

Bloom Energy Server

Natural Gas Specification

This gas specification must be used for proper Energy Server contracting and operation

Specifications

Hydrocarbon Composition	Limit (mol %)
Methane (CH ₄)	Min 85
Ethylene (C ₂ H ₄)	Max 0.5
Ethane (C ₂ H ₆)	Max 12
Propylene (C ₃ H ₆)	Max 0.125
Propane (C ₃ H ₈)	Max 3.4
iButane + nButane (C ₄ H ₁₀)	Max 2.0
Sum of C ₅₊	Max 0.2

Notes:

- Note that not all the hydrocarbons can be at the upper limit simultaneously.
- Composition transients within the above specification ranges shall change at less than 1% per hour.
- Composition lab data collected shall be per EPA 3C.
- Customer is expected to provide the hydrocarbon composition during contracting.

Contaminant	Limit
Siloxanes	< 0.12 mg/m ³
Arsenic (AsH ₃ &/or As)	< 0.05 ppmV
Halogens (CH ₃ Cl, HCl, etc.)	< 0.28 µg/m ³
Mercury	< 2.0 ppmV
Cadmium	< 2.0 ppmV
Zinc	< 2.0 ppmV
Ammonia	< 40 ppmV
Phosphorous/PH ₃	< 2.0 ppmV
Sodium	< 2.0 ppmV

Sulfur Species	Average (ppbV)	Maximum (ppbV) ⁴
H ₂ S (Hydrogen Sulfide)	1,000	2,000
COS (Carbonyl Sulfide)	200	500
CS ₂ (Carbon Disulfide)	50	150
Mercaptans ¹	2,000	4,000
Thiophenes ²	2,000	4,000
Others ³	50	100
Total Sulfurs (sum of all)	5,000	10,000

- TBM is the primary Mercaptan
- THT is the primary Thiophene
- Other sulfides and disulfides
- Levels above this amount must be approved by Bloom

- Contaminants and Sulfur species limits shall be measured by Draeger tubes, bag sampling, or online gas analyzers at site.
- The gas composition requirements of this specification were verified by historical data of site gas sampling per: ASTM D8230 Siloxanes, EPS TO-15 Halogens, EPS29 Arsenic, Mercury, Cadmium, Zinc, NIOSH 6015 Ammonia and ASTM D 5504 Sulfur
- The natural gas shall have a moisture content of less than 154 ppmV H₂O (~7 lbs/mmscf)

Trace component	Limit
N ₂	< 3.0 mol%
O ₂	< 0.2 mol%
CO ₂	< 3.0 mol%
H ₂	< 1.0 mol%
CO	< 100 ppm