Natural Gas

NG is a naturally occurring mixture of hydrocarbons (e.g., methane [CH\textsubscript{4}], ethane [C\textsubscript{2}H\textsubscript{6}], or propane [C\textsubscript{3}H\textsubscript{8}]). It is produced in geological formations beneath the Earth’s surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions.

**OPERATING GUIDE**

There can be natural variations in NG composition. As a result, pipeline quality standards exist in many countries. For example, the US Environmental Protection Agency (EPA) definition of NG states that it must either be composed of at least 70% CH\textsubscript{4} by volume or have a gross calorific value between 950 and 1,100 British thermal units (Btu) per standard cubic foot.

**PRE-TREATMENT**
- Removal
- Filtration
- Blend
- Heat

**COMBUSTOR**
- Startup
- Dilute
- Controls

**POST-TREATMENT**
- Removal

Gray icons indicate processes not required for this fuel.

**GE EXPERIENCE**

- More than 70 million fired hours
- ~9000 hours in GE’s Gas Turbine Technology Lab (Greenville, SC)
- ~4000 gas turbines (HDGT, data from McCoy)

**LOCATIONS AVAILABLE**

Available in all locations

![World Map with GE locations marked](Map.png)

**CHARACTERISTICS**

- **Heating Value**
  - ~800-1,100 BTU/scf NG
  - (~29,850-41,000 kJ/Nm\textsuperscript{3})

- **Methane**
  - >85% NG

- **Diluent**
  - <15% NG

- **Hydrogen**
  - <3% NG

- **C\textsubscript{2}H\textsubscript{6}**
  - <15% NG

- **H\textsubscript{2}O**
  - <0% NG

- **H\textsubscript{2}S**
  - <0.3 GRAIN/100 scf NG
  - (~10 ppm)

**MAINTENANCE FACTOR**

Follow maintenance recommendations for NG per GER-3620 (GE Heavy-Duty Gas Turbine Operating and Maintenance Considerations).
Use of selective catalytic reduction (SCR) to reduce NO\textsubscript{x} emissions may be required to meet local and/or national environmental emission regulations. A separate catalyst can be added to reduce carbon monoxide (CO) emissions levels as required by environmental regulations.

Removal

GE’s OpFlex Autotune system uses a full thermodynamic model of the GT with data from a range of sensors to make real-time adjustments to the GT to optimize performance.

Controls

If run in a standard or multi-nozzle quiet combustor (MNQC), a diluent is required to mitigate nitrogen oxide (NO\textsubscript{x}) emissions. Diluent can be nitrogen (N\textsubscript{2}), steam or water.

Dilute

Performance heating to increase GT efficiency, or to adjust overall fuel energy input if natural gas variations are causing shifts in heating value. GER-4189B (Design Considerations for Heated Gas Fuel) provides details of a “typical” GE gas fuel heating system as well as general system requirements.

Heat

Per GEI-41040 (Specification for Fuel Gases for Combustion in Heavy-Duty Gas Turbines), the fuel gas delivery system shall be designed to prevent the generation or the admittance of solid particulate to the gas turbine (GT) gas fuel system. This shall include but not be limited to particulate filtration and noncorrosive (i.e. stainless steel) piping from the particulate filtration to the inlet of the GT equipment. Fuel gas piping systems shall be properly cleaned/flushed and maintained prior to GT operation.

Filtration

• Performance fuel heaters use steam or feedwater from the heat recovery steam generator (HRSG)
• Requires separate infrastructure and accessory systems for back-up fuel
• If using liquid as a back-up fuel, requires dual fuel combustor configuration and liquid fuel accessory system

TURBINE OPTIONS

E

CLASS

STANDARD

DLN

MNQC

F

CLASS

DLN

MNQC

H

CLASS

DLN

MNQC