbiological organisms, active bacteria or bacterial agents at levels that are higher than the natural gas in the LDC System and that are capable of causing or contributing to injury to the Company's pipelines, meters, regulators, or other facilities and appliances through which such Biomethane flows, or interference with the proper operation of the Company's facilities.

7. The Company may require certain monitoring equipment and interval requirements where additional measures are necessary to provide reliable service in a safe environment.

8. The Company and the Producer agree to share information related to any testing of the Biomethane quality with each other no more than five (5) business days from the date of receipt from the laboratory, including, but not limited to, the constituent(s) measured, the date of the sample, the date of the analysis, the sampling methodology, the sampling equipment, detection and/or reportable limits, the sample test results, and QC test results.

   8.1. Any testing results that identify a constituent is measured above the Allowable Level must be shared immediately upon receipt of results by calling the Company.

9. Discretionary Testing. The Company may request discretionary testing at any time with reasonable advance notice if the Company has a specific concern with the gas quality plan or sampling results. The cost of such testing will be borne by the Producer if such testing demonstrates that the contaminant of special concern exists in concentrations above acceptable limits. If, after such testing, no such contaminants are found, or the contaminants are determined to exist in acceptable concentrations, then the cost of testing shall be borne by the Company.

10. The Producer will provide sixty (60) day notice to the Company if there will be (i) feedstock used in the processing other than the types described in items (1) and (2) of the definition of "renewable biomass" in 40 CFR 80.1401, (ii) a change in feedstock from what has historically been used in the Producer's biomethane production process, or (iii) a change in the facilities owned by the Producer (including but not limited to the conditioning or cleanup equipment) that could increase the level of any constituent over

the previously measured levels, but replacing a component with a functionally-equivalent component does not constitute a "change" for purposes of this item.

10.1. As a result of any of the changes identified in 10 above, The Company may direct the Producer to complete one round of Periodic Sampling for the constituents identified in Table 2 before resuming Biomethane deliveries.

11. The Company may make changes to this Biomethane Quality Specification in its sole discretion based on: (a) the gas specifications listed in the applicable Gas Tariff; (b) recommendations by the American Gas Association (AGA) or the Gas Technology Institute (GTI) or other reputable sources; (c) the resulting gas flows on the pipeline system are not meeting the specified gas quality standard; (d) documented changes to gas pipeline system operating conditions; (e) to meet new or revised generally accepted natural gas utility practices regarding quality or testing; (f) or as ordered by the Oregon Public Utility Commission ("OPUC"), the Washington Utility and Transportation Commission ("WUTC"), the Pipeline and Hazardous Materials Safety Administration ("PHMSA"), or another regulatory body having authority in the matter. The Company will provide the Producer the reason for these changes and will require Biomethane that meets the modified quality specifications within six (6) months of the date the Producer is notified of the modifications, unless an imminent health or safety concern exists, an equipment integrity hazard is detected, or otherwise required by a governing agency. In the event the Biomethane Quality Specification and/or Tables 1 and/or 2 are modified by the Company and additional equipment is required to ensure the Biomethane meets the quality specifications, the Producer will purchase and install the additional equipment at the Producer's expense

11.1. If modifications to the facilities owned by the Producer will take longer than six (6) months to complete due to equipment procurement times or an equivalent challenge, the Company shall determine, in its sole discretion, an alternative effective date to meet the modified quality specifications.