Gaseous Generator Set Installation and Case Studies

*PowerHour* webinar series for consulting engineers

Experts you trust. Excellence you count on.

April 28, 2020 2:00pm Eastern Time / 11:00am Pacific Time
(1 PDH issued by Cummins Inc.)
Welcome!

Cummins PowerHour webinar series is designed to help our engineer partners to…

▪ Keep up to date on products, technology, and codes and standards development
▪ Interact with Cummins experts and gain access to ongoing technical support
▪ Participate at your convenience, live or on-demand
▪ Earn Professional Development Hours (PDH)

Technical tips:
▪ Audio is available through teleconference or Zoom application.
▪ Attendees are in “listen only” mode throughout the event.
▪ Use the Zoom Q&A Panel to submit questions, comments, and feedback throughout the event. Time is allotted at the end of the PowerHour to address Q&A.
▪ If the audio connection is lost, disconnected or experiences intermittent connectivity issues, please check your audio connection through the "Join Audio" or "Audio Connectivity" button at the bottom left of the Zoom application.
▪ Report technical issues using the Zoom Q&A Panel.
Meet your panelists

Cummins instructor:
Michael Sanford  
Technical Marketing Specialist  
Cummins Inc.

Cummins facilitator:
Chad Hale  
Technical Marketing Specialist  
Cummins Inc.

Your local Cummins contacts:
- AZ, ID, NM, NV: Carl Knapp (carl.knapp@cummins.com)
- CO, MT, ND, UT, WY: Christopher Scott (christopher.l.scott@cummins.com)
- CA, WA, OR, AK, HI: Brian Pumphrey (brian.pumphrey@cummins.com)
- MA, ME, NH, RI, VT: Jim Howard (james.howard@cummins.com)
- CT, MD, NJ, NY: Charles Attisani (charles.attisani@cummins.com)
- Northern IL, MI: John Kilinskis (john.a.kilinskis@cummins.com)
- NE, SD, KS: Earnest Glaser (earnest.a.glaser@cummins.com)
- IL, IN, KY, MO: Jeff Yates (jeffrey.yates@cummins.com)
- IA, MO: Kirby Holden (kirby.holden@cummins.com)
- DE, MD, MN, ND, OH, PA, WI, WV: Michael Munson (michael.s.munson@cummins.com)
- TX: Scott Thomas (m.scott.thomas@cummins.com)
- OK, AR: Wes Ruebman (wes.ruebman@cummins.com)
- LA, MS, AL: Trina Casbon (trina.casbon@cummins.com)
- TN, GA: Mariano Rojas (mariano.rojas@cummins.com)
- FL: Bob Kelly (robert.kelly@cummins.com)
- NC, SC, VA: Bill Morris (william.morris@cummins.com)
- Canada: Ian Lindquist (ian.lindquist@cummins.com)
Disclaimer

The views and opinions expressed in this course shall not be considered the official position of any regulatory organization and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Participants are encouraged to refer to the entire text of all referenced documents. In addition, when in doubt, reach out to the Authority Having Jurisdiction.
Course Objectives

Gaseous Generator Set Installation and Case Studies

The specification and installation of gaseous generator sets continues to grow in North America in both emergency and non-emergency applications. Although the installation requirements differ only minimally from their diesel counterparts, it is important to understand the basics of gaseous generator sets to ensure they are specified appropriately. This course will explore a number of unique installations that feature gaseous generator sets and will highlight the need for gaseous fuel sources in these applications.

After completing this course, participants will be able to:

• List the basic installation requirements of gaseous generator sets.
• Recognize the broad range of capability of gaseous generator sets.
• Describe potential challenges and advantages of gaseous generator set installations.
What are some of the key installation requirements of natural gas generator sets?
Gaseous Generator Sets

Fuel Supply Basics

Primary factors impacting gaseous fuel system installations:
Gaseous Generator Sets

Fuel Supply Basics

Primary factors impacting gaseous fuel system installations:

1. The gas supplied to the generator set must be of acceptable quality.
Gaseous Generator Sets

Fuel Supply Basics

Primary factors impacting gaseous fuel system installations:

1. The gas supplied to the generator set must be of acceptable quality.
2. The gas supplied to the generator set must be of **sufficient pressure**.
Gaseous Generator Sets

Fuel Supply Basics

Primary factors impacting gaseous fuel system installations:

1. The gas supplied to the generator set must be of acceptable quality.
2. The gas supplied to the generator set must be of sufficient pressure.
3. The gas supplied to the generator set must be available in **sufficient volume**.
Gaseous Generator Sets

Fuel Supply Basics

Primary factors impacting gaseous fuel system installations:

1. The gas supplied to the generator set must be of **acceptable quality**.
2. The gas supplied to the generator set must be of **sufficient pressure**.
3. The gas supplied to the generator set must be available in **sufficient volume**.
## Gaseous Generator Sets

### Fuel Supply Basics - Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Also Known As</th>
<th>BTU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional Natural Gas</strong></td>
<td>Pipeline Gas, Standard Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated Petroleum Gas (APG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Flare Gas, Field Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated-Dissolved Gas (ADG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Wellhead Gas</td>
<td>High</td>
</tr>
<tr>
<td><strong>Unconventional Natural Gas</strong></td>
<td>Coal Bed Methane (CBM)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Coal Mine Methane (CMM)</td>
<td>~Low</td>
</tr>
<tr>
<td><strong>Biogas</strong></td>
<td>Anaerobic Digester Gas (ADG)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Wastewater Treatment Plant Gas</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Syngas</strong></td>
<td>Synthesis Gas, Pyrolysis Gas</td>
<td>Very Low</td>
</tr>
<tr>
<td><strong>Industrial Gas</strong></td>
<td>Town Gas</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
# Gaseous Generator Sets

## Fuel Supply Basics - Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Also Known As</th>
<th>BTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Natural Gas</td>
<td>Pipeline Gas, Standard Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated Petroleum Gas (APG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Flare Gas, Field Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated-Dissolved Gas (ADG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Wellhead Gas</td>
<td>High</td>
</tr>
<tr>
<td>Unconventional Natural Gas</td>
<td>Coal Bed Methane (CBM)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Coal Mine Methane (CMM)</td>
<td>~Low</td>
</tr>
<tr>
<td>Biogas</td>
<td>Anaerobic Digester Gas (ADG)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Wastewater Treatment Plant Gas</td>
<td>Low</td>
</tr>
<tr>
<td>Syngas</td>
<td>Synthesis Gas, Pyrolysis Gas</td>
<td>Very Low</td>
</tr>
<tr>
<td>Industrial Gas</td>
<td>Town Gas</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
## Gaseous Generator Sets

### Fuel Supply Basics - Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Also Known As</th>
<th>BTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Natural Gas</td>
<td>Pipeline Gas, Standard Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated Petroleum Gas (APG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Flare Gas, Field Gas</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Associated-Dissolved Gas (ADG)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Wellhead Gas</td>
<td>High</td>
</tr>
<tr>
<td>Unconventional Natural Gas</td>
<td>Coal Bed Methane (CBM)</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Coal Mine Methane (CMM)</td>
<td>~Low</td>
</tr>
<tr>
<td>Biogas</td>
<td>Anaerobic Digester Gas (ADG)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Wastewater Treatment Plant Gas</td>
<td>Low</td>
</tr>
<tr>
<td>Syngas</td>
<td>Synthesis Gas, Pyrolysis Gas</td>
<td>Very Low</td>
</tr>
<tr>
<td>Industrial Gas</td>
<td>Town Gas</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
Gaseous Generator Sets

Fuel Supply Basics - Quality
Gaseous Generator Sets
Fuel Supply Basics - Quality

Fuel Specification:
Natural Gas: Dry gas received from Supplier (1000 BTU/SCF)
Propane: Meets the requirements for Commercial Grade Propane under the
Spec Note Generator set manufacturer shall provide documentation indicating product performance at a specified fuel energy content or range based on site fuel sample analysis.
Gaseous Generator Sets

Fuel Supply Basics - Quality

Methane Index Number (MN)
- Defines likelihood of a fuel to auto-ignite
- Scale of 0-100
Gaseous Generator Sets

Fuel Supply Basics - Quality

Methane Index Number (MN)

- Defines likelihood of a fuel to auto-ignite
- Scale of 0-100
  - Higher MN may be less likely to auto-ignite (knock) and may be suitable for high power density applications.
  - Lower MN may be more likely to auto-ignite (knock) and may require power derate and/or timing changes.

![Methane number capability chart](chart.png)
Gaseous Generator Sets

Fuel Supply Basics - Quality

Methane Index Number (MN)
- Defines likelihood of a fuel to auto-ignite
- Scale of 0-100
  - Higher MN may be less likely to auto-ignite (knock) and may be suitable for high power density applications.
  - Lower MN may be more likely to auto-ignite (knock) and may require power derate and/or timing changes.
- High quality pipeline natural gas is typically 80-90 MN.
Gaseous Generator Sets

Fuel Supply Basics - Quality

Methane Index Number (MN)

- Defines likelihood of a fuel to auto-ignite
- Scale of 0-100
  - Higher MN may be less likely to auto-ignite (knock) and may be suitable for high power density applications.
  - Lower MN may be more likely to auto-ignite (knock) and may require power derate and/or timing changes.
- High quality pipeline natural gas is typically 80-90 MN.

Spec Note Generator set manufacturer shall provide documentation indicating product performance at a specified Methane Number or range based on site fuel sample analysis.
Gaseous Generator Sets

Fuel Supply Basics - Quality

Methane Index Number (MN)
- Defines likelihood of a fuel to auto-ignite
- Scale of 0-100
  - Higher MN may be less likely to auto-ignite (knock) and may be suitable for high power density applications.
  - Lower MN may be more likely to auto-ignite (knock) and may require power derate and/or timing changes.
- High quality pipeline natural gas is typically 80-90 MN.

Spec Note Generator set manufacturer shall provide documentation indicating product performance at a specified Methane Number or range based on site fuel sample analysis.
Gaseous Generator Sets

Fuel Supply Basics - Pressure

- Pressure and volume must be available at RATED load.
- Be aware of fuel system pressure drop.
- Booster may be installed to raise pressure, if needed.
- Consult generator set manufacturer for specific fuel system requirements.

**Fuel system**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas supply pressure to engine inlet, bar (psi)</td>
<td>0.2 (2.9)</td>
</tr>
<tr>
<td>Minimum methane index</td>
<td>62</td>
</tr>
</tbody>
</table>
Gaseous Generator Sets

Fuel Supply Basics - Pressure

- Pressure and volume must be available at RATED load.
- Be aware of fuel system pressure drop.
- Booster may be installed to raise pressure, if needed.
- Consult generator set manufacturer for specific fuel system requirements.

**Fuel system**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas supply pressure to engine inlet, bar (psi)$^8$</td>
<td>0.2 (2.9)</td>
</tr>
<tr>
<td>Minimum methane index</td>
<td>62</td>
</tr>
</tbody>
</table>
Gaseous Generator Sets

Fuel Supply Basics - Pressure

- Pressure and volume must be available at **RATED** load.
- **Be aware of fuel system pressure drop.**
- Booster may be installed to raise pressure, if needed.
- Consult generator set manufacturer for specific fuel system requirements.

**Fuel system**

| Gas supply pressure to engine inlet, bar (psi) | 0.2 (2.9) |
| Minimum methane index                     | 62        |

**Spec Note** Generator set manufacturer shall provide documentation indicating minimum fuel pressure at engine inlet at rated load.
Gaseous Generator Sets

Fuel Supply Basics - Pressure

- Pressure and volume must be available at **RATED** load.
- Be aware of fuel system pressure drop.
- Booster may be installed to raise pressure, if needed.
- Consult generator set manufacturer for specific fuel system requirements.

### Fuel system

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas supply pressure to engine inlet, bar (psi)</td>
<td>0.2 (2.9)</td>
</tr>
<tr>
<td>Minimum methane index</td>
<td>62</td>
</tr>
</tbody>
</table>

**Spec Note** Generator set manufacturer shall provide documentation indicating minimum fuel pressure at engine inlet at rated load.
Gaseous Generator Sets

Fuel Supply Basics – Volume
# Gaseous Generator Sets

## Fuel Supply Basics – Volume

### Fuel Consumption

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Natural gas</th>
<th>Propane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standby (KW)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
<td>kW</td>
<td>115</td>
<td>230</td>
</tr>
<tr>
<td>scfh</td>
<td>718</td>
<td>1111</td>
</tr>
<tr>
<td>m³/hr</td>
<td>20.35</td>
<td>31.47</td>
</tr>
</tbody>
</table>

### Generator Set Data Sheet

**Model:** C150M6

**Frequency:** 60 Hz

**Fuel Type:** Natural gas

**Rating:** 150 Natural gas standby

**Emissions:** EPA Emissions

### Engine Performance

<table>
<thead>
<tr>
<th>Engine</th>
<th>Natural gas Standby</th>
<th>Propane Standby</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>235</td>
<td>353</td>
</tr>
<tr>
<td>BHP</td>
<td>353</td>
<td>518</td>
</tr>
<tr>
<td>RPM</td>
<td>1800</td>
<td>1800</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air-to-Air, Radiator</td>
<td>Air-to-Air, Radiator</td>
</tr>
<tr>
<td>Oil pressure</td>
<td>35 psi</td>
<td>35 psi</td>
</tr>
<tr>
<td>Coolant temperature</td>
<td>180°F (82°C)</td>
<td>180°F (82°C)</td>
</tr>
<tr>
<td>Fuel pressure</td>
<td>100 psi</td>
<td>100 psi</td>
</tr>
<tr>
<td>Coolant flow rate</td>
<td>138 L/min</td>
<td>138 L/min</td>
</tr>
<tr>
<td>Emission data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Gaseous Generator Sets

Fuel Supply Basics – Volume
Gaseous Generator Sets

Fuel Supply Basics – Volume

Spec Note
Generator set manufacturer shall provide documentation indicating maximum fuel consumption at rated load.
Concept Check

Three key factors impacting gaseous generator set installation include:

a) Gas Supply Pressure  
b) Gas Supply Volume  
c) Gas Supply Quality  
d) All of the Above
Concept Check

Three key factors impacting gaseous generator set installation include:

a) Gas Supply Pressure
b) Gas Supply Volume
c) Gas Supply Quality
d) All of the Above
Gaseous Generator Sets

Installation Considerations

- Natural gas is available through extensive and reliable pipeline network.
- Natural gas pipeline avoids fuel transportation, handling and storage issues associated with on-site fuel storage.
  - No fuel tank cleaning required.
  - Limited degradation of fuel over time.
  - No requirement for regular fuel testing.
- Can be easily backed-up with on-site fuel storage (LNG or LPG).
Gaseous Generator Sets

Installation Considerations

- Natural gas is available through extensive and reliable pipeline network.
- Natural gas pipeline avoids fuel transportation, handling and storage issues associated with on-site fuel storage.
  - No fuel tank cleaning required.
  - Limited degradation of fuel over time.
  - No requirement for regular fuel testing.
- Can be easily backed-up with on-site fuel storage (LNG or LPG).

Related Content

Considerations for Specifying Generator Set Fuel Sources
On-Demand PowerHour Recording
5.1.1 The following energy sources shall be permitted to be used for the emergency power supply (EPS):

1. Liquid petroleum products…
2. Liquified petroleum gas…
3. Natural or synthetic gas
Gaseous Generator Sets
Compliance and Reliability

NFPA 110-2019

5.1.1 The following energy sources shall be permitted to be used for the emergency power supply (EPS):

(1) Liquid petroleum products…
(2) Liquified petroleum gas…
(3) Natural or synthetic gas

Exception: For Level 1 installations in locations where the probability of interruption of off-site fuel supplies is high, on-site storage of an alternate energy source sufficient to allow full output of the EPSS to be delivered for the class specified shall be required, with the provision for automatic transfer from the primary energy source to the alternate energy source.
Gaseous Generator Sets

Compliance and Reliability

NFPA 110-2019

5.1.1 The following energy sources shall be permitted to be used for the emergency power supply (EPS):

(1) Liquid petroleum products…
(2) Liquified petroleum gas…
(3) Natural or synthetic gas

Exception: For Level 1 installations in locations where the probability of interruption of off-site fuel supplies is high, on-site storage of an alternate energy source sufficient to allow full output of the EPSS to be delivered for the class specified shall be required, with the provision for automatic transfer from the primary energy source to the alternate energy source.

Natural Gas Council

Natural gas is a secure, reliable and resilient choice for customers

- Operational reliability
  - 2017 survey of 51 interstate pipelines – 99.97% of contractual commitments
  - Geographic dispersion of production reduces vulnerability to local weather
  - Transportation network interconnected, offering multiple pathways for rerouting

- Contractual continuity of service
  - Firm or interruptible contracts
Gaseous Generator Sets

Compliance and Reliability

Map of U.S. interstate and intrastate natural gas pipelines

Source: U.S. Energy Information Administration, About U.S. Natural Gas Pipelines
Gaseous Generator Sets

Compliance and Reliability

Map of U.S. inter-state and intrastate natural gas pipelines

Source: U.S. Energy Information Administration, About U.S. Natural Gas Pipelines

**Spec Note** Specify natural-gas fueled generator sets for emergency power systems where permitted by the local Authority Having Jurisdiction.
Gaseous Generator Sets

Applications and Capability
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

EPA Certified stationary non-emergency. Capable of extended grid paralleling.

Related Content
EPA Emissions and Air Permitting
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

EPA Certified stationary non-emergency. Capable of extended grid paralleling.

Large single generator set or multiple paralleled units.

Related Content
Paralleling Power System Design and System Level Control
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

EPA Certified stationary non-emergency.
Capable of extended grid paralleling.

Large single generator set or multiple paralleled units.

On-site fuel storage limits usage of diesel generator sets.
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

EPA Certified stationary non-emergency. Capable of extended grid paralleling.

Large single generator set or multiple paralleled units.

On-site fuel storage limits usage of diesel generator sets.

Challenging for some spark-ignited engines.

NFPA 110 Type 10 Requirements for Emergency Power Systems
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Demand Response
Segment: Wastewater Treatment Plant
Location: Wisconsin, US

Key Acceptance Criteria
- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

- EPA Certified stationary non-emergency. Capable of extended grid paralleling.
- Large single generator set or multiple paralleled units.
- On-site fuel storage limits usage of diesel generator sets.
- Challenging for some spark-ignited engines.
- Challenging for some spark-ignited engines.

Related Content
An Introduction to Generator Set Sizing Software
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review
Gaseous Generator Sets

Installation Review

2 x Cummins C650N6 DR
750 kWe Standby
650 kWe Demand Response
On-Board Paralleling Controls
2 x Cummins C650N6 DR
750 kWe Standby
650 kWe Demand Response
On-Board Paralleling Controls

Cummins Digital Master Control
Main-Tie-Main System Topology
Extended Utility Paralleling
Allen Bradley PLC
Gaseous Generator Sets

Installation Review

**Application:** Standby and Demand Response

**Segment:** Wastewater Treatment Plant

**Location:** Wisconsin, US

**Key Acceptance Criteria**

- 1500 kWe Installed Capacity
- Extended Run Time with Limited On-Site Storage Capacity
- NFPA 110 Type 10 Starting
- 100% Nameplate Load Acceptance

Related Content

Case Studies

Case Study Library
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
- NFPA 110 Type 10 Starting for Life Safety Loads
- Extended Run Time (>24 Hours)
- Operational Flexibility
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
- NFPA 110 Type 10 Starting for Life Safety Loads
- Extended Run Time (>24 Hours)
- Operational Flexibility

High operating cost to power optional loads throughout extended outage.

Considerations for Specifying Generator Set Fuel Sources
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US
Key Acceptance Criteria
- NFPA 110 Type 10 Starting for Life Safety Loads
- Extended Run Time (>24 Hours)
- Operational Flexibility

High operating cost to power optional loads throughout extended outage.
Operational reliability needs limit reliance on fuel storage and delivery.

Related Content
Considerations for Specifying Generator Set Fuel Sources
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
- NFPA 110 Type 10 Starting for Life Safety Loads
- Extended Run Time (>24 Hours)
- Operational Flexibility

High operating cost to power optional loads throughout extended outage.

Operational reliability needs limit reliance on fuel storage and delivery.

EPA Certified stationary non-emergency. Capable of extended grid paralleling.

Related Content
EPA Emissions and Air Permitting
On-Demand PowerHour Recording
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
✓ NFPA 110 Type 10 Starting for Life Safety Loads
▪ Extended Run Time (>24 Hours)
▪ Operational Flexibility

1 x Cummins DQKAD
1750 kWe Standby
On-Board Paralleling Controls
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
✓ NFPA 110 Type 10 Starting for Life Safety Loads
✓ Extended Run Time (>24 Hours)
✓ Operational Flexibility

1 x Cummins DQKAD
1750 kWe Standby
On-Board Paralleling Controls

4 x Cummins C1750N6CB
1750 kWe Continuous
On-Board Paralleling Controls
Gaseous Generator Sets

Installation Review

Application: Standby and Hurricane Relief
Segment: Medical Center (763 Licensed Beds)
Location: Louisiana, US

Key Acceptance Criteria
✓ NFPA 110 Type 10 Starting for Life Safety Loads
✓ Extended Run Time (>24 Hours)
✓ Operational Flexibility

1 x Cummins DQKAD
1750 kWe Standby
On-Board Paralleling Controls

4 x Cummins C1750N6CB
1750 kWe Continuous
On-Board Paralleling Controls

Related Content
Case Study
Concept Check

When recommending the preferred fuel source for on-site power generation, which of the following project or site requirements should be considered?

a) NFPA 110 Type requirements (Life Safety loads)
b) Extended outage operation
c) Operational flexibility (non-emergency usage)
d) On-site fuel storage limitations
e) All of the above
Concept Check

When recommending the preferred fuel source for on-site power generation, which of the following project or site requirements should be considered?

a) NFPA 110 Type requirements (Life Safety loads)
b) Extended outage operation
c) Operational flexibility (non-emergency usage)
d) On-site fuel storage limitations
e) All of the above
Course Summary

Gaseous Generator Set Installation and Case Studies

- List the basic installation requirements of gaseous generator sets.
- Recognize the broad range of capability of gaseous generator sets.
- Describe potential challenges and advantages of gaseous generator set installations.

Specify:

- Project performance requirements based on the application limitations (loads, power factor, transient limits, emissions, start-time and other code-driven requirements).
- Gaseous generator sets in emergency and non-emergency applications when appropriate and permitted by the authority having jurisdiction.
Additional Resources

Cummins White Papers
- Understanding EPA NSPS Emissions Regulations for Stationary Spark-ignited Engines
- The Latest Evolution Of Distributed Energy Resources: Opportunity For Business Within The PJM

Cummins PowerHour On-Demand Webinars
- Considerations for Specifying Generator Set Fuel Sources
- Specifying Gaseous Generator Sets
- Lean Burn Natural Gas Generator Sets in Standby-Peak Shaving Applications
- Introduction to Generator Set Sizing Software
- EPA Emissions and Air Permitting
Please type your questions, comments and feedback in the Zoom Q&A window.

After the PowerHour, a complete list of questions and answers will be published on powersuite.cummins.com.

Your local Cummins contacts:

- AZ, ID, NM, NV: Carl Knapp (carl.knapp@cummins.com)
- CO, MT, ND, UT, WY: Christopher Scott (christopher.l.scott@cummins.com)
- CA, WA, OR, AK, HI: Brian Pumphrey (brian.pumphrey@cummins.com)
- MA, ME, NH, RI, VT: Jim Howard (james.howard@cummins.com)
- CT, MD, NJ, NY: Charles Attisani (charles.attisani@cummins.com)
- Northern IL, MI: John Kilinskis (john.a.kilinskis@cummins.com)
- NE, SD, KS: Earnest Glaser (earnest.a.glaser@cummins.com)
- IL, IN, KY, MO: Jeff Yates (jeffrey.yates@cummins.com)
- IA, MO: Kirby Holden (kirby.holden@cummins.com)
- DE, MD, MN, ND, OH, PA, WI, WV: Michael Munson (michael.s.munson@cummins.com)
- TX: Scott Thomas (m.scott.thomas@cummins.com)
- OK, AR: Wes Ruebman (wes.ruebman@cummins.com)
- LA, MS, AL: Trina Casbon (trina.casbon@cummins.com)
- TN, GA: Mariano Rojas (mariano.rojas@cummins.com)
- FL: Bob Kelly (robert.kelly@cummins.com)
- NC, SC, VA: Bill Morris (william.morris@cummins.com)
- Canada: Ian Lindquist (ian.lindquist@cummins.com)
Q&A

Please type your questions, comments and feedback in the **Zoom Q&A window**.

After the PowerHour, a complete list of questions and answers will be published on **powersuite.cummins.com**.

Please complete the brief survey before exiting the webinar!

Your local Cummins contacts:

- AZ, ID, NM, NV: Carl Knapp ([carl.knapp@cummins.com](mailto:carl.knapp@cummins.com))
- CO, MT, ND, UT, WY: Christopher Scott ([christopher.l.scott@cummins.com](mailto:christopher.l.scott@cummins.com))
- CA, WA, OR, AK, HI: Brian Pumphrey ([brian.pumphrey@cummins.com](mailto:brian.pumphrey@cummins.com))
- MA, ME, NH, RI, VT: Jim Howard ([james.howard@cummins.com](mailto:james.howard@cummins.com))
- CT, MD, NJ, NY: Charles Attisani ([charles.attisani@cummins.com](mailto:charles.attisani@cummins.com))
- Northern IL, MI: John Kilinskis ([john.a.kilinskis@cummins.com](mailto:john.a.kilinskis@cummins.com))
- NE, SD, KS: Earnest Glaser ([earnest.a.glaser@cummins.com](mailto:earnest.a.glaser@cummins.com))
- IL, IN, KY, MO: Jeff Yates ([jeffrey.yates@cummins.com](mailto:jeffrey.yates@cummins.com))
- IA, MO: Kirby Holden ([kirby.holden@cummins.com](mailto:kirby.holden@cummins.com))
- DE, MD, MN, ND, OH, PA, WI, WV: Michael Munson ([michael.s.munson@cummins.com](mailto:michael.s.munson@cummins.com))
- TX: Scott Thomas ([m.scott.thomas@cummins.com](mailto:m.scott.thomas@cummins.com))
- OK, AR: Wes Ruebman ([wes.ruebman@cummins.com](mailto:wes.ruebman@cummins.com))
- LA, MS, AL: Trina Casbon ([trina.casbon@cummins.com](mailto:trina.casbon@cummins.com))
- TN, GA: Mariano Rojas ([mariano.rojas@cummins.com](mailto:mariano.rojas@cummins.com))
- FL: Bob Kelly ([robert.kelly@cummins.com](mailto:robert.kelly@cummins.com))
- NC, SC, VA: Bill Morris ([william.morris@cummins.com](mailto:william.morris@cummins.com))
- Canada: Ian Lindquist ([ian.lindquist@cummins.com](mailto:ian.lindquist@cummins.com))
Closing

Watch out for a follow-up email including:
- A link to the webinar recording and copy of the presentation
- A certificate issuing one professional development hour (1 PDH)

Visit powersuite.cummins.com for:
- Sizing and specification development tools
- PowerHour webinar recordings, presentations and FAQ
- Additional Cummins continuing education programs

Visit cummins.com/energy-iq and sign-up for communications to:
- Receive energy insights
- Read about energy technologies and trends

Please contact Michael Sanford if you have any questions related to the PowerHour webinar (michael.sanford@cummins.com)

Upcoming PowerHour Webinars:
- Considerations for Specifying Generator Set Fuel Sources, May 20
- The Role of a System Level Control in a Power System, May 21
- Ensuring Power System Reliability through Service Specifications, June