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RE: SIP Application Package
VoltaGrid ATL-1 EGU

To Whom It May Concern:

Please find enclosed two signed copies of an application to obtain a Permit to Construct and Permit to Operate for a new electric generating unit to be located in Covington, Georgia. SIP permit application forms, supporting calculations, equipment specifications, and air dispersion files are included as attachments to the submittal.

This application is asked to be included in Georgia Department of Environmental Protection's permit expedite program. VoltaGrid understand that a notification will be submitted with applicable permit processing fees, including the expediting fee, for approval. To expedite processing on our side, the notification can be sent electronically to korby.bracken@voltagrid.com.

We look forward to working with the Air Protection Branch on this project. If anyone at the Branch has any questions regarding this application please contact me at (307) 630-1430 or korby.bracken@voltagrid.com.

Best regards,

Korby Bracken, P.E.
Senior Director – Health, Safety & Environment

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Prepared for
VoltaGrid LLC

Submitted to
Georgia Environmental Protection Division

Prepared by
Ramboll Americas Engineering Solutions, Inc.

Date
November 2025

SIP PERMIT APPLICATION FOR A 90 MW POWER PLANT IN COVINGTON, GA

VOLTAGRID LLC

RAMBOLL

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ACRONYMS AND ABBREVIATIONS

AAC	Acceptable Ambient Concentration
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CFR	Code of Federal Regulations
CH_2O	Formaldehyde
CH_4	Methane
CI ICE	Compression Ignition Internal Combustion Engine
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
EGU	Electric Generating Unit
GA EPD	Georgia Environmental Protection Division
GHG	Greenhouse Gas
GRAQC	Georgia Rules for Air Quality Control
HAP	Hazardous Air Pollutant
hr	Hour
IGCC	Integrated Gasification Combined Cycle
Kg	Kilogram
lb	Pounds
LLC	Limited Liability Corporation
MMBtu	Million British Thermal Units
MW	Megawatt
NAICS	North American Industrial Classification System
MACT	Maximum Achievable Control Technology
MER	Maximum Emission Rate
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
N_2O	Nitrous Oxide
O_3	Ozone
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
PTE	Potential To Emit
RACT	Reasonably Available Control Technology
RICE	Reciprocating Internal Combustion Engines
SCR	Selective Catalytic Reduction
SI	Spark Ignition Internal Combustion Engine
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_X	Sulfur Oxides
TAP	Toxic Air Pollutant
TIA	Toxic Impact Assessment
tpy	Tons Per Year
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

1. INTRODUCTION

1.1 Project Overview

VoltaGrid, LLC (VoltaGrid) is proposing to construct a power generation facility with a maximum power output of 90 megawatts (MW) consisting of 33 Jenbacher J620 natural gas-fired, four-stroke lean-burn, reciprocating internal combustion engines (RICE) ("the Facility" or "ATL-1"). The Facility is a baseload facility; that is, it is proposed to operate continuously for 8,760 hours per year.

In addition to the 33 J620 RICE units, the Facility will also have two (2) 4 MMBtu/hr natural gas-fired fuel gas heaters and one (1) natural gas-fired black start emergency engine generator.

The proposed Facility will be classified as a synthetic minor source of air emissions with respect to the Title V and New Source Review (NSR) permitting programs.

1.2 Source Segregation

The subject of this permit application is the ATL-1 power generation Facility. The Facility is proposed to provide prime power to itself and to a nearby facility owned and operated by an external third party (Serverfarm facility). Construction of the ATL-1 Facility would fulfill an immediate need for alternative, rapidly deployable prime power to the separately owned and operated nearby third-party facility. As discussed in the following paragraphs, the VoltaGrid ATL-1 Facility is a separate stationary source from the Serverfarm facility.

Source determinations are largely based on the regulatory definition of a "source", legal interpretations of the definition, and past determinations or precedents. According to 40 CFR 70.2 and 71.2, the definition of "major source" in Title V regulations and the definitions of "stationary source" and "building, structure, facility or installation" in NSR regulations [40 CFR 52.21(b)(5) & (6), 51.165(a)(1)(i) & (ii) and 51.166(b)(5) & (6)] form the basis of the regulatory definition of a source.

The source definitions establish three general conditions, ALL of which must be met for two or more facilities to be aggregated as a single stationary source for air permitting purposes:

- All pollutant-emitting activities at such sources belong to the same industrial grouping
- Sources are located on one or more contiguous or adjacent properties
- Sources under control of the same person or persons under common control

These are discussed in detail below:

1. Same industrial grouping: The primary economic activity of an emissions unit determines its Standard Industrial Classification (SIC) code. If the SIC major group codes are different, then the pollutant emitting activities (or parts of) are considered separate stationary sources. Data centers typically fall under **SIC Code 7374** (Data Processing & Hosting Services). Data processing is an IT service, which is unrelated to energy production. Power plants typically fall under **SIC Code 4911** (Electric Services).

   United States Environmental Protection Agency (USEPA) guidance suggests that if a unit is considered a "support facility" for other activities, then that will affect the assignment of the SIC code [45 FR 52695]. Establishments primarily engaged in

performing supporting services for other establishments of the same company rather than for the general public or for other business firms" are "classified industrially on the basis of the primary activity of the operating establishment(s) they serve."

2. Contiguous or Adjacent: The 2019 Idsal Memo[1] interprets adjacent to mean *physical proximity* for all sources except SIC 13 (oil and natural gas production). In USEPA's opinion, "functional interrelatedness of operations is not relevant. While there is no bright line, USEPA notes that adjacency requires the operations to be in physical proximity and should meet the "common sense notion of a plant." The proposed VoltaGrid Facility and the Serverfarm facility will be located on adjacent parcels of land, but each will be fenced in order to prevent unauthorized access.

3. Common Control: Common control is noted as being under the control of the same person or persons under common control. USEPA's interpretation of common control was established in the April 2018 Meadowbrook Memo[2] which requires "power or authority to dictate the outcome of decisions of another entity, not the ability to merely influence." That is, the entity being influenced, affected, or somewhat constrained by contractual relationships that it negotiated at arm's length, or by external market forces, does not necessarily mean that one entity is actually controlled or governed by these influences. "Control" in this instance is in terms of applicability of, or compliance with, air permitting requirements.

The power plant source (Facility) will be owned and operated by VoltaGrid, LLC and responsibility for compliance with the power plant's air permit lies solely with VoltaGrid. The Facility will generate electric power for use to the adjacent Serverfarm facility via a behind-the-meter arrangement. The Serverfarm facility's will be owned and operated by Serverfarm and responsibility for compliance with its air permit lies solely with Serverfarm. Neither entity will have any control over the day-to-day operations of the other, including compliance with the requirements and conditions of their respective air permits.

For the reasons discussed above, the Serverfarm facility and the VoltaGrid power plant are considered two separate stationary sources and do not need to be aggregated for air permitting purposes. This air permit application is for the VoltaGrid ATL-1 power generation Facility.

1.3 Purpose of the Permit Application

Construction of a new source or modification to an existing source requires an air permit from the Georgia Environmental Protection Division (GA EPD). Ramboll Americas Engineering Solutions, Inc. (Ramboll), on behalf of VoltaGrid, has prepared this application to obtain a Georgia State Implementation Plan (SIP) Construction & Operating Permit under Georgia Rules for Air Quality Control (GRAQC) 391-3-1-.03(1) & (2). VoltaGrid will serve as the ATL-1 Facility owner, operator, and permit holder.

[1] https://www.epa.gov/sites/default/files/2019-12/documents/adjacent_guidance.pdf
[2] https://www.epa.gov/sites/default/files/2018-05/documents/meadowbrook_2018.pdf

2. PROCESS DESCRIPTION

2.1 Facility General Information

The VoltaGrid ATL-1 Facility will be constructed adjacent to the Serverfarm facility on Hazelbrand Road NE in Covington, Georgia. **Figure 1** shows the Facility's location.

The operations of the Facility are categorized under North American Industrial Classification System (NAICS) 221112: Fossil Fuel Electric Power Generation, SIC Code 4911: Electric Services.

2.2 J620 RICE Units

2.2.1 Emission Units

The proposed ATL-1 Facility will consist of 33 Jenbacher J620 natural gas-fired four-stroke lean-burn RICE units. Each RICE unit will consist of combustion exhaust treatment, and equipment cooling systems will be stacked above each enclosure. Emissions from each RICE will be released from a 2.5-foot inside-diameter vertical stack at approximately 62 feet above grade.

The mechanical power generated by the RICE units will connect to an on-site generator. The electrical power generated by the generator will be connected to a substation for distribution to the Serverfarm facility. A portion of the power generated by the RICE units will be used to power the ancillary, on-site equipment through a switch gear.

A detailed site layout of the Facility, as well as a simplified process flow diagram, can be found in **Figure 2** and **Figure 3**, respectively.

2.2.2 Air Pollution Control Information

Each RICE will be equipped with a built-in combustion exhaust treatment system, consisting of a selective catalytic reduction (SCR) system and oxidation catalyst. For SCR control, VoltaGrid proposes to use a 32.5% urea solution. The urea solution is proposed to be stored in bulk tanks at the Facility. The urea solution is injected into the combustion exhaust gas prior to the SCR bed, to aid in the reduction of nitrogen oxide (NO_X) in the stack. The oxidation catalyst will control emissions of carbon monoxide (CO) and volatile organic compounds (VOC), and gaseous organic toxic air pollutants (TAP).

Details on emission factors and facility-wide potential-to-emit (PTE) calculations are provided in **Appendix B**.

2.3 Two (2) Natural Gas-Fired Fuel Gas Heaters

The Facility will have two (2) heaters of 4 MMBtu/hour each. The fuel gas heaters are required to warm up the incoming pipeline natural gas to prevent freezing of the gas regulating valves under certain gas operating conditions and to avoid condensation and formation of moisture in the inlet gas lines. The fuel gas heaters are proposed to be operated for 8760 hours/year.

Emissions from each of the two fuel gas heaters will be released from a 1.17-foot diameter vertical stack approximately 13.5 feet above grade.

2.4 One (1) Natural Gas-Fired Black Start Emergency Engine

The Facility will also include one (1) natural gas-fired black start engine. The engine is required to provide emergency power to start the auxiliary systems to power the first J620 engine post a black out event. The emergency engine will be permitted to operate for 100 hours/year.

Emissions from the emergency engines will be released from a 2.33-foot diameter vertical stack at approximately 18 feet above grade.

2.5 Five (5) Temporary Natural Gas-Fired Engines

The Facility will also include a total of five (5), trailer-mounted, Caterpillar G3520 natural gas-fired engines during the months of April and May 2026. Each engine is about 2.5 MW in power output.

Two (2) engines are needed in April 2026 to provide for the construction-related power needs (approximately 1 MW required) for Serverfarm's data halls. Three (3) engines will be operational in May 2026 to provide approximately 4 MW of power for Serverfarm's construction needs.

Pursuant to discussions with the GA EPD, the temporary engines are being included within the requested synthetic minor SIP Permit even though they will be operational only for two months and will not overlap in operations with the main J620 power generation units.

3. EMISSION ESTIMATES

3.1 Overview

Pollutants emitted from the proposed emission units include NO_X,CO, VOC, sulfur dioxide (SO_2), particulate matter (PM), including PM_{10} and $PM_{2.5}$, hazardous and toxic air pollutants (HAP and TAP), and greenhouse gases (GHG), which are quantified in units of carbon dioxide equivalents (CO_2e).

The methodology used to estimate the potential hourly and annual emissions from each source is discussed in the sections below. Detailed emissions calculations are provided in **Appendix B** and the manufacturer's specification sheets for the units (if applicable) are provided in **Appendix C**.

3.2 J620 RICE Units - Methodology

3.2.1 Criteria Air Pollutants

The engine-specific emission factors provided by the manufacturer for NO_X, VOC (hydrocarbons), CO, filterable PM, and SO_2 were used to estimate the emissions of those pollutants for the engines under different operating conditions including steady state operations and startup periods. During startup periods (discussed further in Section 3.2.4), conservatively assumed to last 5 minutes, the control efficiency of the SCR and oxidation catalyst was conservatively assumed to be 0%. While the calculations conservatively assume 0% control through the duration of the startup process, the oxidation catalyst (which is a passive control device) will begin oxidizing organics and CO as the engine exhaust heats up the catalyst bed (well before the end of the 5 min startup period).

During normal operations, the SCR has a control efficiency of 98% for NO_X control, and the oxidation catalyst has a control efficiency of 95% for VOC and CO, based on the manufacturer's specifications.

3.2.2 Greenhouse Gas Pollutants

The GHG emission factors provided in 40 CFR 98 Subpart C, Tables C-1 and C-2 were used to estimate emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Emissions of GHGs as CO_2e were calculated based on the global warming potentials provided in 40 CFR 98, Subpart A, Table A-1.

3.2.3 Toxic Air Pollutants

During startup operations, the TAP emissions are assumed to be uncontrolled. The TAP emission factors provided in AP-42, Chapter 3.2-2, were used to estimate uncontrolled emissions from 4-stroke lean-burn natural gas-fired RICE units. Formaldehyde and other organic TAPs are assumed to be 95% controlled (similar to VOC), based on the manufacturer's specifications.

Additional TAP emissions will result from operation of the SCR, where unreacted ammonia will be emitted as ammonia slip. Manufacturer guarantees were used to estimate emissions of ammonia at the engine stack. Manufacturer-guaranteed ammonia slip level of 5 parts per million by volume (ppmv) will be upheld through optimal operation of the SCR.

3.2.4 Startup Emissions

Based on operational experience at other sites, VoltaGrid estimates that there could be up to three (3) startup events for each engine every month, with each startup event lasting up to five (5) minutes. The thermal heat-up and the control efficiency will increase during the (up to) 5-minute startup event. However, the calculations conservatively assume a 0% control efficiency for the entire startup duration of 5 minutes.

As such, up to one hour per month (3 events/month/engine x 5 minutes/event) and three (3) hours per year will be spent in startup for each engine. During startup, the catalyst-based control devices (SCR and oxidation catalyst) will require time to reach the operational temperature range needed to optimally control emissions of NO_X, CO, and VOC (including organic TAPs). Therefore, it is conservatively assumed that 3 hours per engine per year results in uncontrolled emissions, and 8,757 hours per engine per year are controlled emissions.

3.3 Natural Gas-Fired Fuel Gas Heaters - Methodology

3.3.1 Criteria Air Pollutants

The engine-specific emission factors provided by the manufacturer for NO_X, VOC, SO_2 and CO were used to estimate the emissions of those pollutants for the fuel gas heaters. Emissions of filterable PM, PM_{10} and $PM_{2.5}$ were based on emissions factors available AP-42, Section 1.4, Natural Gas Combustion (July 1998). As per footnote "c" to AP-42 Table 1.4-2, all PM is assumed to be less than 1.0 micrometer in diameter. Therefore, PM = PM_{10} = $PM_{2.5}$ = PM-CON + PM-FIL. Where needed, emission factors were converted using the higher heating value (HHV) of 1,020 Btu/scf.

3.3.2 Greenhouse Gas Pollutants

The GHG emission factors provided in 40 CFR 98 Subpart C, Tables C-1 and C-2 were used to estimate emissions of CO_2, CH_4 and N_2O. The emission factors were converted from kg/MMBtu to lb/MMBtu. Emissions of GHGs as CO_2e were calculated based on the global warming potentials provided in 40 CFR 98, Subpart A, Table A-1.

3.3.3 Toxic Air Pollutants

The TAP emission factors provided in AP-42, Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-3 and 1.4-4 were used to estimate TAP emissions from natural gas-fired heaters/boilers.

3.4 Black Start Emergency Engine - Methodology

3.4.1 Criteria Air Pollutants

The engine-specific emission factors provided by the manufacturer for NO_X, VOC, and CO were used to estimate the emissions of those pollutants for the temporary engines. Emissions of filterable PM, and SO_2 were based on emissions factors available in AP-42 Table 3.2-3 (Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines). Annual emissions were calculated based on an annual operating rate of 100 hours/year.

3.4.2 Greenhouse Gas Pollutants

The GHG emission factors provided in 40 CFR 98 Subpart C, Tables C-1 and C-2 were used to estimate emissions of CO_2, CH_4 and N_2O. The emission factors were converted from kg/MMBtu to lb/MMBtu. Emissions of GHGs as CO_2e were calculated based on the global warming potentials provided in 40 CFR 98, Subpart A, Table A-1.

3.4.3 Toxic Air Pollutants

The TAP emission factors provided in AP-42, Chapter 3.2-2 were used to estimate uncontrolled emissions from the black start engine.

3.5 Temporary Engines CATG3520 - Methodology

3.5.1 Criteria Air Pollutants

The engine-specific emission factors provided by the manufacturer for NO_X, CO, VOC, formaldehyde and CO_2 were used to estimate the emissions of those pollutants for the temporary engines. Emissions of PM, PM_{10}, $PM_{2.5}$, and SO_2 were based on emissions factors available in AP-42 Table 3.2-3 (Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines). The temporary engines will only be operational during the months of April (2 engines) and May 2026 (3 engines) to provide bridging power for construction of the Serverfarm data halls. The main J620 engines are not expected to be operational at the same time as the temporary engines used for bridging power.

3.5.2 Greenhouse Gas Pollutants

The engine-specific emission factors provided by the manufacturer for were used to estimate CO_2 emissions for the temporary engines The GHG emission factors provided in 40 CFR 98 Subpart C, Tables C-1 and C-2 were used to estimate emissions of CH_4 and N_2O. Emissions of GHGs as CO_2e were calculated based on the global warming potentials provided in 40 CFR 98, Subpart A, Table A-1.

3.5.3 Toxic Air Pollutants

Formaldehyde emissions are based on manufacturer provided data. The TAP emission factors provided in AP-42, Chapter 3.2-2, were used to estimate uncontrolled emissions from 4-stroke lean-burn natural gas-fired RICE units.

3.6 Project Emissions Summary

Table 3-1 summarizes the Facility-wide emissions from the ATL-1 Facility. VoltaGrid is requesting

Table 3-1 Facility-Wide Emissions Summary and Requested Permit Limits

Pollutant	*Potential Emissions* (TPY)	Requested Synthetic Minor Permit Limit (TPY)
VOC	30.05	99.0
NO_X	41.57	99.0
CO	115.10	99.0
SO_2	8.80	99.0
PM	18.43	99.0
PM_{10}	18.43	99.0
$PM_{2.5}$	18.43	99.0
CO_2	432,851	--
CH_4	8.21	--
N_2O	0.82	--
CO_2e	433,298	433,298
Single HAP	5.26	9.0
Total HAPs	9.67	24.0

4. REGULATORY APPLICABILITY

The Facility is subject to several federal and state regulations. The following subsections discuss applicable regulations. It should be noted that the Facility will be located in Newton County, which is designated as maintenance" for the 2008, 8-hour ozone standard, but is in attainment for all other ambient air quality standards.

4.1 Major New Source Review (40 CFR 52.21 and GRAQC 391-3-1)

The NSR preconstruction permitting program is an element of air quality regulations for maintaining attainment with the NAAQS established by the USEPA for criteria pollutants. Under the federal Clean Air Act (CAA) and implementing state permitting programs, NSR preconstruction permitting is divided into two programs, which apply on a pollutant-specific basis as determined by the air quality of the area. In areas that are designated by the USEPA as "in attainment" or "unclassifiable" regarding a NAAQS, the construction of a new major source is subject to the Prevention of Significant Deterioration (PSD) NSR program for the attainment pollutants regulated by that NAAQS. In areas that are designated "nonattainment" regarding a NAAQS, the construction of a new major source is subject to review under the Nonattainment New Source Review (NNSR) program for the specific nonattainment pollutants.

VoltaGrid understands that the 90 MW power generation facility does not meet the definitions for any of the 28 listed categories in 40 CFR 52.21(b)(1)(i)(A) and adopted by reference in GRAQC 391-3-1-.02(7)(a)(2)(iii). As such, the facility will be subject to the 250 tons per year (TPY) major source threshold (40 CFR 52.21(b)(1)(i)(B)) for PSD. That is, the facility will be classified as a major stationary source if the PTE of any NSR-regulated pollutant (other than greenhouse gases) is 250 TPY or more.

The NSR major source thresholds in Newton County are 250 TPY for all regulated criteria pollutants except for ozone (O_3) precursors like NO_X and VOC, which have thresholds of 100 TPY. As presented in **Section 3**, PTE of each regulated pollutant is well below this threshold so the facility will be classified as a minor source with respect to the federal NSR permitting program.

4.2 SIP Permitting (GRAQC 391-3-1-.03)

Georgia requires new or modified industrial sources to obtain a SIP construction and operating permit. Pursuant to the requirements of GRAQC 391-3-1-.03(1)(b), this report provides the information to enable the GA EPD to issue the permit. Regulations also require a demonstration of compliance with the applicable air quality standards for TAP, which is typically accomplished through air dispersion modeling analysis. The modeling analysis methodology and results are provided in **Section 5** of this report.

Table 4-1 identifies additional equipment to be installed at the Facility, which is not subject to permitting requirements and provides justification for the exemption.

Table 4-1: Summary of Exempt Equipment

Equipment Description	Basis for Not Being Subject to SIP Permitting
Urea storage tanks	GRAQC 391-3-1-.03(6)(i)3(c)(7): All chemical storage tanks used to store a chemical with a true vapor pressure of less than or equal to 10 millimeters of mercury.
Heating, Ventilation, and Air Conditioning (HVAC)	GRAQC 391-3-1-.03(6)(i)3(e)(1): HVAC systems not designed to remove air contaminants generated by or released from process or fuel-burning equipment.

This application describes all the units (emitting and non-emitting) and presents the necessary pre-construction assessment for those emitting units not covered by an exemption.

4.3 New Source Performance Standards (40 CFR 60 and GRAQC 391-3-1-.02(8))

New Source Performance Standards (NSPS), promulgated in 40 CFR 60 and adopted by reference in GRAQC 391-3-1-.02(8), provide emissions standards for regulated pollutant emissions from new, modified, and reconstructed sources. The following sections discuss the NSPS that are potentially applicable to the proposed project.

4.3.1 NSPS Subpart A – General Provisions

NSPS Subpart A provides requirements for testing, monitoring, notifications and recordkeeping. Any source that is subject to another subpart under 40 CFR 60 is also subject to Subpart A, unless stated otherwise. Since the proposed facility will be subject to an NSPS (discussed later in this section), the proposed project will be required to comply with applicable provisions of Subpart A.

Table 4-2: 40 CFR 60 Subpart A Requirements

40 CFR 60 Subpart A Section	Requirement
60.7	Initial notification and recordkeeping
60.8	Performance Tests
60.11	Compliance with standards and maintenance requirements
60.13	Monitoring requirements
60.19	General notification and reporting requirements

4.3.2 NSPS Subpart Dc - Small Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Dc is applicable to small steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 29 megawatts (MW) (100 million British thermal units per hour (MMBtu/h)) or less, but greater than or equal to 2.9 MW (10 MMBtu/h). The proposed fuel

gas heaters are each less than 10 MMBtu/hr and as such are not subject to NSPS Subpart Dc.

4.3.3 NSPS Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines

NSPS Subpart JJJJ applies to new, modified, and reconstructed spark ignition (SI) internal combustion engines (ICE). New engines with engine power greater than 19 kW are subject to this regulation if construction of the SI ICE commenced after June 12, 2006, and if the engine was manufactured on or after July 1, 2007. Ramboll has assumed the model year of the proposed engines will be 2008 or later, and therefore this rule is applicable to the proposed SI ICE that will be operated at the facility.

4.3.3.1 Primary J620 Engines

Emissions Standards

The proposed primary generators will be classified as non-emergency generators under this regulation and will have a horsepower-brake (HP) rating greater than 500 HP. Per 40 CFR §60.4233(e), the generators will be subject to the applicable emission standards in Table 1 of NSPS Subpart JJJJ. The applicable emission standards are summarized in **Table 4-3.**

Table 4-3: NSPS Subpart JJJJ Emissions Standards – Non-Emergency SI Natural Gas (HP≥500)

Pollutant	g/HP-hr	ppmvd at 15% O_2
NO_X	1.0	82
CO	2.0	270
VOC	0.7	60
Source: Table 1 to Subpart JJJJ of Part 60		

The facility will need to comply with the emission standards above by purchasing an engine certified by the manufacturer to comply with the emission standards. Further, the site will be required to operate and maintain the engine according to the manufacturer's emission-related written instructions and only change those emission-related settings that are permitted by the manufacturer. Records of conducted maintenance must be maintained on site to demonstrate compliance. The engine must be operated and maintained to ensure that the emissions standards are achieved over the lifetime of the engine.

Fuel Requirements

Fuel requirements under this subsection are only applicable to engines burning gasoline. The potential SI ICE at the facility will only burn natural gas and, therefore, this section is not applicable.

Notifications, Reporting, and Recordkeeping

An Initial Notification under NSPS Subpart A is not required for stationary ICE that are certified to meet the standards of 40 CFR 60.4231. The facility is required to keep records of all notifications submitted, all maintenance performed on the engine, and documentation

from the manufacturer that the engine is certified. Additionally, the proposed engines will not use propane as an alternative fuel, so no testing is required.

4.3.3.2 Black Start Engines

Emissions Standards

The proposed black start engines will be classified as emergency generators under this regulation and will have a HP rating greater than 500 HP. Per 40 CFR §60.4233(e), the generators will be subject to the applicable emission standards in Table 1 of NSPS Subpart JJJJ. The applicable emission standards are summarized in **Table 4-4.**

Table 4-4: NSPS Subpart JJJJ Emissions Standards – Emergency SI Natural Gas (HP≥130)

Pollutant	g/HP-hr	ppmvd at 15% O_2
NO_X	2.0	160
CO	4.0	540
VOC	1.0	86
Source: Table 1 to Subpart JJJJ of Part 60		

The facility will need to comply with the emission standards above by purchasing an engine certified by the manufacturer to comply with the emission standards. Further, the site will be required to operate and maintain the engine according to the manufacturer's emission-related written instructions and only change those emission-related settings that are permitted by the manufacturer. Records of conducted maintenance must be maintained on site to demonstrate compliance. The engine must be operated and maintained to ensure that the emissions standards are achieved over the lifetime of the engine.

Fuel Requirements

Fuel requirements under this subsection are only applicable to engines burning gasoline. The potential SI ICE at the facility will only burn natural gas and, therefore, this section is not applicable.

Notifications, Reporting, and Recordkeeping

An Initial Notification under NSPS Subpart A is not required for stationary ICE that are certified to meet the standards of 40 CFR 60.4231. The facility is required to keep records of all notifications submitted, all maintenance performed on the engine, and documentation

4.3.3.3 Temporary Engines

Pursuant to 40 CFR 60.4230(f), the temporary engines are not subject to the requirements of this subpart provided that they are located onsite for less than one year and are properly certified as non-road engines. The proposed temporary engines are Tier 2 certified and will be located onsite for two months (less than one year). Therefore, the temporary engines are not subject to the requirements of this subpart.

4.3.4 NSPS Subpart TTTT and TTTTa

Pursuant to 40 CFR 60.5508, Subpart TTTT establishes emission standards and compliance schedules for the control of GHG emissions from a stationary combustion turbine that

commences construction after January 8, 2014, but on or before May 23, 2023, or commences reconstruction after June 18, 2014, but on or before May 23, 2023.

Pursuant to 40 CFR 60.5509a, NSPS Subpart TTTTa establishes emission standards for the control of greenhouse gas emissions from a coal-fired steam generating unit or integrated gasification combined cycle facility (IGCC) that commences modification after May 23, 2023. This subpart also establishes emission standards and compliance schedules for the control of greenhouse gas emissions from a stationary combustion turbine that commences construction or reconstruction after May 23, 2023.

Both Subpart TTTT and TTTTa apply to either IGCC units or combustion turbines. As part of the project, VoltaGrid proposes installing RICE and not combustion turbines or IGCC units. As such, the project and its units are not subject to NSPS Subpart TTTT or Subpart TTTTa.

4.4 National Emissions Standards for Hazardous Air Pollutants (40 CFR 61, 63, and GRAQC 391-3-1-.02(9))

The National Emissions Standards for Hazardous Air Pollutants (NESHAP) promulgated in 40 CFR 61 and adopted by reference in GRAQC 391-3-1-.02(9), are stationary source standards for HAPs from specific source categories. The proposed project is not subject to any NESHAP under 40 CFR Part 61.

NESHAPs for Source Categories, promulgated in 40 CFR 63 and adopted by reference in GRAQC 391-3-1-.02(9), regulate emissions of HAPs from specific source categories. NESHAP set the maximum available control technology (MACT) standards for major sources of HAP. A facility that has potential emissions exceeding 10 tpy for any individual HAP and/or emissions exceeding 25 tpy for the sum of all HAPs is classified as a major source of HAP emissions. A facility that is not a major source of HAPs is classified as an area source. The proposed facility is an area source of HAPs. The following sections discuss the potentially applicable NESHAP standards to the proposed facility.

4.4.1 NESHAP Subpart A

NESHAP Subpart A provides generally applicable requirements for testing, monitoring, notifications, and recordkeeping. Any source that is subject to another subpart under 40 CFR 63 is also subject to Subpart A, unless stated otherwise.

4.4.2 NESHAP Subpart ZZZZ

NESHAP Subpart ZZZZ applies to new and existing stationary RICE located at both major and area sources of HAP emissions. Per 40 CFR 63.6590(c), for new or reconstructed stationary RICE located at an area source of HAP emissions, the only requirement under NESHAP Subpart ZZZZ is to meet the requirements of NSPS Subpart IIII for compression ignition (CI) ICE and of NSPS Subpart JJJJ for spark ignition (SI) ICE. Since the proposed SI ICE at the facility will be in compliance with NSPS Subpart JJJJ, the units will also be in compliance with NESHAP Subpart ZZZZ. No further requirements apply for these engines under this regulation.

4.4.3 NESHAP Subpart DDDDD

NESHAP Subpart DDDDD establishes national emission limitations and work practice standards for HAP emitted from industrial, commercial, and institutional boilers and process heaters located at major sources of HAP. However, the ATL-1 Facility is not a major source

of HAP, and as such NESHAP Subpart DDDDD is not applicable to the proposed fuel gas heaters.

4.4.4 NESHAP Subpart JJJJJJ

NESHAP Subpart JJJJJJ applies to industrial, commercial, or institutional boilers as defined in 40 CFR 63.11237 that is located at, or is part of, an area source of HAP. The ATL-1 Facility is an area source of HAP and the two 4 MMBtu/hr natural gas-fired fuel gas heaters meet the definition of a boiler located at an industrial facility. However, pursuant to 40 CFR 63.11195(e), a gas-fired boiler[3] as defined in 40 CFR 63.11237 is exempt from the requirements of NESHAP Subpart JJJJJJ. As such, NESHAP Subpart JJJJJJ is not applicable.

4.5 Compliance Assurance Monitoring (40 CFR 64)

Pursuant to 40 CFR 64.2(a), the provisions of 40 CFR 64 (CAM) are applicable to emission units that:

1. Are subject to an emission limitation or standard unless the standard is an NSPS or NESHAP standard promulgated after November 15, 1990;
2. Use a control device to achieve compliance with that emission limitation or standard; and
3. Whose pre-control emissions of the regulated air pollutant are equal to or greater than 100% of the amount required for the source to be classified as a major source.

Also, per 40 CFR 64.2(b)(vi), a unit equipped with a continuous emissions monitoring system (CEMS) is not required to develop a CAM plan. The Facility's PTE is not expected to be greater than the amount required for the source to be classified as a major source under the Title V program. Therefore, CAM regulations are not applicable.

4.6 Risk Management Program (RMP) (40 CFR 68)

Title III of the 1990 CAA Amendments contains requirements for subject facilities that store and/or process certain hazardous substances for ensuring their safe use. Under these requirements, facilities must identify and assess their hazards and carry out certain activities designed to reduce the likelihood and severity of accidental chemical releases. Section 112(r) of the CAA, codified in 40 CFR 68, mandates the EPA to publish rules to develop and implement RMPs for sources with more than the threshold quantity of a listed regulated substance to identify, prevent, and minimize the consequences of accidental releases. The three elements that should be incorporated into an RMP include:

- Hazard Assessment;
- Prevention Program; and
- Emergency Response Program.

The facility proposes to use 32.5% urea reagent in the SCRs on the engines, and as such the RMP requirements do not apply. Additionally, there are no RMP subject substances anticipated to be stored onsite in quantities greater than the threshold quantities listed in 40 CFR 68.130, Table 1. Therefore, the RMP will not apply.

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[3] Gas-fired boiler includes any boiler that burns gaseous fuels not combined with any solid fuels and burns liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or for periodic testing, maintenance, or operator training on liquid fuel. Periodic testing, maintenance, or operator training on liquid fuel shall not exceed a combined total of 48 hours during any calendar year.

4.7 Title V Program (40 CFR 70 and GRAQC 391-3-1-.03(10))

A Title V operating permit is required for operating the facility and is in addition to a pre-construction permit for any "major source" as defined in 40 CFR 70.2. To operate under a permit application shield, a complete and timely initial Title V permit application needs to be submitted within 12 months of beginning operation of the facility.

The proposed 90 MW Facility will not qualify as a major stationary source because the Facility-wide PTEs are well below the applicable thresholds for the regulated air pollutants.

4.8 Acid Rain Program (40 CFR 72 and GRAQC 391-3-1-.13))

The Acid Rain Program is codified in Title IV of the Clean Air Act. The purpose of this regulation is to reduce and/or limit emissions of NO_X and SO_X, which contribute to acid rain. This regulation establishes certain general provisions and the operating permit program requirements for affected sources and units under the Acid Rain Program, pursuant to Title IV of the CAA. Further requirements for affected sources under Part 72 are outlined in 40 CFR 73, 74, 75, 76, 77, and 78.

Pursuant to 40 CFR 72.6(b)(9) and 40 CFR 72.7(a), new units (ones that have not previously lost an exemption) that serve one or more generators with total nameplate capacity of 25 MWe or less, that burn gaseous fuel with an annual average sulfur content of 0.05 % or less by weight, and that do not burn any coal or coal-derived fuels are exempt from the requirements of the Acid Rain Program. The proposed engines will burn only natural gas and will not serve generators with a total nameplate capacity of 25 MWe or more. As such, the provisions of the Acid Rain Program are not expected to be applicable.

4.9 Greenhouse Gas Reporting (40 CFR 98)

40 CFR 98[4] establishes mandatory GHG reporting requirements for owners and operators of certain facilities that directly emit GHG as well as for certain suppliers. Per 40 CFR 98.2(a)(1), "electricity generation units that report CO_2 mass emissions year-round through 40 CFR 75 (subpart D)" are part of the source categories presented in Table A-3 of 50 CFR 98, Subpart A. As such, pursuant to 40 CFR 98.2(a)(3), the power plant will be required to report under Part 98, if the aggregate maximum rated heat input capacity of the stationary fuel combustion units at the facility is 30 MMBtu/hr or greater, and if the facility emits 25,000 metric tons CO_2e or more per year in combined emissions from all stationary fuel combustion sources (both conditions are expected to be satisfied). As such, GHG reporting obligations under 40 CFR 98 are expected to be applicable to the proposed Facility.

4.10 Georgia Rules for Air Quality Control

In addition to the federal regulations, the GRAQC establishes regulations applicable at the emission unit level. The state regulations also include general requirements for facilities, such as the requirement to obtain construction and operating permits. Source specific standards in the GRAQC that are potentially applicable to the facility are discussed in the following sections.

[4] The USEPA is proposing to amend the Greenhouse Gas Reporting Program (GHGRP) to remove program obligations for most source categories. The comment period closed on November 3, 2025.

4.10.1 GRAQC 391-3-1-.02(2)(a) – General Provisions

Rule (a) broadly prohibits the emission of air contaminants which unreasonably interfere with the enjoyment of life or use of property. To that end, GRAQC 391-3-1-0.2(2)(a)3(ii) specifies that the Director can provide more specific restrictions and limitations to safeguard the public health, safety, and welfare of the people of the State of Georgia.

As a new source, the Facility is required to conduct a Toxic Impact Assessment (TIA) if the maximum uncontrolled emissions of TAP are greater than the Minimum Emission Rate (MER) values identified in Appendix A of the Guideline. Each listed TAP has an established MER, a short-term Acceptable Ambient Concentration (AAC), and a long-term AAC. If the TAP emission rate from a source is above its *MER* level, further determination of compliance with the AACs is required. Compliance with this requirement and the ambient air quality assessment are addressed in **Section 5**.

4.10.2 GRAQC 391-3-1-.02(2)(b) – Visible Emissions

Rule (b) limits visible emissions from all sources to no more than 40% opacity, unless a source has another opacity limitation elsewhere in the Georgia rules. This limitation is applicable to the proposed emission units to be located at the facility, and the facility will comply with this limitation through the exclusive use of natural gas in its generator engines, which will result in negligible visible emissions.

4.10.3 GRAQC 391-3-1-.02(2)(d) – Fuel-Burning Equipment

Rule (d) provides standards for PM emissions and visible emissions from fuel-burning equipment. Fuel-burning equipment is defined as "equipment the primary purchase of which is the production of thermal energy from the combustion of any fuel."[5] The proposed generators do not meet this definition of fuel-burning equipment, therefore, are not subject to the limitations in Rule (d).

4.10.4 GRAQC 391-3-1-.02(2)(e) – Particulate Emission from Manufacturing Processes

Rule (e), also known as the process weight rate (PWR) rule, limits emissions from manufacturing processes based on their process input weight rates. This rule is not applicable to the proposed emission units as they are not manufacturing equipment.

4.10.5 GRAQC 391-3-1-.02(2)(g) – Sulfur Dioxide

This regulation provides emissions standards for new and existing fuel-burning sources (not "fuel-burning equipment"). For fuel-burning sources with a heat input capacity of less than 100 million British thermal units per hour (MMBtu/hr), Rule (g) limits the sulfur content of the fuels burned to less than 2.5 % by weight (wt%). This rule is applicable to the proposed generators to be located at the facility. VoltaGrid will comply with this limitation through the exclusive use of natural gas in its engines.

4.10.6 GRAQC 391-3-1-.02(2)(n) – Fugitive Dust

Rule (n) requires facilities to take reasonable precautions to limit fugitive dust from becoming airborne. Further, opacity from fugitive dust sources, such as roads and the handling of dusty materials, is limited to 20% opacity. VoltaGrid will comply with the

[5] GRAQC 391-3-1-.01(cc)

requirements of this rule, including during periods of construction, through appropriate mitigative measures.

4.10.7 GRAQC 391-3-1-.02(2)(tt) – VOC Emissions from Major Sources

Rule (tt) requires a review of reasonably available control technology (RACT) from sources in certain Atlanta metropolitan area counties that have potential VOC emissions exceeding 100 TPY.[6] The facility will have less potential VOC emissions than this threshold, so a case-by-case RACT analysis is not required.

4.10.8 GRAQC 391-3-1-.02(2)(yy) – Emissions of NO_X from Major Sources

Rule (yy) requires a case-by-case NO_X RACT review for facilities located in certain Atlanta metropolitan area counties that have potential NO_X emissions exceeding 100 TPY.[7] The potential NO_X emissions from the facility do not exceed 100 TPY. Additionally, per GRAQC 391-3-1-.02(2)(yy)5, the requirements of this rule do not apply to individual equipment at the source which are subject to (jjjj), (lll), (mmm), or (nnn). As discussed in **Section 4.10.10**, the proposed generators will be subject to Rule (mmm); therefore, as the proposed generators will be the only source of NO_X at the facility, the provisions of Rule (yy) will not apply. Even though a RACT review is not required, since the proposed generators will be Tier 2 certified, they are expected to meet RACT.

4.10.9 GRAQC 391-3-1-.02(2)(lll) – NO_X Emissions from Fuel-Burning Equipment

Rule (lll) applies to affected fuel-burning equipment located in certain Atlanta metropolitan area counties that have a heat input capacity between 10 MMBtu/hr and 250 MMBtu/hr. The facility is located in Newton County, which is a listed county, and each generator will have a heat input capacity within the specified range. However, as previously discussed, the SI ICE do not meet the definition of fuel-burning equipment under the Georgia rules. Thus, Rule (lll) does not apply.

4.10.10 GRAQC 391-3-1-.02(2)(mmm) – NO_X Emissions from Stationary Gas Turbines and Stationary Engines used to Generate Electricity

Rule (mmm) provides NO_X emission limitations for stationary gas turbines and stationary engines located in certain Atlanta metropolitan area counties, including Newton County. This regulation is applicable to the proposed generator engines. Specifically, the emissions from the facility's engines shall not exceed 80 ppm of NO_X at 15% O_2. Compliance with this emissions limitation is guaranteed by the vendor specifications.

4.10.11 GRAQC 391-3-1-.02(2)(rrr) – NO_X Emissions from Small Fuel-Burning Equipment

Rule (rrr) applies to affected fuel-burning equipment located in certain Atlanta metropolitan area counties that have a heat input capacity less than 10 MMBtu/hr. While the facility is located in the listed counties, none of the generators will meet the definition of fuel-burning equipment. As such, Rule (rrr) does not apply.

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[6] GRAQC 391-3-1-.02(2)(tt)3
[7] GRAQC 391-3-1-.02(2)(yy)2

5. TOXICS IMPACT ASSESSMENT

The GA EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions ("Guideline")* provides requirements for assessing the impacts of TAP emissions from a proposed project.[8] The *Guideline* defines a TAP as any substance which may have an adverse effect on public health, excluding any specific substance that is covered by a state or federal ambient air quality standard. If a facility's emissions of a specific TAP are less than the MER, no further analysis is required for that pollutant. Otherwise, an air dispersion modeling analysis is required to demonstrate that the facility's emissions of the TAP will not exceed the pollutant's AAC. Appendix A of the *Guideline* provides a list of state TAPs, as well as their respective MERs and AACs.

A comparison of the potential emissions of each TAP from the proposed facility to the MERs is provided in **Table 5-1**, which indicates that a TIA is only required for seven (7) pollutants – 1,3-Butadiene, Acetaldehyde, Acrolein, Ammonia, Benzene, Ethylene Dibromide and Formaldehyde. Each of the seven TAPs has long-term AAC on an annual basis.

Table 5-1: Comparison of Facility-Wide TAP Emissions to Georgia MERs

Toxic Air Pollutant Emissions		Facility-Wide Emissions	Minimum Emission Rate (MER)	Review Required?
Pollutant	CAS Number	lb/year	lb/year	(Model / No)
1,1,2,2-Tetrachloroethane	79-34-5	18	414	No
1,1,2-Trichloroethane	79-00-5	14	1,521	No
1,1-Dichloroethane	75-34-3	11	46,334	No
1,2-Dichloroethane	107-06-2	11	94	No
1,2-Dichloropropane	78-87-5	12	973	No
1,3-Butadiene	106-99-0	119	7	Model
1,3-Dichloropropene	542-75-6	12	487	No
Acetaldehyde	75-07-0	3,737	1,107	Model
Acrolein	107-02-8	2,298	85	Model
Ammonia	7664417	72,707	24,333	Model
Arsenic	7440382	0	0	No
Barium	7440393	0	58	No
Benzene	71-43-2	197	32	Model
Beryllium Compounds	7440417	0	1	No
Biphenyl	92-52-4	95	117	No
Cadmium Compounds	7440439	0	1	No
Carbon Tetrachloride	56-23-5	16	162	No
Chlorobenzene	108-90-7	14	40,542	No

[8] *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*. Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch. Revised May 2017. https://epd.georgia.gov/air/sites/epd.georgia.gov.air/files/related_files/document/ToxicGuideline_May2017.pdf

Toxic Air Pollutant Emissions		Facility-Wide Emissions	Minimum Emission Rate (MER)	Review Required?
Pollutant	CAS Number	lb/year	lb/year	(Model / No)
Chloroethane	75-00-3	1	2,433,300	No
Chloroform	67-66-3	13	106	No
Chromium	7440473	0	58	No
Cobalt	7440484	0	12	No
Copper	7440508	0	117	No
Dichlorobenzene	95-50-1	0	17,375	No
Ethylbenzene	100-41-4	18	243,330	No
Ethylene Dibromide	106-93-4	20	4	Model
Formaldehyde	50-00-0	10,512	22	Model
Manganese	7439965	0	12	No
Mercury	7439976	0	73	No
Methanol	67-56-1	1,118	30,127	No
Methylcyclohexane	108-87-2	550	231,767	No
Methylene Chloride	75-09-2	9	5,183	No
Naphthalene	91-20-3	33	730	No
n-Hexane	110-54-3	620	170,331	No
Nickel	7440020	0	39	No
n-Pentane	109-66-0	1,162	341,858	No
Perchloroethylene	127-18-4	1	78,553	No
Phenol	108-95-2	11	2,200	No
Propane	74-98-6	18,721	208,600	No
Selenium	7782492	0	23	No
Styrene	100-42-5	11	243,330	No
Toluene	108-88-3	183	1,216,650	No
Vinyl Chloride	75-01-4	7	56	No
Xylenes	1330-20-7	82	24,333	No

The TIA was conducted using USEPA's SCREEN3 modeling software (version 13043), which evaluates the maximum 1-hour average impact. Ramboll prepared three separate model runs, one for each of the emission units at the Facility:

1. One J620 engine/generator with a unit emission rate of 1 g/s,
2. One black start emergency engine with a unit emission rate of 1 g/s, and
3. One fuel gas heater with a unit emission rate of 1 g/s.

This approach conservatively models the maximum impact. The temporary engines will be onsite only for two months and as such, were not included in the TIA.

Per Appendix A of the *Guideline*, the majority of the modeled pollutants have both a short-term (15-minute average) AAC and a long-term (annual average) AAC. The proposed generators and the two fuel gas heaters are permitted to operate continuously throughout the year, so the short-term and long-term modeled emission rates are identical. The black start engine will be operated for 100 hours/year.

In accordance with the *Guideline*, the maximum facility-wide short-term 1-hour modeled impact was converted to a 15-minute impact by multiplying by a factor of 1.32, and the maximum facility-wide long-term 1-hour modeled impacts were converted to annual impacts by multiplying the maximum modeled concentration by a factor of 0.08.

The results of the TIA are presented in **Table 5-2** and demonstrate that the impacts from the proposed Facility will be less than the AACs. The SCREEN3 model output files supporting this TIA are provided in **Attachment D**.

Table 5-2: Comparison of Modeled TAP Impacts with the AACs

Pollutant	Short Term AAC (15-min)			Long Term AAC (Annual)		
Pollutant	**Impact (µg/m³)**	**AAC (µg/m³)**	**Exceeds AAC?**	**Impact (µg/m³)**	**AAC (µg/m³)**	**Exceeds AAC?**
1,3-Butadiene	0.02	1100	No	0.00	0.03	No
Acetaldehyde	0.61	4500	No	0.04	4.55	No
Acrolein	0.37	23	No	0.02	0.35	No
Ammonia	14.55	2400	No	0.88	100.00	No
Benzene	0.03	1600	No	0.00	0.13	No
Ethylene Dibromide	0.00	23050	No	0.00	0.02	No
Formaldehyde	1.10	245	No	0.07	0.09	No

FIGURES

Figure 1 Site Location

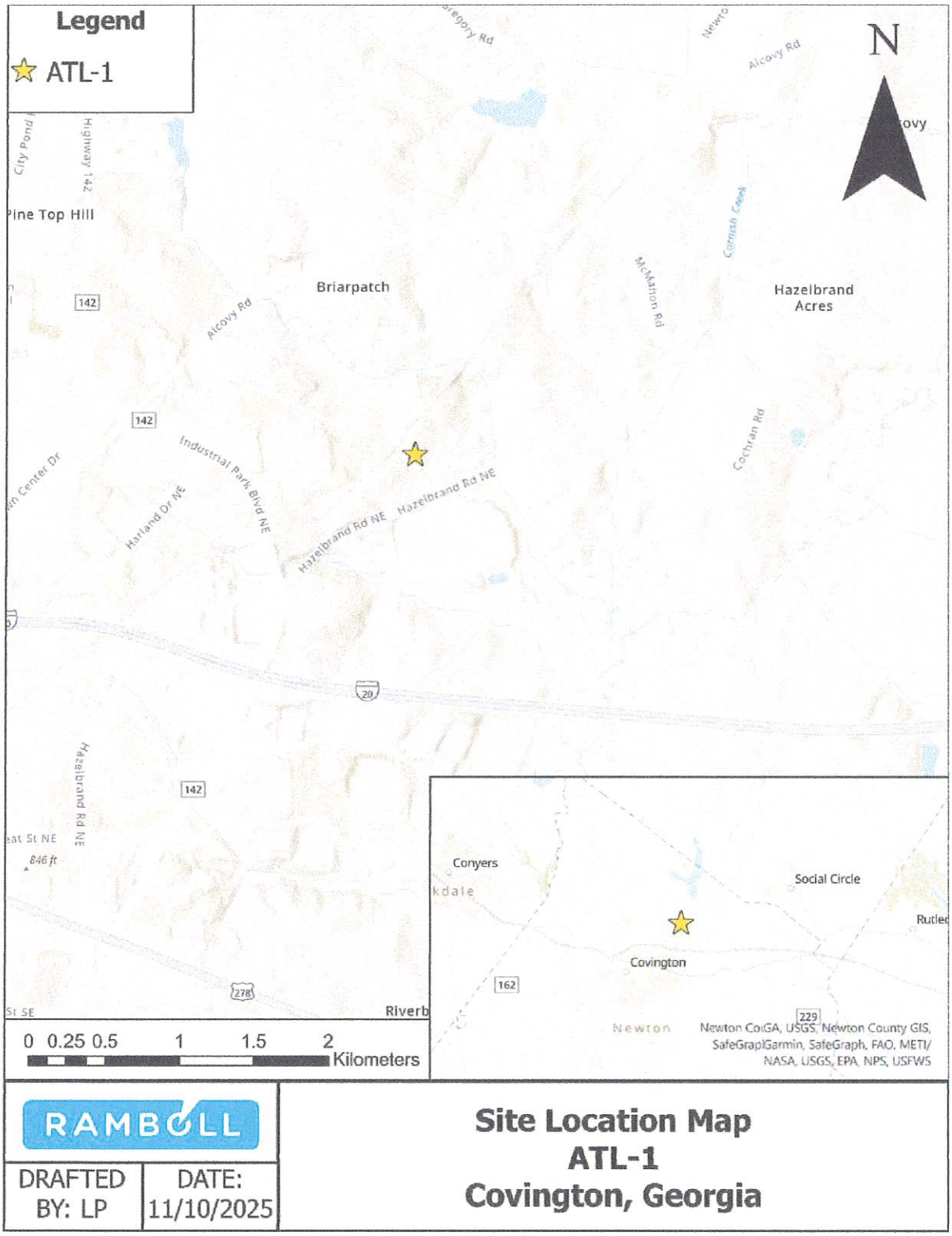


Figure 2 ATL-1 Site Layout Plan

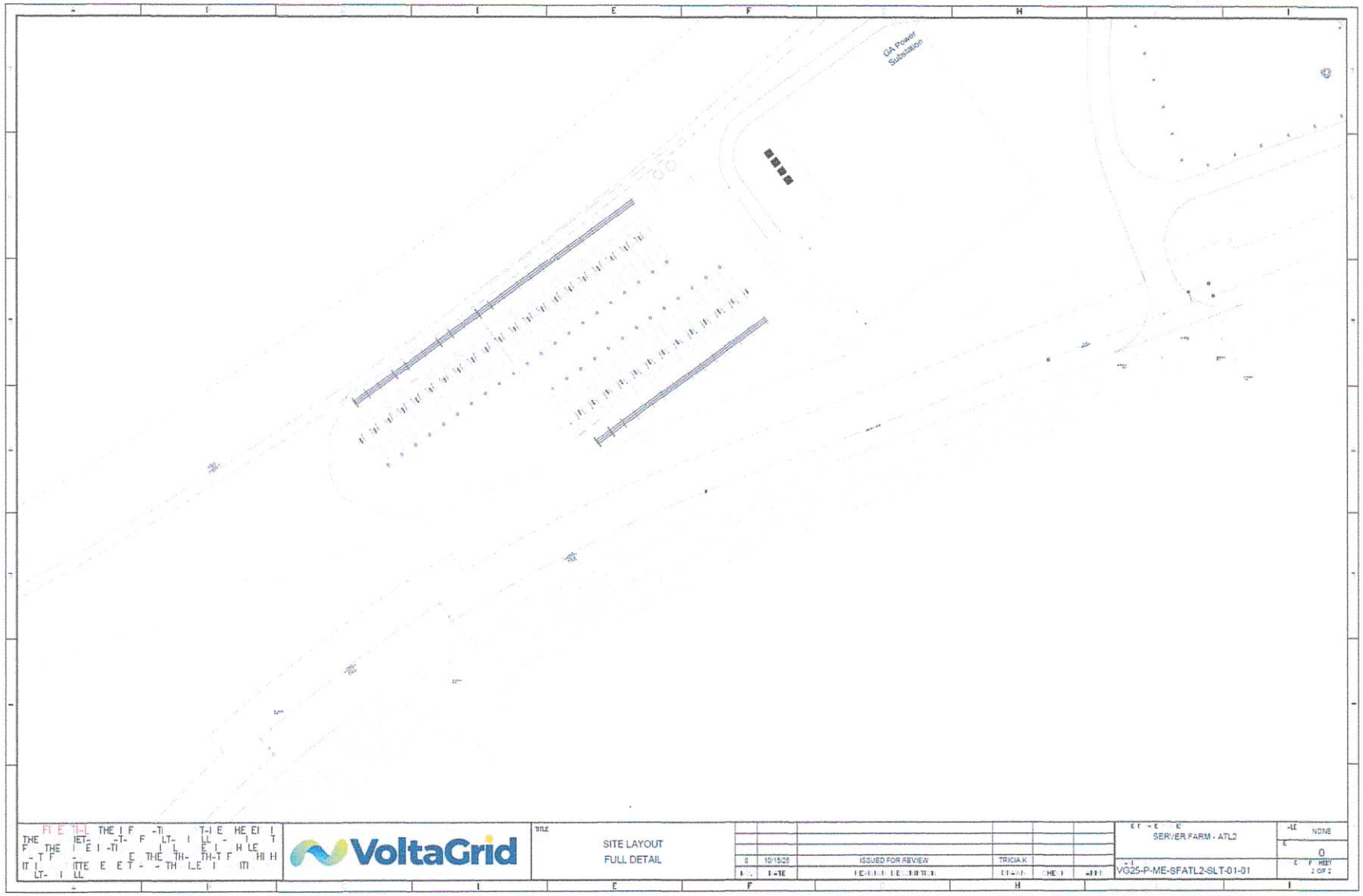
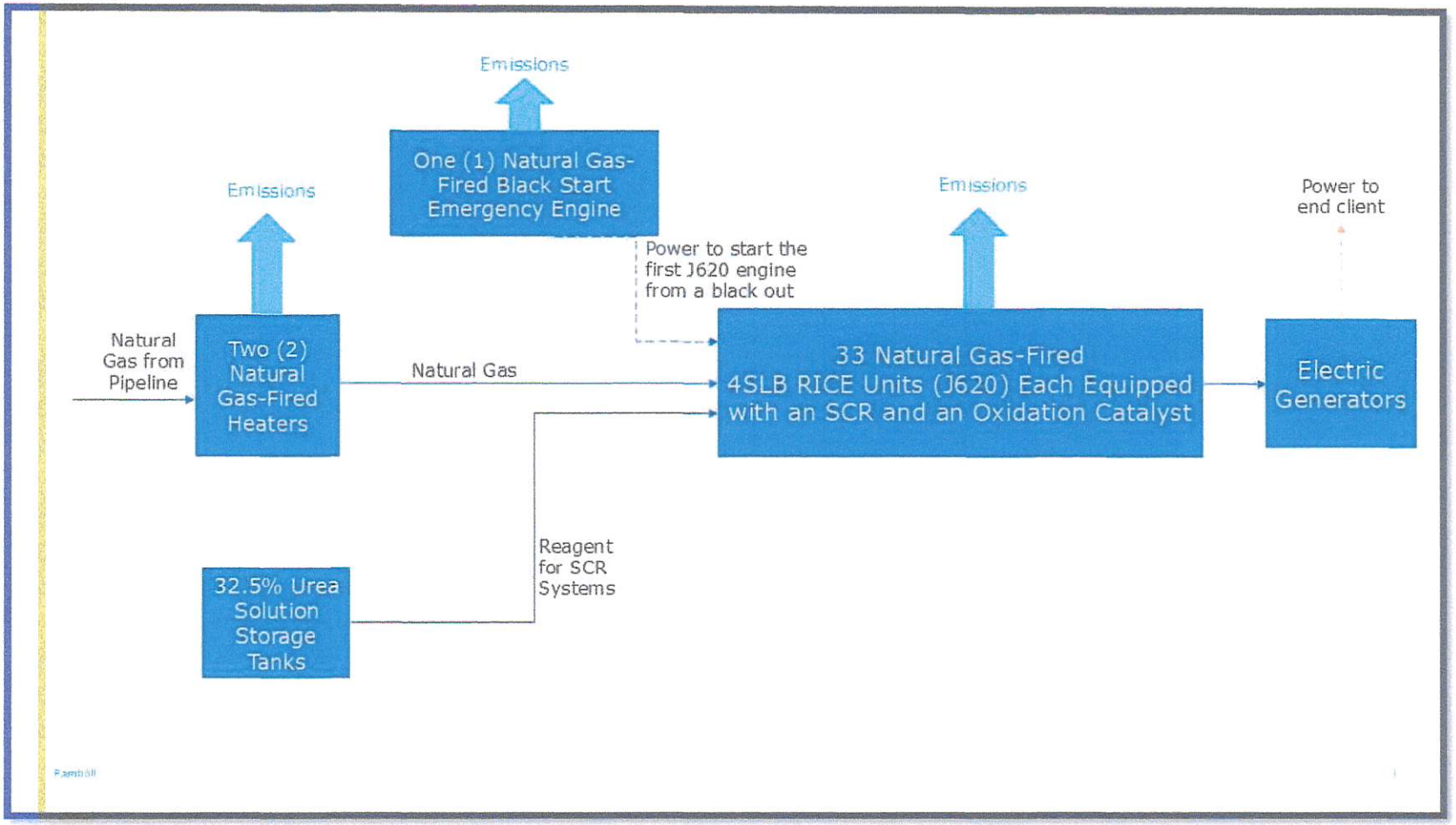


Figure 3 Process Flow Diagram



APPENDIX A
GA EPD SIP PERMIT APPLICATION FORMS

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

EXPEDITED PERMITTING PROGRAM – APPLICATION FOR ENTRY TO PROGRAM FOR AIR PERMITS

RECEIVED
AIR PROTECTION BRANCH

EPD Use Only

Date Received: NOV 14 2025 Application No. 29947

To be eligible for expedited review, this application form must be accompanied by the complete permit application for the type of air permit being requested.

1. Contact Information

Facility Name: VoltaGrid ATL-1 EGU
AIRS No. (if known): 04-13-217-00080
Contact Person: Korby Bracken Title: Senior Director - Health, Safety, & Environment
Telephone No.: (307) 630-1430 Alternate Phone No.:
Email Address: korby.bracken@voltagrid.com

If EPD is unable to contact me, please contact the alternate contact person:
Contact Person: Title:
Telephone No.: Alternate Phone No.:
Email Address:

On Page 2 of this form, please check the appropriate box for which type of air permit you are requesting expedited review.

I have read the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I have participated in the required pre-application meeting with EPD. I understand that it is my responsibility to ensure an application of the highest quality is submitted and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.

Signature: Korby Bracken Date: November 12, 2025

2. Applying For Which Type of Permit: (Please Check Appropriate Box)

Expedited Review Fees for Air Permits	
Permit Type – Please Check One	**Expedited Review Fee* as of January 1, 2025**
☐ Generic Permit: Concrete Batch Plant – Minor Source	$2,500
☐ Generic Permit: Concrete Batch Plant – Synthetic Minor Source	$3,750
☐ Generic Permit: Hot Mix Asphalt Plant – Synthetic Minor Source	$5,000
☐ Minor Source SIP Permit (or Amendment)	$7,500
☐ Permit-by-Rule	$7,500
☐ Title V 502(b)(10) Permit Amendment	$10,000
☒ Synthetic Minor SIP Permit (or Amendment)	$10,000
☐ Major Source SIP Permit **not** subject to Prevention of Significant Deterioration (PSD) or 112(g)	$15,000
☐ Title V Minor Modification with or without Construction	$10,000
☐ Title V Significant Modification with or without Construction (Not subject to PSD or 112(g))	$15,000
☐ Major Source SIP Permit subject to 112(g) but **not** subject to PSD	$37,500
☐ PSD Permit (or Amendment) **not** subject to NAAQS and/or PSD Increment Modeling	$37,500
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling but **not** subject to Modeling for $PM_{2.5}$, NO_2, or SO_2	$50,000
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2	$62,500
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2 and also impacting a Class I Area	$75,000
* Do not send fee payment with this form. Upon acceptance of application for the expedited permit program, EPD will notify you and an invoice will appear on GECO. Fees must be paid via check to "Georgia Department of Natural Resources" within ten (10) business days of acceptance.	

3. Comments.

This section is optional. Applicants may use this field to include specific comments or requests for EPD consideration. For example, the applicant may use this field to request a public hearing or to remind EPD of review time needs and/or expectations that may differ from the time frames in the procedures.

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

RECEIVED
NOV 14 2025
AIR PROTECTION BRANCH

EPD Use Only

Date Received: NOV 14 2025 Application No. 29947

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: VoltaGrid ATL-1 EGU

AIRS No. (if known): 04-13-217-00080

Facility Location: Street: Hazelbrand Road NE

City: Covington Georgia Zip: 30014 County: Newton

Is this facility a "small business" as defined in the instructions? Yes: ☐ No: ☒

2. Facility Coordinates

Latitude: 33° 37' 20.6" **NORTH** Longitude: 83° 48' 59.4" **WEST**

UTM Coordinates: 238716 **EAST** 3723847 **NORTH** **ZONE** 17 S

3. Facility Owner

Name of Owner: VoltaGrid, LLC

Owner Address Street: 10800 Telge Road

City: Houston State: TX Zip: 77095

4. Permitting Contact and Mailing Address

Contact Person: Korby Bracken Title: Senior Director – Health, Safety, & Environment

Telephone No.: (307) 630-1430 Ext. Fax No.:

Email Address: korby.bracken@voltagrid.com

Mailing Address: Same as: Facility Location: ☐ Owner Address: ☒ Other: ☐

If Other: Street Address: 10800 Telge Road

City: Houston State: TX Zip: 77095

5. Authorized Official

Name: Korby Bracken Title: Senior Director – Health, Safety, & Environment

Address of Official Street: 10800 Telge Road

City: Houston State: TX Zip: 77095

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature: Kody Bracken Date: NOVEMBER 12, 2025

6. **Reason for Application: (Check all that apply)**

☒ New Facility (to be constructed)
☐ Existing Facility (initial or modification application)
☒ Permit to Construct
☒ Permit to Operate
☐ Change of Location
☐ Permit to Modify Existing Equipment: Affected Permit No.: _____
☐ Revision of Data Submitted in an Earlier Application
Application No.: _____
Date of Original Submittal: NOVEMBER 12, 2025

7. **Permitting Exemption Activities (for permitted facilities only):**

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☒ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. **Has assistance been provided to you for any part of this application?**

☐ **No** ☐ **Yes, SBAP** ☒ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: Ramboll Americas Engineering Solutions, Inc.
Name of Contact: Sim Deshpande
Telephone No.: 978-449-0304 Fax No.: _____
Email Address: sdeshpande@ramboll.com
Mailing Address: Street: One Technology Park Drive
City: Westford State: MA Zip: 01886

Describe the Consultant's Involvement:

Application Preparer

9. **Submitted Application Forms:** Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
1	2.00 Emission Unit List
1	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
	2.06 Manufacturing and Operational Data
1	3.00 Air Pollution Control Devices (APCD)
	3.01 Scrubbers
	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
1	5.00 Monitoring Information
	6.00 Fugitive Emission Sources

1	7.00 Air Modeling Information

10. Construction or Modification Date

Estimated Start Date: March 2026

11. *If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?*

☐ No ☒ Yes

12. New Facility Emissions Summary

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	115.10	99
Nitrogen oxides (NOx)	41.57	99
Particulate Matter (PM) (filterable only)	18.43	99
PM <10 microns (PM10)	18.43	99
PM <2.5 microns (PM2.5)	18.43	99
Sulfur dioxide (SO_2)	8.80	99
Volatile Organic Compounds (VOC)	30.05	99
Greenhouse Gases (GHGs) (in CO2e)	433,298	433,298
Total Hazardous Air Pollutants (HAPs)	9.67	9.67
Individual HAPs Listed Below:		
Formaldehyde	5.16	5.16
See permit application narrative		

13. Existing Facility Emissions Summary

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	N/A	N/A	N/A	N/A
Nitrogen oxides (NOx)				
Particulate Matter (PM) (filterable only)				
PM <10 microns (PM10)				
PM <2.5 microns (PM2.5)				
Sulfur dioxide (SO_2)				
Volatile Organic Compounds (VOC)				
Greenhouse Gases (GHGs) (in CO2e)				
Total Hazardous Air Pollutants (HAPs)				

Individual HAPs Listed Below:				

14. 4-Digit Facility Identification Code:

SIC Code: 4911 SIC Description: Electric Services

NAICS Code: 221112 NAICS Description: Fossil Fuel Electric Power Generation

15. *Description of general production process and operation for which a permit is being requested.* If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

The VoltaGrid ATL-1 facility will consist of 33 natural gas-fired four-stroke lean burn Jenbacher J620 engine/generators which will provide prime power to the nearby Serverfarm facility (located at 10834 Hazelbrand Road NE in Covington, Georgia). The ATL-1 facility will also include one (1) black start engine, two (2) fuel gas heaters, and up to five (5) temporary engines (the temporary engines will be operational for a total of two months prior to installation and operation of the 33 x J620 units). See permit application narrative for additional details.

16. Additional information provided in attachments as listed below:

Attachment A - SIP Permit Application Forms

Attachment B - Supporting Calculations

Attachment C - Engine Specifications

Attachment D - Air Dispersion Modeling Files

Attachment E -

Attachment F -

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal:

☒ Flow Diagram or date of previous submittal:

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☒ No ☐ Yes, please list below:

19. List requested permit limits including synthetic minor (SM) limits.

The applicant is requesting a facility-wide CO limit of 99 tons per year. The facility will track the emissions on an aggregate, 12-month rolling basis to stay below the 99 tons per year CO limit. No other permit limits are being requested as part of this Georgia SIP Permit application.

20. Effective March 1, 2019, permit application fees will be assessed. The fee amount varies based on type of permit application. Application acknowledgement emails will be sent to the current registered fee contact in the GECO system. If fee contacts have changed, please list that below:

Fee Contact name: Korby Bracken

Fee Contact email address: korby.bracken@voltagrid.com

Fee Contact phone number: (307) 630-1430

Fee invoices will be created through the GECO system shortly after the application is received. It is the applicant's responsibility to access the facility GECO account, generate the fee invoice, and submit payment within 10 days after notification.

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
EU1 - EU33	Generator #1 through #33	Jenbacher J620	4,425 hp natural gas-fired electricity generating units
EU34	Black Start Engine	MESA GV22PU	684 hp natural gas-fired emergency generator
EU35 - EU36	Fuel Gas Heater #1 and #2	Algas-SDI SH400-LN	4 MMBtu/hour natural gas-fired fuel gas heaters

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 2.01 – BOILERS AND FUEL BURNING EQUIPMENT

Emission Unit ID	Type of Burner	Type of Draft[1]	Design Capacity of Unit (MMBtu/hr Input)	Percent Excess Air	Dates		Date & Description of Last Modification
					Construction	Installation	
EU1 - EU33	Internal Combustion Engines (Natural Gas, 4SLB)	N/A	25	N/A	March 2026	March 2026	N/A
(per engine)							
EU34	Internal Combustion Engine (Natural Gas, 4SRB)	N/A	4.742	N/A	March 2026	March 2026	N/A
EU35 - EU36	External Combustion Heater (Natural Gas)	N/A	4	N/A	March 2026	March 2026	N/A
(per heater)							

[1] This column does not have to be completed for natural gas only fired equipment.

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FUEL DATA

Emission Unit ID	Fuel Type	Potential Annual Consumption				Hourly Consumption		Heat Content		Percent Sulfur		Percent Ash in Solid Fuel	
		Total Quantity		Percent Use by Season									
		Amount	Units	Ozone Season May 1 - Sept 30	Non-ozone Season Oct 1 - Apr 30	Max.	Avg.	Min.	Avg.	Max.	Avg.	Max.	Avg.
EU1 - EU33	Natural Gas	215	SCF	42	58	0.025	0.025	1020	1020	0.001	0.001	N/A	N/A
(per engine)													
EU34	Natural Gas	40.73	SCF	42	58	0.005	0.005	1020	1020	0.001	0.001	N/A	N/A
EU35 - EU36	Natural Gas	34.35	SCF	42	58	0.004	0.004	1020	1020	0.001	0.001	N/A	N/A
(per heater)													

Fuel Supplier Information						
Fuel Type	Name of Supplier	Phone Number	Supplier Location			
			Address	City	State	Zip
Natural Gas	TBD					

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
CD1 - CD33	EU1 - EU33	SCR and Catalytic Oxidation	TBD	Jenbacher J620 with SCR and Catalytic Oxidation	No	Unknown	~680	~17,000
								(per control device)

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2024

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
CD1 - CD34	NOx	98	98	9.00	Calculation	0.18	Manufacturer Specifications + 20% safety factor	4
CD1 - CD34	CO	95	95	13.02	Calculation	0.65	Manufacturer Specifications + 5% safety factor	4
CD1 - CD34	VOC	95	95	3.60	Calculation	0.18	Manufacturer Specifications + 20% safety factor	4
CD1 - CD34	Formaldehyde (CH2O)	95	95	0.36	Calculation	0.018	Manufacturer Specifications + 20% safety factor	4

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
EU1 - EU33	CD1 - CD33	S1 - S33	PM/PM2.5/PM10	0.12	0.12	TBD	0.53	Manufacturer's Specifications
(per EU)	(per CD)	(per stack)	SO2	0.06	0.06	TBD	0.26	Manufacturer's Specifications
			NOX	0.18	9.00	TBD	0.80	Manufacturer's Specifications
			VOC	0.18	3.60	TBD	0.79	Manufacturer's Specifications
			CO	0.65	13.02	TBD	2.87	Manufacturer's Specifications
			Formaldehyde	0.018	0.13	TBD	0.08	Manufacturer's Specifications
			Total HAP	0.11	0.33	TBD	0.19	AP-42

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
EU34	CD34	S34	PM/PM2.5/PM10	0.09	0.09	TBD	0.005	AP-42
			SO2	0.003	0.003	TBD	0.0001	AP-42
			NOX	0.13	0.13	TBD	0.006	Manufacturer's Specifications
			VOC	0.09	0.09	TBD	0.004	Manufacturer's Specifications
			CO	0.03	0.03	TBD	0.002	Manufacturer's Specifications
			Formaldehyde	0.10	0.10	TBD	0.005	AP-42
			Total HAP	0.15	0.33	TBD	0.008	AP-42

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
EU35 - EU36	CD34 - CD36	S34 - S36	PM/PM2.5/PM10	0.03	0.03	TBD	0.13	Manufacturer's Specifications
(per EU)	(per CD)	(per stack)	SO2	0.01	0.01	TBD	0.05	Manufacturer's Specifications
			NOX	0.05	0.05	TBD	0.21	Manufacturer's Specifications
			VOC	0.02	0.02	TBD	0.10	Manufacturer's Specifications
			CO	0.15	0.15	TBD	0.65	Manufacturer's Specifications
			Formaldehyde	0.0003	0.0003	TBD	0.001	AP-42
			Total HAP	0.008	0.008	TBD	0.03	AP-42

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 5.00 MONITORING INFORMATION

Emission Unit ID/ APCD ID	Emission Unit/APCD Name	Monitored Parameter		Monitoring Frequency
		Parameter	Units	
EU1 - EU33	Generator #1 through #33	Annual operating hours of each generator	hours	Monthly
EU34	Black Start Engine #1	Annual operating hours	hours	Monthly
EU35 - EU36	Fuel Gas Heater #1 and #2	Fuel Consumption	SCF of natural gas	Monthly

Comments:

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	Inside Diameter (ft)	Exhaust Direction	Height (ft)	Longest Side (ft)	Velocity (ft/sec)	Temperature (°F)	Flow Rate (acfm)	
									Average	Maximum
S1 - S33	EU1-EU33	62	2.5	Vertical	36	1400	71.5	682	21,068	21,068
S34	EU34	18	2.3	Vertical	36	1400	43.8	858	11,198	11,198
S35-S36	EU35-EU36	13.4	1.16	Vertical	36	1400	21.2	400	1,358	1,358

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

Facility Name: VoltaGrid ATL-1 EGU **Date of Application:** November 2025

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
See permit application narrative				☐
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APPENDIX B
EMISSIONS CALCULATIONS

Table 1. VoltaGrid ATL-1 EGU Emission Summary

Project Emissions Summary: Annual Emissions (tpy - total) [1]													
Pollutant --->	**VOC**	**NO_X**	**CO**	**SO_2**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**	**Single HAP**	**Total HAPs**
J620 Primary Engines	26.19	26.45	94.71	8.67	17.34	17.34	17.34	423,278	7.98	0.80	423,713	2.61	6.13
Temporary CATG3520 Engines	3.67	14.69	19.09	0.02	0.82	0.82	0.82	5,433	0.09	0.01	5,439	2.64	3.47
Black Start Emergency Engine	0.004	0.006	0.002	1.39E-04	0.005	0.005	0.005	41	0.06	0.00	43	4.86E-03	0.01
Fuel Gas Heaters	0.19	0.42	1.30	0.11	0.26	0.26	0.26	4,099	0.08	0.01	4,103	2.58E-03	0.07
Total Site-Wide Annual Emissions	**30.05**	**41.57**	**115.10**	**8.80**	**18.43**	**18.43**	**18.43**	**432,851**	**8.21**	**0.82**	**433,298**	**5.26**	**9.67**
Requested Site-wide Permit Limitations	**99.00**	**99.00**	**99.00**	**99.00**	**99.00**	**99.00**	**99.00**	--	--	--	**433,298**	**5.26**	**9.67**
New Source Review (NSR) Major Source Thresholds [2]	*100*	*100*	*250*	*250*	*250*	*250*	*250*	--	--	--	*100,000*	--	--
Below NSR Major Source Threshold?	YES	YES	YES	YES	YES	YES	YES	--	--	--	*NOTE 4*	--	--
Title V Major Source Threshold [3]	*100*	*100*	*100*	*100*	*100*	*100*	*100*	--	--	--	--	*10*	*25*
Below Title V Major Source Threshold?	YES	YES	YES	YES	YES	YES	YES	--	--	--	--	YES	YES

Notes:

[1] Total facility-wide annual emissions include emissions from all engines and include all modes of operation (startup and steady state operation).

[2] Major source New Source Review threshold is 250 tons/year per 40 CFR 52.21 and GAC Subject 391-3-1. The threshold for NOx and VOC, however, are lowered because Newton county is in maintenance for the 2008 ozone standard.

[3] Title V major source threshold is 100 tons/year for any criteria pollutant (for sources located in attainment areas) or 10 tons/year for any single HAP or 25 tons/year for combined HAPs.

[4] While the GHG emissions are above the major source threshold, USEPA's July 24, 2014 memo (https://www.epa.gov/sites/default/files/2015-08/documents/2014scotus.pdf) notes that PSD review cannot be triggered for GHGs alone.

Table 2. Engine Specifications and Vendor Emissions Data

Parameter	Units	Post-Control Emissions (100% Load)	Proposed Safety Factor	Post-Control Emissions (100% Load) with Safety Factor	Calculated Pre-Control Emissions	Control Device	Approx. Control Efficiency
Model	Jenbacher J620						
Number of Engines	33						
Generator Rating [1]	MWe	3.30					
MW to hp; 1 MW =	1341.0 hp						
Engine Power[1]	hp	4,425					
Brake-Specific Fuel Consumption[1]	BTU/hp-hr	5,657					
Heat Input Rate	MMBtu/hr	25.0					
Natural Gas HHV [2]	Btu/scf	1,020					
Fuel Consumption[1]	scf/hr	0.025					
VOC[1]	lb/hr per engine	0.15	20%	0.18	3.60	Oxidation Catalyst	95%
NOx[1]	lb/hr per engine	0.15	20%	0.18	9.00	SCR	98%
CO[1]	lb/hr per engine	0.62	5%	0.65	13.02	Oxidation Catalyst	95%
$PM/PM_{10}/PM_{2.5}$[1]	lb/hr per engine	0.10	20%	0.12	0.12	N/A	0%
SO_2[1]	lb/hr per engine	0.05	20%	0.06	0.06	N/A	0%
CH_2O[1]	lb/hr per engine	0.015	20%	0.018	0.36	Oxidation Catalyst	95%

Notes:

1. Information provided by Jenbacher and VoltaGrid. CH2O emissions are based on test data for J620 engines at a comparable facility in Texas.
2. Natural gas HHV based on a typical value of 1,020 Btu/scf.

Table 3. Potential Emission Calculations - Criteria Pollutants and Greenhouse Gases

Engine Specifications	
Emission Units	GEN-1, GEN-2, GEN-3, GEN-4, GEN-5, GEN-6, GEN-7, GEN-8, GEN-9, GEN-10, GEN-11, GEN-12, GEN-13, GEN-14, GEN-15, GEN-16, GEN-17, GEN-18, GEN-19, GEN-20, GEN-21, GEN-22, GEN-23, GEN-24, GEN-25, GEN-26, GEN-27, GEN-28, GEN-29, GEN-30, GEN-31, GEN-32, GEN-33
Engine	Jenbacher J620
Fuel Type	Natural Gas
Engine Power[1]	4,425 HP
Heat Input[1]	25 MMBtu/hr/engine
Fuel Consumption[1]	5,657 BTU/hp-hr
Annual Hours of Operation	8,760 hr/yr/engine
Startup / Shutdown Events	
Number of Startups per Engine per Month	3 events/month/engine
Number of Startups per Engine per Year	36 events/year/engine
Duration of Startup Event	5 minutes/event/engine[2]
Total time spent in startup mode per engine per month	0.25 hours/month/engine
Total time spent in startup mode per engine per year	3 hours/year/engine
Total time spend in normal, steady state operations mode	8,757 hours/year/engine
Total Number of Engines at the site[3]	33 engines

Notes:

1. Engine data provided by manufacturer.
2. While VoltaGrid conservatively assumes 0% control for the entire startup duration, the oxidation catalyst (which is a passive control device) will begin oxidizing organics and CO as the engine exhaust heats up the catalyst bed (well before the end of the 5 min startup period).
3. For the purposes of potential emissions calculations, VoltaGrid has assumed that all 33 engines are operated at the same at the worst-case load.

Criteria Pollutant Emissions (Per Engine)

Pollutant	Hourly Emissions Assuming 1 event (5 mins) of Startup and Remainder of Steady State (SS) Operations			Hourly Emissions Assuming 1 hour of Steady State Operation[1]	Annual Emissions (per engine)		
	Startup (5 min in the hour with the startup)	Steady State Operation (55 mins in the hour with the startup)	Total Worst-Case Hourly Emissions [1]		Startup (36 events / year/engine)	Steady State (8757 hr/year/ engine)	Total[2]
	lb/startup event	lb/55 mins of SS Operation	lb/hr per engine	lb/hr per engine	tpy per engine	tpy per engine	tpy per engine
VOC	0.30	3.30	3.60	0.18	5.40E-03	0.79	0.79
NO_x	0.75	8.2	9.00	0.18	0.01	0.79	0.80
CO	1.09	11.94	13.02	0.65	0.02	2.9	2.87
$PM/PM_{10}/PM_{2.5}$	0.01	0.110	0.12	0.12	1.80E-04	0.53	0.53
SO_2	5.00E-03	0.055	0.060	0.06	9.00E-05	0.26	0.26

Notes:

1. Short-term (hourly) emissions are calculated assuming one 5-minute startup event occurs during an hour with the balance of time (55 mins) spent in steady state operation.

   Short-term (hourly) emissions are also calculated assuming the entire hour (60 mins) consists of steady state operations.
2. Annual emissions are calculated assuming 36, 5-minute startup events occur during a year for each engine.

Table 3. Potential Emission Calculations - Criteria Pollutants and Greenhouse Gases

Criteria Pollutant Emissions (Total for All 33 Engines)

Pollutant	Max. Hourly Emissions (total for all engines)	Annual Emissions (total for all engines)
	Total [1]	
	lb/hr - total	tpy - total
VOC	118.8	26.2
NO_x	297.0	26.5
CO	429.7	94.7
$PM/PM_{10}/PM_{2.5}$	4.0	17.3
SO_2	2.0	8.7

Notes:

1. Total emissions for all the engines proposed at the facility are calculated as follows:
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)

Greenhouse Gas (GHG) Emissions

Pollutant	Emission Factor[1] (lb/MMBtu)
CO_2	116.98
CH_4	2.2E-03
N_2O	2.2E-04
CO_2e^2	117.10

Notes:

1. Per 40 CFR 98, Subpart C, Tables C-1 and C-2 for natural gas combustion. The emission factors were converted from kg/MMBtu to lb/MMBtu.

2. The carbon dioxide equivalent (CO_2e) emission factor is calculated as the sum of each GHG pollutant multiplied by its global warming potential.

Global warming potentials are based on 40 CFR 98, Subpart A, Table A-1:

CO_2:	1
CH_4:	28
N_2O:	265

Pollutant	Emission Factor [1]	Emissions per Engine/Generator		Total Emissions for all Engines/Generators	
		lb/hr	tpy	lb/hr	tpy
CO_2	116.98 lb/MMBtu	2,928	12,827	96,639	423,278
CH_4	0.0022 lb/MMBtu	0.055	0.24	1.82	8.0
N_2O	0.00022 lb/MMBtu	0.0055	0.024	0.182	0.80
CO_2e^2	117.10 lb/MMBtu	2,931	12,840	96,738	423,713

Notes:

1. Per 40 CFR 98, Subpart C, Tables C-1 and C-2 for natural gas combustion. The emission factors were converted from kg/MMBtu to lb/MMBtu.

2. The carbon dioxide equivalent (CO_2e) emission factor is calculated as the sum of each GHG pollutant multiplied by its global warming potential.

Global warming potentials are based on 40 CFR 98, Subpart A, Table A-1:

Table 4. Potential Emission Calculations - Hazardous and Toxic Air Pollutants

Engine Specifications	
Emission Units	GEN-1, GEN-2, GEN-3, GEN-4, GEN-5, GEN-6, GEN-7, GEN-8, GEN-9, GEN-10, GEN-11, GEN-12, GEN-13, GEN-14, GEN-15, GEN-16, GEN-17, GEN-18, GEN-19, GEN-20, GEN-21, GEN-22, GEN-23, GEN-24, GEN-25, GEN-26, GEN-27, GEN-28, GEN-29, GEN-30, GEN-31, GEN-32, GEN-33
Engine	Jenbacher J620
Fuel Type	Natural Gas
Engine Power[1]	4,425 HP
Heat Input[1]	25 MMBtu/hr/engine
Fuel Consumption[1]	5,657 BTU/hp-hr
Annual Hours of Operation	8,760 hr/yr/engine
Control Efficiency (Organic Air Toxics)	95% Based on the VOC control efficiency
Startup / Shutdown Events	
Number of Startups per Engine per Month	3 events/month/engine
Duration of Startup Event	5 minutes/event/engine[2]
Startup Events per Day	1 startup/day
Total time spent in startup mode per engine per month	0.25 hours/month/engine
Total time spent in startup mode per engine per year	3 hours/year/engine
Total time spent in normal operations mode	8,757 hours/year/engine
Total Number of Engines at the site[3]	33 engines

Notes:

1. Engine data provided by manufacturer.
2. While VoltaGrid conservatively assumes 0% control for the entire startup duration, the oxidation catalyst (which is a passive control device) will begin oxidizing organics and CO as the engine exhaust heats up the catalyst bed (well before the end of the 5 min startup period).
3. For the purposes of potential emissions calculations, VoltaGrid has assumed that all 33 engines are operated at the same at the worst-case load.

Table 4. Potential Emission Calculations - Hazardous and Toxic Air Pollutants

Toxic Air Pollutant Emissions

Pollutant	CAS Number	HAP	Emission Factor[1]	Startup Emissions (per engine)	Steady State Emissions (per engine)[2]	Emissions - Per Engine			Emissions - All Engines[6]		
						Hourly With One Startup Event in that Hour[3]	Daily With One Startup Event per Day[4]	Annual With 36 Startup Events per Year[5]	Hourly With One Startup Event in that Hour[3]	Daily With One Startup Event per Day[4]	Annual With 36 Startup Events per Year[5]
			lb/MMBtu	lb/startup event	lb/hr	lb/hr	lb/day	lb/year	lb/hr	lb/day	lb/year
Ammonia	7664417	--	5.0 ppmv	--	0.25	0.25	6.0	2,203.2	8.3	199	72,707
1,1,2,2-Tetrachloroethane	79-34-5	HAP	4.0E-05	8.3E-05	5.0E-05	1.3E-04	1.3E-03	0.4	4.3E-03	0.042	14.5
1,1,2-Trichloroethane	79-00-5	HAP	3.2E-05	6.6E-05	4.0E-05	1.0E-04	1.0E-03	0.3	3.4E-03	0.034	11.5
1,1-Dichloroethane	75-34-3	HAP	2.4E-05	4.9E-05	3.0E-05	7.6E-05	7.6E-04	0.3	2.5E-03	0.025	8.6
1,2,3-Trimethylbenzene	526-73-8	--	2.3E-05	4.8E-05	2.9E-05	7.4E-05	7.4E-04	0.3	2.5E-03	0.024	8.3
1,2,4-Trimethylbenzene	95-63-6	--	1.4E-05	3.0E-05	1.8E-05	4.6E-05	4.6E-04	0.2	1.5E-03	0.015	5.2
1,2-Dichloroethane	107-06-2	HAP	2.4E-05	4.9E-05	3.0E-05	7.6E-05	7.6E-04	0.3	2.5E-03	0.025	8.6
1,2-Dichloropropane	78-87-5	HAP	2.7E-05	5.6E-05	3.4E-05	8.7E-05	8.6E-04	0.3	2.9E-03	0.028	9.7
1,3,5-Trimethylbenzene	108-67-8	--	3.4E-05	7.1E-05	4.2E-05	1.1E-04	1.1E-03	0.4	3.6E-03	0.036	12.2
1,3-Butadiene	106-99-0	HAP	2.7E-04	5.6E-04	3.3E-04	8.6E-04	8.550E-03	2.9	0.028	0.28	96.745
1,3-Dichloropropene	542-75-6	HAP	2.6E-05	5.5E-05	3.3E-05	8.5E-05	8.5E-04	0.3	2.8E-03	0.028	9.6
2-Methylnaphthalene	91-57-6	HAP	3.3E-05	6.9E-05	4.2E-05	1.1E-04	1.1E-03	0.4	3.5E-03	0.035	12.0
2,2,4-Trimethylpentane	540-84-1	HAP	2.5E-04	5.2E-04	3.1E-04	8.1E-04	8.006E-03	2.7	0.027	0.26	90.585
Acenaphthene	83-32-9	HAP	1.3E-06	2.6E-06	1.6E-06	4.0E-06	4.0E-05	0.0	1.3E-04	1.3E-03	0.5
Acenaphthylene	208-96-8	HAP	5.5E-06	1.2E-05	6.9E-06	1.8E-05	1.8E-04	0.1	5.9E-04	5.8E-03	2.0
Acetaldehyde	75-07-0	HAP	8.4E-03	0.017	0.010	0.027	0.27	91.79	0.9	8.8	3,029.2
Acrolein	107-02-8	HAP	5.1E-03	0.011	6.434E-03	0.017	0.16	56.438	0.55	5.4	1,862.44
Benzene	71-43-2	HAP	4.4E-04	9.2E-04	5.5E-04	1.4E-03	0.014	4.8	0.047	0.46	159.430
Benzo(b)fluoranthene	205-99-2	HAP	1.7E-07	3.5E-07	2.1E-07	5.4E-07	5.3E-06	1.8E-03	1.8E-05	1.8E-04	0.1
Benzo(e)pyrene	192-97-2	HAP	4.2E-07	8.7E-07	5.2E-07	1.3E-06	1.3E-05	4.6E-03	4.4E-05	4.4E-04	0.2
Benzo(g,h,i)perylene	191-24-2	HAP	4.1E-07	8.6E-07	5.2E-07	1.3E-06	1.3E-05	4.5E-03	4.4E-05	4.4E-04	0.2
Biphenyl	92-52-4	HAP	2.1E-04	4.4E-04	2.7E-04	6.9E-04	6.789E-03	2.3	0.023	0.22	76.816
Butane	106-97-8	--	5.4E-04	1.1E-03	6.8E-04	1.7E-03	0.017	5.9	0.058	0.57	196.027
Butyr/Isobutyraldehyde	78-84-2	--	1.0E-04	2.1E-04	1.3E-04	3.3E-04	3.2E-03	1.1	0.011	0.11	36.597
Carbon Tetrachloride	56-23-5	HAP	3.7E-05	7.7E-05	4.6E-05	1.2E-04	1.2E-03	0.4	3.9E-03	0.039	13.3
Chlorobenzene	108-90-7	HAP	3.0E-05	6.3E-05	3.8E-05	9.8E-05	9.7E-04	0.3	3.2E-03	0.032	11.0
Chloroethane	75-00-3	HAP	1.9E-06	3.9E-06	2.3E-06	6.0E-06	6.0E-05	0.0	2.0E-04	2.0E-03	0.7
Chloroform	67-66-3	HAP	2.9E-05	5.9E-05	3.6E-05	9.2E-05	9.1E-04	0.3	3.0E-03	0.030	10.3
Chrysene	218-01-9	HAP	6.9E-07	1.4E-06	8.7E-07	2.2E-06	2.2E-05	7.6E-03	7.4E-05	7.3E-04	0.3
Cyclopentane	287-92-3	--	2.3E-04	4.7E-04	2.8E-04	7.3E-04	7.269E-03	2.5	0.024	0.24	82.252
Ethane	74-84-0	--	0.1	0.22	0.13	0.3	3.4	1,152.9	11	111	38,046
Ethylbenzene	100-41-4	HAP	4.0E-05	8.3E-05	5.0E-05	1.3E-04	1.3E-03	0.4	4.236E-03	0.042	14.385
Ethylene Dibromide	106-93-4	HAP	4.4E-05	9.2E-05	5.5E-05	1.4E-04	1.4E-03	0.5	4.7E-03	0.047	16.1
Fluoranthene	206-44-0	HAP	1.1E-06	2.3E-06	1.4E-06	3.6E-06	3.6E-05	0.0	1.2E-04	1.2E-03	0.4
Fluorene	86-73-7	HAP	5.7E-06	1.2E-05	7.1E-06	1.8E-05	1.8E-04	0.1	6.1E-04	6.0E-03	2.1
Formaldehyde	50-00-0	HAP	---	0.03	0.018	0.05	0.5	157.90	2	15	5,210.6
Methanol	67-56-1	HAP	2.5E-03	5.215E-03	3.1E-03	8.084E-03	0.08	27.450	0.27	2.6	905.85
Methylcyclohexane	108-87-2	--	1.2E-03	2.566E-03	1.5E-03	3.977E-03	0.04	13.505	0.13	1.3	445.68
Methylene Chloride	75-09-2	HAP	2.0E-05	4.2E-05	2.5E-05	6.5E-05	6.4E-04	0.2	2.1E-03	0.021	7.2
n-Hexane	110-54-3	HAP	1.1E-03	2.316E-03	1.4E-03	3.589E-03	0.036	12.188	0.12	1.2	402.20
n-Nonane	111-84-2	--	1.1E-04	2.3E-04	1.4E-04	3.6E-04	3.5E-03	1.2	0.012	0.12	39.858
n-Octane	111-65-9	--	3.5E-04	7.3E-04	4.4E-04	1.1E-03	0.011	3.9	0.037	0.37	127.182
n-Pentane	109-66-0	--	2.6E-03	5.42E-03	3.25E-03	8.41E-03	8.33E-02	28.548	0.28	2.7	942.09
Naphthalene	91-20-3	HAP	7.4E-05	1.6E-04	9.3E-05	2.4E-04	2.4E-03	0.8	7.939E-03	0.079	26.958
PAH	--	HAP	2.7E-05	5.6E-05	3.4E-05	8.7E-05	8.6E-04	0.3	2.9E-03	0.028	9.7
Perchloroethylene	127-18-4	HAP	2.5E-06	5.2E-06	3.1E-06	8.0E-06	7.9E-05	0.0	2.6E-04	2.6E-03	0.9
Phenanthrene	85-01-8	HAP	1.0E-05	2.2E-05	1.3E-05	3.4E-05	3.3E-04	0.1	1.1E-03	0.011	3.8
Phenol	108-95-2	HAP	2.4E-05	5.0E-05	3.0E-05	7.8E-05	7.7E-04	0.3	2.6E-03	0.025	8.7
Propane	74-98-6	--	4.19E-02	8.74E-02	5.24E-02	1.35E-01	1.34E+00	460.06	4.5	44	15,182.1
Pyrene	129-00-0	HAP	1.4E-06	2.8E-06	1.7E-06	4.4E-06	4.4E-05	0.0	1.5E-04	1.4E-03	0.5
Styrene	100-42-5	HAP	2.4E-05	4.9E-05	3.0E-05	7.6E-05	7.6E-04	0.3	2.5E-03	0.025	8.6
Toluene	108-88-3	HAP	4.1E-04	8.5E-04	5.1E-04	1.3E-03	0.013	4.5	0.044	0.43	147.836
Vinyl Chloride	75-01-4	HAP	1.5E-05	3.1E-05	1.9E-05	4.8E-05	4.8E-04	0.2	1.6E-03	0.016	5.4
Xylenes	1330-20-7	HAP	1.8E-04	3.8E-04	2.3E-04	5.9E-04	5.89E-03	2.0	0.02	0.19	66.67
Max. Single HAP											**5,210.6**
TOTAL HAPs				**0.1**	**0.042**	**0.11**	**1.1**	**371.7**	**3.6**	**35.8**	**12,265.8**

Notes:

1. Toxics/HAP emission factors are based on AP-42. Chapter 3.2-2. Emission factor for formaldehyde are provided by the manufacturer.
2. All organic toxics are assumed to be controlled by 95% (consistent with the VOC and .
3. Short-term (hourly) emissions are calculated assuming one 5-minute startup event occurs during an hour.
4. Daily emissions are calculated assuming one 5-minute startup event occurs during a day.
5. Annual emissions are calculated assuming 36, 5-minute startup events occur during a year for each engine.
6. Total emissions for all the engines proposed at the facility are calculated as follows:
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)
7. Ammonia slip data provided by the manufacturer. Peak ammonia emissions conservatively assume no startup events occur during the emission period.
   Ammonia emissions for each engine proposed at the facility are calculated as follows:
   Short term emissions (lb/hr/engine) = (NH3 Slip [ppmv] / 10^6) * (1 / Molar Vol. of Flue Gas [scf/lb-mol]) * MW of NH3 [lb/lb-mol] * Flue Gas Flow Rate [acfm] * 60 [min/hr]

   Annual emissions (tpy per engine) = Short term emissions (lb/hr/engine) * 8760 [hr/day] / 2000 [lb/ton]
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)

Table 5. Potential Emission Calculations - Criteria Pollutants and GHGs from the Black Start Engine

Engine Specifications	
Emission Units	BS GEN-1
Engine	MESA Solutions
Fuel Type	Natural Gas
Engine Power[1]	684 HPm
Heat Input[1]	4.7 MMBtu/hr/engine
Annual Hours of Operation	100 hr/yr/engine
Total Number of Black Start Engines at the site[1]	1 engine

Notes:

1. Engine data provided by manufacturer.

Criteria Pollutant Emissions (Per Engine)

Pollutant	lb/hr	Tons/year
VOC	0.09	0.004
NO_x	0.13	0.006
CO	0.03	0.002
$PM/PM_{10}/PM_{2.5}$	0.09	0.005
SO_2	2.8E-03	0.0001

Notes:

1. Emissions of VOC, CO and NOx are based on the following vendor emissions guarantees:

Pollutant	D2 (g/HP-hr)	D1 (g/HP-hr)	Max (lb/hour)	Control Efficiency	Vendor Emissions (lb/MMBtu)	AP-42 EF (Table 3.2-3) (lb/MMBtu)	Ratio of Vendor Emissions to AP-42 EF
VOC (NMHC)	0.059	0.04	0.09	>99%	0.0188	0.36	0.0524
NO_x	0.051	0.084	0.13	>99%	0.0267	2.27	0.0118
CO	0.015	0.02	0.03	>99%	0.0064	3.51	0.0018

2. Emissions of PM and SO2 are based on AP-42, Table 3.2-3 (Emission Factors for natural gas-fired four-stroke rich burn engines)

$PM/PM_{10}/PM_{2.5}$	1.94E-02	lb/MMBtu	(includes condensable emissions)
SO_2	5.88E-04	lb/MMBtu	

Greenhouse Gas (GHG) Emissions

Pollutant	Emissions per Engine/Generator	
	lb/hr	tpy
CO_2	816.3	40.8
CH_4	1.3	0.06
N_2O	0.1	0.003
CO_2e^2	867	43

Notes:

1. Emissions of GHGs are based on the following vendor emissions guarantees:

Pollutant	D2 (g/HP-hr)	D1 (g/HP-hr)	Max (lb/hour)
CO_2	541.3	477.7	816.26
CH_4	0.832	0.556	1.25
N_2O	0.032	0.04	0.06

2. *The carbon dioxide equivalent (CO_2e) emission factor is calculated as the sum of each GHG pollutant multiplied by its global warming potential.*

Global warming potentials are based on 40 CFR 98, Subpart A, Table A-1:

CO_2: 1
CH_4: 28
N_2O: 265

Table 6. Potential Emission Calculations - Hazardous and Toxic Air Pollutants from the Black Start Engine

Engine Specifications	
Emission Units	BS GEN-1
Engine	MESA Solutions
Fuel Type	Natural Gas
Engine Power[1]	684 HPm
Heat Input[1]	4.742 MMBtu/hr/engine
Annual Hours of Operation	100 hr/yr/engine
Total Number of Black Start Engines at the site[1]	1 engine

Notes:

1. Engine data provided by manufacturer.

Table 6. Potential Emission Calculations - Hazardous and Toxic Air Pollutants

Toxic Air Pollutant Emissions

Pollutant	CAS Number	HAP	Emission Factor[1]	Total Emissions	
				Hourly	Annual
			lb/MMBtu	lb/hr	lb/year
1,1,2,2-Tetrachloroethane	79-34-5	HAP	2.53E-05	1.20E-04	0.0
1,1,2-Trichloroethane	79-00-5	HAP	1.53E-05	7.26E-05	7.3E-03
1,1-Dichloroethane	75-34-3	HAP	1.13E-05	5.36E-05	5.4E-03
1,2,3-Trimethylbenzene	526-73-8	--	0.00E+00	0.00E+00	--
1,2,4-Trimethylbenzene	95-63-6	--	0.00E+00	0.00E+00	--
1,2-Dichloroethane	107-06-2	HAP	1.13E-05	5.36E-05	5.4E-03
1,2-Dichloropropane	78-87-5	HAP	1.30E-05	6.16E-05	6.2E-03
1,3,5-Trimethylbenzene	108-67-8	--	0.00E+00	0.00E+00	--
1,3-Butadiene	106-99-0	HAP	0.00E+00	0.00E+00	--
1,3-Dichloropropene	542-75-6	HAP	0.00E+00	0.00E+00	--
2-Methylnaphthalene	91-57-6	HAP	0.00E+00	0.00E+00	--
2,2,4-Trimethylpentane	540-84-1	HAP	0.00E+00	0.00E+00	--
Acenaphthene	83-32-9	HAP	0.00E+00	0.00E+00	--
Acenaphthylene	208-96-8	HAP	0.00E+00	0.00E+00	--
Acetaldehyde	75-07-0	HAP	2.79E-03	1.32E-02	1.3
Acrolein	107-02-8	HAP	2.63E-03	1.25E-02	1.2
Benzene	71-43-2	HAP	1.58E-03	7.49E-03	0.7
Benzo(b)fluoranthene	205-99-2	HAP	0.00E+00	0.00E+00	--
Benzo(e)pyrene	192-97-2	HAP	0.00E+00	0.00E+00	--
Benzo(g,h,i)perylene	191-24-2	HAP	0.00E+00	0.00E+00	--
Biphenyl	92-52-4	HAP	0.00E+00	0.00E+00	--
Butane	106-97-8	--	0.00E+00	0.00E+00	--
Butyr/Isobutyraldehyde	78-84-2	--	4.86E-05	2.30E-04	0.0
Carbon Tetrachloride	56-23-5	HAP	1.77E-05	8.39E-05	8.4E-03
Chlorobenzene	108-90-7	HAP	1.29E-05	6.12E-05	6.1E-03
Chloroethane	75-00-3	HAP	0.00E+00	0.00E+00	--
Chloroform	67-66-3	HAP	1.37E-05	6.50E-05	6.5E-03
Chrysene	218-01-9	HAP	0.00E+00	0.00E+00	--
Cyclopentane	287-92-3	--	0.00E+00	0.00E+00	--
Ethane	74-84-0	--	7.04E-02	3.34E-01	33.4
Ethylbenzene	100-41-4	HAP	2.48E-05	1.18E-04	0.0
Ethylene Dibromide	106-93-4	HAP	2.13E-05	1.01E-04	0.0
Fluoranthene	206-44-0	HAP	0.00E+00	0.00E+00	--
Fluorene	86-73-7	HAP	0.00E+00	0.00E+00	--
Formaldehyde	50-00-0	HAP	2.05E-02	9.72E-02	9.7
Methanol	67-56-1	HAP	3.06E-03	1.45E-02	1.5
Methylcyclohexane	108-87-2	--	0.00E+00	0.00E+00	--
Methylene Chloride	75-09-2	HAP	4.12E-05	1.95E-04	0.0
n-Hexane	110-54-3	HAP	0.00E+00	0.00E+00	--
n-Nonane	111-84-2	--	0.00E+00	0.00E+00	--
n-Octane	111-65-9	--	0.00E+00	0.00E+00	--
n-Pentane	109-66-0	--	0.00E+00	0.00E+00	--
Naphthalene	91-20-3	HAP	9.71E-05	4.60E-04	0.0
PAH	--	HAP	1.41E-04	6.69E-04	0.1
Perchloroethylene	127-18-4	HAP	0.00E+00	0.00E+00	--
Phenanthrene	85-01-8	HAP	0.00E+00	0.00E+00	--
Phenol	108-95-2	HAP	0.00E+00	0.00E+00	--
Propane	74-98-6	--	0.00E+00	0.00E+00	--
Pyrene	129-00-0	HAP	0.00E+00	0.00E+00	--
Styrene	100-42-5	HAP	1.19E-05	5.64E-05	5.6E-03
Toluene	108-88-3	HAP	5.58E-04	2.65E-03	0.3
Vinyl Chloride	75-01-4	HAP	7.18E-06	3.40E-05	3.4E-03
Xylenes	1330-20-7	HAP	1.95E-04	9.25E-04	0.1
Total HAPs (lb/year)					**15.07**

otes:

1. Toxics/HAP emission factors are based on AP-42. Chapter 3.2-3.

Table 7. Fuel Gas Heaters Potential Emissions Calculations

Inputs		
Description	**Value**	**Units**
Natural Gas Firing Rate	4	MMBtu/hr
High Heating Value (HHV)	1,020	Btu/ft^3
Quantity	2	heaters
Hours of Operation	8,760	hr/yr

Emission Factors				
Pollutant		**Value**	**Units**	Source
CO		0.04	lb/MMBtu	(1)
NO_X		0.01	lb/MMBtu	(1)
VOC		0.0055	lb/MMBtu	(1)
PM		0.01	lb/MMBtu	(2)
PM_{10}		0.01	lb/MMBtu	(2)
$PM_{2.5}$		0.01	lb/MMBtu	(2)
SO_2		0.003	lb/MMBtu	(1)
Pb		0.0005	lb/10^6 ft^3	(3)
Benzene	71-43-2	0.0021	lb/10^6 ft^3	(3)
Dichlorobenzene	95-50-1	0.0012	lb/10^6 ft^3	(3)
Formaldehyde	50-00-0	0.075	lb/10^6 ft^3	(3)
n-hexane	110-54-3	1.8	lb/10^6 ft^3	(3)
Naphthalene	91-20-3	0.00061	lb/10^6 ft^3	(3)
2-Methylnaphthale	91-57-6	0.0000240	lb/10^6 ft^3	(3)
Toluene	108-88-3	0.0034	lb/10^6 ft^3	(3)
Arsenic	7440382	0.0002	lb/10^6 ft^3	(3)
Barium	7440393	0.0044	lb/10^6 ft^3	(3)
Beryllium Compou	7440417	0.000012	lb/10^6 ft^3	(3)
Cadmium Compou	7440439	0.0011	lb/10^6 ft^3	(3)
Chromium	7440473	0.0014	lb/10^6 ft^3	(3)
Cobalt	7440484	0.000084	lb/10^6 ft^3	(3)
Copper	7440508	0.00085	lb/10^6 ft^3	(3)
Manganese	7439965	0.00038	lb/10^6 ft^3	(3)
Mercury	7439976	0.00026	lb/10^6 ft^3	(3)
Nickel	7440020	0.0021	lb/10^6 ft^3	(3)
Selenium	7782492	0.000024	lb/10^6 ft^3	(3)
Zinc		0.029	lb/10^6 ft^3	(3)
Total HAPs		1.92E+00	lb/10^6 ft^3	(3)
CO_2		116.98	lb/MMBtu	(4)
CH_4		0.002	lb/MMBtu	(4)
N_2O		0.0002	lb/MMBtu	(4)
CO_2e		117.10	lb/MMBtu	(4)

Pollutant	Emissions Per Heater		Total Emissions [7]	
Name	**lb/hr** [5]	**tpy** [6]	**lb/hr**	**tpy**
CO	0.15	0.65	0.30	1.30
NO_x	0.05	0.21	0.10	0.42
VOC	0.02	0.10	0.04	0.19
PM	0.03	0.13	0.06	0.26
PM_{10}	0.03	0.13	0.06	0.26
$PM_{2.5}$	0.03	0.13	0.06	0.26
SO_2	0.01	0.05	0.02	0.11
Pb	1.96E-06	8.59E-06	3.92E-06	1.72E-05
Benzene	8.24E-06	3.61E-05	1.65E-05	7.21E-05
Dichlorobenzene	4.71E-06	2.06E-05	9.41E-06	4.12E-05
Formaldehyde	2.94E-04	1.29E-03	5.88E-04	2.58E-03
n-hexane	7.06E-03	3.09E-02	1.41E-02	6.18E-02
Naphthalene	2.39E-06	1.05E-05	4.78E-06	2.10E-05
2-Methylnaphthalene	9.41E-08	4.12E-07	1.88E-07	8.24E-07
Toluene	1.33E-05	5.84E-05	2.67E-05	1.17E-04
Arsenic	7.84E-07	3.44E-06	1.57E-06	6.87E-06
Barium	1.73E-05	7.56E-05	3.45E-05	1.51E-04
Beryllium	4.71E-08	2.06E-07	9.41E-08	4.12E-07
Cadmium	4.31E-06	1.89E-05	8.63E-06	3.78E-05
Chromium	5.49E-06	2.40E-05	1.10E-05	4.81E-05
Cobalt	3.29E-07	1.44E-06	6.59E-07	2.89E-06
Copper	3.33E-06	1.46E-05	6.67E-06	2.92E-05
Manganese	1.49E-06	6.53E-06	2.98E-06	1.31E-05
Mercury	1.02E-06	4.47E-06	2.04E-06	8.93E-06
Nickel	8.24E-06	3.61E-05	1.65E-05	7.21E-05
Selenium	9.41E-08	4.12E-07	1.88E-07	8.24E-07
Zinc	1.14E-04	4.98E-04	2.27E-04	9.96E-04
Total HAPs	7.54E-03	3.30E-02	0.02	0.07
CO_2	467.91	2,049.44	935.82	4098.88
CH_4	0.01	0.04	0.02	0.08
N_2O	0.00	0.00	0.00	0.01
CO_2e	468.39	2,051.55	936.78	4,103.09

NOTES:

1. Algas SDI vendor guarantee:

Pollutant	lb/mmscf	lb/mmbtu	Source
SO_2	--	0.0030	Vendor Guarantee
NO_X	--	0.0121	
VOC	--	0.0055	
CO	--	0.0370	

2. Emission factors obtained from AP-42, Section 1.4, Natural Gas Combustion (July 1998). As per footnote "c" to AP-42 Table 1.4-2, all PM is assumed to be less than 1.0 micrometer in diameter. Therefore, PM = PM_{10} = $PM_{2.5}$ = PM-CON + PM-FIL. Where needed, emission factors were converted using the HHV, as shown below.

Pollutant	lb/mmscf	lb/mmbtu	Source
PM-CON	5.7	0.0056	Vendor Guarantee (similar to AP-42)
PM-FIL	1.9	0.0019	

3. Emission factors for HAPs and TAPs are based on AP-42, Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-3 and 1.4-4.
4. Greenhouse gas emissions are based on 40 CFR 98, Subpart C, Tables C-1 and C-2 for natural gas combustion. The emission factors were converted from kg/MMBtu to lb/MMBtu. The carbon dioxide equivalent (CO2e) emission factor is calculated as the sum of each GHG pollutant multiplied by its global warming potential. Global warming potentials are based on 40 CFR 98, Subpart A, Table A-1:

GWP	
CO_2	1
CH_4	28
N_2O	265

5. Short-term emissions/unit (lb/hr) = emission factor (lb/MMBtu) x heat input (MMBtu/hr)
   Short-term emissions/unit (lb/hr) = emission factor (lb/MMscf) x heat input (MMscf/hr)
6. Annual emissions/unit (tpy) = Short-term emissions/unit (lb/hr) x 8,760 hr/year x ton/ 2,000 lb
7. Short-term emissions - total (lb/hr) = Short-term emissions/unit (lb/hr) x number of units
   Annual emissions - total (tpy) = Annual emissions/unit (tpy) x number of units

Table 8. Toxic Air Pollutant Screening Evaluation

Toxic Air Pollutant Emissions		Facility-Wide Emissions	Minimum Emission Rate (MER)	Review Required?
Pollutant	CAS Number	lb/year	lb/year	(Model / No)
1,1,2,2-Tetrachloroethane	79-34-5	18	414	No
1,1,2-Trichloroethane	79-00-5	14	1,521	No
1,1-Dichloroethane	75-34-3	11	46,334	No
1,2-Dichloroethane	107-06-2	11	94	No
1,2-Dichloropropane	78-87-5	12	973	No
1,3-Butadiene	106-99-0	119	7	Model
1,3-Dichloropropene	542-75-6	12	487	No
Acetaldehyde	75-07-0	3,737	1,107	Model
Acrolein	107-02-8	2,298	85	Model
Ammonia	7664417	72,707	24,333	Model
Arsenic	7440382	0	0	No
Barium	7440393	0	58	No
Benzene	71-43-2	197	32	Model
Beryllium Compounds	7440417	0	1	No
Biphenyl	92-52-4	95	117	No
Cadmium Compounds	7440439	0	1	No
Carbon Tetrachloride	56-23-5	16	162	No
Chlorobenzene	108-90-7	14	40,542	No
Chloroethane	75-00-3	1	2,433,300	No
Chloroform	67-66-3	13	106	No
Chromium	7440473	0	58	No
Cobalt	7440484	0	12	No
Copper	7440508	0	117	No
Dichlorobenzene	95-50-1	0	17,375	No
Ethylbenzene	100-41-4	18	243,330	No
Ethylene Dibromide	106-93-4	20	4	Model
Formaldehyde	50-00-0	10,512	22	Model
Manganese	7439965	0	12	No
Mercury	7439976	0	73	No
Methanol	67-56-1	1,118	30,127	No
Methylcyclohexane	108-87-2	550	231,767	No
Methylene Chloride	75-09-2	9	5,183	No
Naphthalene	91-20-3	33	730	No
n-Hexane	110-54-3	620	170,331	No
Nickel	7440020	0	39	No
n-Pentane	109-66-0	1,162	341,858	No
Perchloroethylene	127-18-4	1	78,553	No
Phenol	108-95-2	11	2,200	No
Propane	74-98-6	18,721	208,600	No
Selenium	7782492	0	23	No
Styrene	100-42-5	11	243,330	No
Toluene	108-88-3	183	1,216,650	No
Vinyl Chloride	75-01-4	7	56	No
Xylenes	1330-20-7	82	24,333	No

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Table 9. VoltaGrid Modeled Stack Parameters and Emission Rates

Stack Parameters

Modeled Source	Primary Engines	Black Start Engine	Fuel Gas Heaters	
Parameter	**J620**	**GV22PU**	**SH400-LN**	**Units**
Count	33	1	2	#
Stack Height	18.9	5.5	4.1	m
Stack Diameter	0.76	0.71	0.36	m
Temperature	682	858	400	°F
Exhaust Flow Rate (Actual)	21,068	11,198	1,358	acfm
Exit Velocity	21.8	13.3	6.5	m/s
SCREEN3 Modeled Concentration @ 1 g/s	**10.54**	**62.18**	**515.60**	**µg/m³**

Toxic Air Pollutants (TAPs)

Emission Source	Pollutant	CAS Number	Averaging Period	Total Emissions (33 Primary Engines, 1 Black Start Engine, and 2 Fuel Gas Heaters)		MGLC [2]
				(lb/hr) [1]	(g/s) [1]	µg/m³
Primary Engines (J620)	1,3-Butadiene	106-99-0	Annual	1.10E-02	1.39E-03	0.01
	Acetaldehyde	75-07-0	Annual	3.46E-01	4.36E-02	0.46
	Acrolein	107-02-8	Annual	2.13E-01	2.68E-02	0.28
	Ammonia	7664417	Annual	8.30E+00	1.05E+00	11.02
	Benzene	71-43-2	Annual	1.82E-02	2.29E-03	0.02
	Ethylene Dibromide	106-93-4	Annual	1.83E-03	2.31E-04	0.00
	Formaldehyde	50-00-0	Annual	5.95E-01	7.49E-02	0.79
Black Start Engine	1,3-Butadiene	106-99-0	Annual	0.00E+00	0.00E+00	0.00
	Acetaldehyde	75-07-0	Annual	1.51E-04	1.90E-05	0.00
	Acrolein	107-02-8	Annual	1.42E-04	1.79E-05	0.00
	Ammonia	7664417	Annual			
	Benzene	71-43-2	Annual	8.55E-05	1.08E-05	0.00
	Ethylene Dibromide	106-93-4	Annual	1.15E-06	1.45E-07	0.00
	Formaldehyde	50-00-0	Annual	1.11E-03	1.40E-04	0.01
Fuel Gas Heaters	1,3-Butadiene	106-99-0	Annual			
	Acetaldehyde	75-07-0	Annual			
	Acrolein	107-02-8	Annual			
	Ammonia	7664417	Annual			
	Benzene	71-43-2	Annual	1.65E-05	2.08E-06	0.00
	Ethylene Dibromide	106-93-4	Annual			
	Formaldehyde	50-00-0	Annual	5.88E-04	7.41E-05	0.04

Notes:

1. Annual emissions for each emission unit included at the site converted to lb/hr and the lb/hr were converted to g/s.
2. The Maximum Ground Level Concentration (MGLC) is based on scaling the SCREEN3 results (at 1 g/s) proportionally to the total emission rate of the primary engines, the fuel gas heaters and the black start engine.

The temporary engines will be in operation only for two months (April 2026 and May 2026) and as such will not be included in the Toxics Screening Modeling due to their temporary nature.

Table 10. VoltaGrid SCREEN3 Results

Toxic Air Pollutants (TAPs)

Pollutant	CAS Number	Ambient Acceptable Concentrations (AAC) (µg/m³)			SCREEN3 Results (µg/m³)			Exceeds an AAC?
		15-minute	long-term and averaging period		MGLC	15-minute	long-term	
1,3-Butadiene	106-99-0	1100	0.03	Annual	0.01	0.02	0.00	No
Acetaldehyde	75-07-0	4500	4.55	Annual	0.46	0.61	0.04	No
Acrolein	107-02-8	23	0.35	Annual	0.28	0.37	0.02	No
Ammonia	7664417	2400	100.00	Annual	11.02	14.55	0.88	No
Benzene	71-43-2	1600	0.13	Annual	0.03	0.03	0.00	No
Ethylene Dibromide	106-93-4	23050	0.02	Annual	0.00	0.00	0.00	No
Formaldehyde	50-00-0	245	0.09	Annual	0.84	1.10	0.07	No

Notes:
Pursuant to the *Georgia Guideline for Ambient Impact Assessment of TAPs*, maximum 1-hour average concentrations are converted to the appropriate averaging times in accordance with the table below.

averaging time	multiplier
15 minutes	1.32
24 hours	0.4
annual	0.08

Table 3. Potential Emission Calculations - Criteria Pollutants and Greenhouse Gases (Temporary Engines CAT G3520)

Engine Specifications	
Emission Units (Temporary - no more than 2 months on site for the commissioning period)	TEMPGEN-1, TEMPGEN-2, TEMPGEN-3, TEMPGEN-4, TEMPGEN-5
Engine	Caterpillar G3520
Fuel Type	Natural Gas
Engine Power[1]	3,628 BHP
Heat Input[1]	23.0 MMBtu/hr/engine
Fuel Consumption[1]	6,340 BTU/bhp-hr
Operating Schedule	
April-2026	2 units will be running to meet 1 MW contracted demand and provide N+1 availability
May-2026	3 units will be running to meet 4 MW contracted demand and provide N+2 availability
April-2026	2 engines
May-2026	3 engines
Total Engines	5 engines
April 2026 hours of operation (total for 2 engines)	1,440 hr/month (2 units)
May 2026 hours of operation (total for 3 engines)	2,232 hr/month (3 units)

Notes:

1. Engine data provided by manufacturer.
2. For the purposes of potential emissions calculations, VoltaGrid has assumed that all 5 temporary engines are operated at the same time at the worst-case load for the three months that they are onsite.

Criteria Pollutant Emissions (Per Engine)

Pollutant	Short-Term Emissions			Total Emissions		
	lb/hr per engine	lb/hr (2 engines in April 2026)	lb/hr (3 engines in May 2026)	tons/month (2 engines in April 2026)	tons/month (3 engines in May 2026)	tons/2 months (all 5 engines)
VOC	2.00	4.00	6.00	1.44	2.23	3.67
NO_x	8.00	16.00	24.00	5.76	8.93	14.69
CO	10.40	20.80	31.19	7.49	11.60	19.09
$PM/PM_{10}/PM_{2.5}$	0.45	0.89	1.34	0.32	0.50	0.82
SO_2	0.01	0.03	0.04	0.01	0.02	0.02

Notes:

1. Short-term (hourly) emissions are calculated assuming that each of the five temporary engines operates at 100% load for the entire hour. The emission factors for NOx, CO, VOC, HCHO, and CO2 are based on manufacturer's data:

NOx	1.00	g/bhp-hr	0.002	lb/bhp-hr
CO	1.30	g/bhp-hr	0.003	lb/bhp-hr
VOC	0.25	g/bhp-hr	0.001	lb/bhp-hr
Formaldehyde (HCHO)	0.18	g/bhp-hr	0.0004	lb/bhp-hr
CO2	370.00	g/bhp-hr	0.816	lb/bhp-hr

2. Emission factors for SO2 and PM/PM10/PM2.5 are based on AP-42, Table 3.2-3. *UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES*

$PM/PM_{10}/PM_{2.5}$	1.94E-02	lb/MMBtu
SO_2	5.88E-04	lb/MMBtu

3. Total emissions for all the tempoary engines proposed at the facility are calculated as follows:
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   *Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)*

Table 3. Potential Emission Calculations - Criteria Pollutants and

Greenhouse Gas (GHG) Emissions

Pollutant [1], [2]	Emission Factor[1, 2] Value	Emission Factor Units
CO_2	0.82	lb/bhp-hr
CH_4	2.2E-03	lb/MMBtu
N_2O	2.2E-04	lb/MMBtu

Notes:

1. Emission factor of CO2 based on vendor data.
2. *Emission factors of CH4 and N2O based on 40 CFR 98, Subpart C, Tables C-1 and C-2 for natural gas combustion.* The emission factors were converted from kg/MMBtu to lb/MMBtu.

Pollutant	Emission Factor	Emissions per Engine/Con	Total Emissions		
		lb/hr	tons/month (2 engines in April 2026)	tons/month (3 engines in May 2026)	tons/2 months (all 5 engines)
CO_2	0.82 lb/bhp-hr	2,959	2,131	3,303	5,433
CH_4	0.0022 lb/MMBtu	0.051	0.04	0.06	0.09
N_2O	0.00022 lb/MMBtu	0.0051	3.65E-03	5.66E-03	0.01
CO_2e^1				--	5,439

Notes:

1. The carbon dioxide equivalent (CO_2e) emission factor is calculated as the sum of each GHG pollutant multiplied by its global warming potential.

Global warming potentials are based on 40 CFR 98, Subpart A, Table A-1:

CO_2: 1
CH_4: 28
N_2O: 265

Table 4. Potential Emission Calculations - Hazardous and Toxic Air Pollutants (Temporary Engines CAT G3520)

Engine Specifications	
Emission Units	TEMPGEN-1, TEMPGEN-2, TEMPGEN-3, TEMPGEN-4, TEMPGEN-5
Engine	Caterpillar G3520
Fuel Type	Natural Gas
Engine Power[1]	3,628 BHP
Heat Input[1]	23.0 MMBtu/hr/engine
Fuel Consumption[1]	6,340 BTU/bhp-hr
Operating Schedule	
April-2026	2 units will be running to meet 1MW contracted demand and provide n+1 availability
May-2026	3 units will be running to meet 4MW contracted demand and provide n+1 availability
April-2026	2 engines
May-2026	3 engines
Total Engines	5 engines
April 2026 hours of operation (total for 2 engines)	1,440 hr/month (2 units)
May 2026 hours of operation (total for 3 engines)	2,232 hr/month (3 units)

Notes:

1. Engine data provided by manufacturer.
2. While the calculations conservatively assume 0% control during the entire startup duration, the oxidation catalyst (which is a passive control device) will begin oxidizing organics and CO as the engine exhaust heats up the catalyst bed (well before the end of the 20 min startup period).
3. For the purposes of potential emissions calculations, VoltaGrid has assumed that all 34 engines are operated at the same at the worst-case load.

Table 4. Potential Emission Calculations - Hazardous and Toxic Air Pollutants (Temporary Engines CAT G3520)

Toxic Air Pollutant Emissions

Pollutant	CAS Number	HAP	Emission Factor[1]	Short-Term Emissions			Total Emissions		
			lb/MMBtu	lb/hr per engine	lb/hr (2 engines in April 2026)	lb/hr (3 engines in May 2026)	tons/month (2 engines in April 2026)	tons/month (3 engines in May 2026)	tons/2 months (all 5 engines)
1,1,2,2-Tetrachloroethane	79-34-5	HAP	4.0E-05	9.20E-04	1.84E-03	2.76E-03	6.6E-04	1.027E-03	1.7E-03
1,1,2-Trichloroethane	79-00-5	HAP	3.2E-05	7.31E-04	1.46E-03	2.19E-03	5.3E-04	8.163E-04	1.3E-03
1,1-Dichloroethane	75-34-3	HAP	2.4E-05	5.43E-04	1.09E-03	1.63E-03	3.9E-04	6.058E-04	1.0E-03
1,2,3-Trimethylbenzene	526-73-8	--	2.3E-05	5.29E-04	1.06E-03	1.59E-03	3.8E-04	5.904E-04	9.7E-04
1,2,4-Trimethylbenzene	95-63-6	--	1.4E-05	3.29E-04	6.58E-04	9.87E-04	2.4E-04	3.671E-04	6.0E-04
1,2-Dichloroethane	107-06-2	HAP	2.4E-05	5.43E-04	1.09E-03	1.63E-03	3.9E-04	6.058E-04	1.0E-03
1,2-Dichloropropane	78-87-5	HAP	2.7E-05	6.19E-04	1.24E-03	1.86E-03	4.5E-04	6.905E-04	1.1E-03
1,3,5-Trimethylbenzene	108-67-8	--	3.4E-05	7.77E-04	1.55E-03	2.33E-03	5.6E-04	8.676E-04	1.4E-03
1,3-Butadiene	106-99-0	HAP	2.7E-04	6.14E-03	1.23E-02	1.84E-02	4.4E-03	6.854E-03	0.0
1,3-Dichloropropene	542-75-6	HAP	2.6E-05	6.07E-04	1.21E-03	1.82E-03	4.4E-04	6.777E-04	1.1E-03
2-Methylnaphthalene	91-57-6	HAP	3.3E-05	7.64E-04	1.53E-03	2.29E-03	5.5E-04	8.522E-04	1.4E-03
2,2,4-Trimethylpentane	540-84-1	HAP	2.5E-04	5.75E-03	1.15E-02	1.73E-02	4.1E-03	6.417E-03	0.0
Acenaphthene	83-32-9	HAP	1.3E-06	2.88E-05	5.75E-05	8.63E-05	2.1E-05	3.209E-05	5.3E-05
Acenaphthylene	208-96-8	HAP	5.5E-06	1.27E-04	2.54E-04	3.82E-04	9.2E-05	1.420E-04	2.3E-04
Acetaldehyde	75-07-0	HAP	8.4E-03	1.92E-01	3.85E-01	5.77E-01	0.1	0.215	0.4
Acrolein	107-02-8	HAP	5.1E-03	1.18E-01	2.36E-01	3.55E-01	0.1	0.132	0.2
Benzene	71-43-2	HAP	4.4E-04	1.01E-02	2.02E-02	3.04E-02	7.3E-03	0.011	0.0
Benzo(b)fluoranthene	205-99-2	HAP	1.7E-07	3.82E-06	7.64E-06	1.15E-05	2.7E-06	4.261E-06	7.0E-06
Benzo(e)pyrene	192-97-2	HAP	4.2E-07	9.55E-06	1.91E-05	2.86E-05	6.9E-06	1.065E-05	1.8E-05
Benzo(g,h,i)perylene	191-24-2	HAP	4.1E-07	9.52E-06	1.90E-05	2.86E-05	6.9E-06	1.063E-05	1.7E-05
Biphenyl	92-52-4	HAP	2.1E-04	4.88E-03	9.75E-03	1.46E-02	3.5E-03	5.442E-03	9.0E-03
Butane	106-97-8	--	5.4E-04	1.24E-02	2.49E-02	3.73E-02	9.0E-03	0.014	0.0
Butyr/Isobutyraldehyde	78-84-2	--	1.0E-04	2.32E-03	4.65E-03	6.97E-03	1.7E-03	2.593E-03	4.3E-03
Carbon Tetrachloride	56-23-5	HAP	3.7E-05	8.44E-04	1.69E-03	2.53E-03	6.1E-04	9.421E-04	1.5E-03
Chlorobenzene	108-90-7	HAP	3.0E-05	6.99E-04	1.40E-03	2.10E-03	5.0E-04	7.804E-04	1.3E-03
Chloroethane	75-00-3	HAP	1.9E-06	4.30E-05	8.60E-05	1.29E-04	3.1E-05	4.800E-05	7.9E-05
Chloroform	67-66-3	HAP	2.9E-05	6.56E-04	1.31E-03	1.97E-03	4.7E-04	7.316E-04	1.2E-03
Chrysene	218-01-9	HAP	6.9E-07	1.59E-05	3.19E-05	4.78E-05	1.1E-05	1.779E-05	2.9E-05
Cyclopentane	287-92-3	--	2.3E-04	5.22E-03	1.04E-02	1.57E-02	3.8E-03	5.827E-03	0.0
Ethane	74-84-0	--	0.1	2.42E+00	4.83E+00	7.25E+00	1.7	2.695	4.4
Ethylbenzene	100-41-4	HAP	4.0E-05	9.13E-04	1.83E-03	2.74E-03	6.6E-04	1.019E-03	1.7E-03
Ethylene Dibromide	106-93-4	HAP	4.4E-05	1.02E-03	2.04E-03	3.06E-03	7.3E-04	1.137E-03	1.9E-03
Fluoranthene	206-44-0	HAP	1.1E-06	2.55E-05	5.11E-05	7.66E-05	1.8E-05	2.849E-05	4.7E-05
Fluorene	86-73-7	HAP	5.7E-06	1.30E-04	2.61E-04	3.91E-04	9.4E-05	1.455E-04	2.4E-04
Formaldehyde	50-00-0	HAP	3.97E-04 lb/bhp-hr	1.44E+00	2.88E+00	4.32E+00	1.0	1.607	2.6
Methanol	67-56-1	HAP	2.5E-03	5.75E-02	1.15E-01	1.73E-01	0.0	0.064	0.1
Methylcyclohexane	108-87-2	--	1.2E-03	2.83E-02	5.66E-02	8.49E-02	0.0	0.032	0.1
Methylene Chloride	75-09-2	HAP	2.0E-05	4.60E-04	9.20E-04	1.38E-03	3.3E-04	5.134E-04	8.4E-04
n-Hexane	110-54-3	HAP	1.1E-03	2.55E-02	5.11E-02	7.66E-02	0.0	0.028	0.0
n-Nonane	111-84-2	--	1.1E-04	2.53E-03	5.06E-03	7.59E-03	1.8E-03	2.824E-03	4.6E-03
n-Octane	111-65-9	--	3.5E-04	8.07E-03	1.61E-02	2.42E-02	5.8E-03	0.009	0.0
n-Pentane	109-66-0	--	2.6E-03	5.98E-02	1.20E-01	1.79E-01	0.0	0.067	0.1
Naphthalene	91-20-3	HAP	7.4E-05	1.71E-03	3.42E-03	5.13E-03	1.2E-03	1.910E-03	3.1E-03
PAH	--	HAP	2.7E-05	6.19E-04	1.24E-03	1.86E-03	4.5E-04	6.905E-04	1.1E-03
Perchloroethylene	127-18-4	HAP	2.5E-06	5.70E-05	1.14E-04	1.71E-04	4.1E-05	6.366E-05	1.0E-04
Phenanthrene	85-01-8	HAP	1.0E-05	2.39E-04	4.78E-04	7.18E-04	1.7E-04	2.670E-04	4.4E-04
Phenol	108-95-2	HAP	2.4E-05	5.52E-04	1.10E-03	1.66E-03	4.0E-04	6.161E-04	1.0E-03
Propane	74-98-6	--	4.19E-02	9.64E-01	1.93E+00	2.89E+00	0.7	1.076	1.8
Pyrene	129-00-0	HAP	1.4E-06	3.13E-05	6.26E-05	9.38E-05	2.3E-05	3.491E-05	5.7E-05
Styrene	100-42-5	HAP	2.4E-05	5.43E-04	1.09E-03	1.63E-03	3.9E-04	6.058E-04	1.0E-03
Toluene	108-88-3	HAP	4.1E-04	9.38E-03	1.88E-02	2.82E-02	6.8E-03	0.010	0.0
Vinyl Chloride	75-01-4	HAP	1.5E-05	3.43E-04	6.85E-04	1.03E-03	2.5E-04	3.825E-04	6.3E-04
Xylenes	1330-20-7	HAP	1.8E-04	4.23E-03	8.46E-03	1.27E-02	3.0E-03	4.723E-03	7.8E-03
Max. Single HAP									**2.6**
TOTAL HAPs				**1.89**	**3.8**	**5.7**	**1.4**	**2.1**	**3.5**

otes:

1. Toxics/HAP emission factors are based on AP-42. Chapter 3.2-2. Emission factor for formaldehyde are provided by the manufacturer.
2. Formaldehyde is controlled by 95% per vendor specification. To be conservative, all other toxics are assumed to be controlled by 90%.
3. Short-term (hourly) emissions are calculated assuming one 20-minute startup event occurs during an hour.
4. *Daily emissions are calculated assuming one 20-minute startup event occurs during a day.*
5. Annual emissions are calculated assuming thirty-six 20-minute startup events occur during a year.
6. Total emissions for all the engines proposed at the facility are calculated as follows:
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)
7. NO_2 emissions are assumed 10% of NO_x emissions.
8. Ammonia slip data provided by the manufacturer. Peak ammonia emissions conservatively assume no startup events occur during the emission period.
   Ammonia emissions for each engine proposed at the facility are calculated as follows:
   Short term emissions (lb/hr/engine) = (NH3 Slip [ppmv] / 10^6) * (1 / Molar Vol. of Flue Gas [scf/lb-mol]) * MW of NH3 [lb/lb-mol] * Flue Gas Flow Rate [acfm] * 60 [min/hr]

   Annual emissions (tpy per engine) = Short term emissions (lb/hr/engine) * 8760 [hr/day] / 2000 [lb/ton]
   Short-term emissions (lb/hr - total) = Short-term emissions (lb/hr/engine) * (number of engines)
   Annual emissions (tpy - total) = Annual emissions (tpy per engine) * (number of engines)

APPENDIX C
EQUIPMENT SPECIFICATIONS

JENBACHER

Technical Description

Genset-Container

JGC 620 GS-N.L

with Island Operation

no special Grid Code

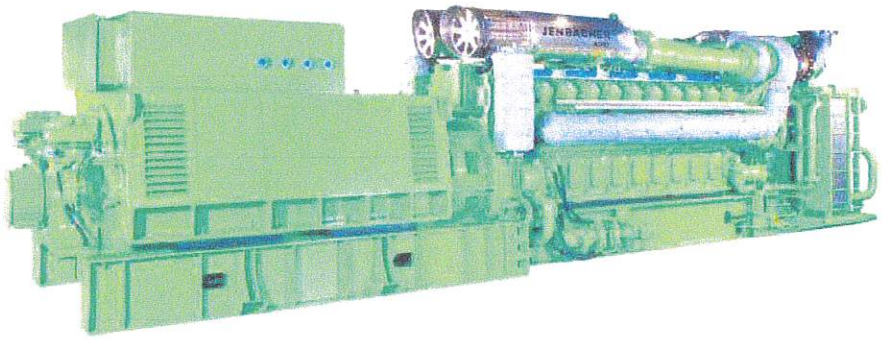
VoltaGrid Vantage

JGC 620 J715, 13800V

The ratings in the specification are valid for full load operation at a site installation of 1000 ft (300 m) and an air intake temperature of T1 < 104F (40C). At T1 > 104F (40C), an output deration of approximately 0.8%/F (1.44%/C) will occur

*** Note: Master Control shown in separate Technical Specification Document.*

TSR 1053



Electrical output @ 104 F (PF = 1.0 / 0.9)	3307 / 3290	kW el.
@ 110 F (PF = 1.0 / 0.9)	3163 / 3150	kW el.

Emission: According to Attachment 5 Emissions letter

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0.01 Technical Data (container)

			100%	75%	50%
Power input	[2]	MBTU/hr	26,028	20,196	14,157
Gas volume	*)	SCFH	28,384	22,024	15,438
Mechanical output	[1]	bhp	4,601	3,450	2,300
Electrical output	[4]	kW el.	3,307	2,471	1,627
Heat to be dissipated (calculated with Glycol 37%)	**[5]**				
~ Intercooler 1st stage (Engine jacket water cooling circuit)	[9]	MBTU/hr	3,900	2,307	945
~ Intercooler 2nd stage (Low temperature circuit)		MBTU/hr	723	488	324
~ Lube oil (with gearbox) (Engine jacket water cooling circuit)		MBTU/hr	1,221	1,058	901
~ Jacket water		MBTU/hr	2,017	1,709	1,402
~ Surface heat	ca. [7]	MBTU/hr	3,197	~	~
Spec. fuel consumption of engine electric	[2]	BTU/kWel.hr	7,871	8,173	8,701
Spec. fuel consumption of engine	[2]	BTU/bhp.hr	5,657	5,854	6,155
Lube oil consumption	ca. [3]	gal/hr	0.21	~	~
Electrical efficiency			43.4%	41.8%	39.2%
Fuel gas LHV		Btu/scft	917		

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...).

Main dimensions and weights (container)(with gearbox)

Length	in	708
Width	in	158
Height	in	595

Engine - Container (with gearbox)

Weight filled	lbs	147,802

Connections

Jacket water inlet and outlet	in/lbs	4"/145
Exhaust gas outlet [C]	in/lbs	25"/145
Fuel gas connection (container) [D]	in/lbs	4"/232
Fresh oil connection	G	28x2"
Waste oil connection	G	28x2"
Cable outlet	in	31.5x15.7
Condensate drain	in	~

Output / fuel consumption

ISO standard fuel stop power ICFN	bhp	4,601
Mean effe. press. at stand. power and nom. speed	psi	319
Fuel gas type		Natural gas
Based on methane number | Min. methane number	MN	75 | 75 d)
Compression ratio	Epsilon	10.5
Min. fuel gas pressure for the pre chamber	psi	58.88532244
Min./Max. fuel gas pressure at inlet to gas train	psi	58.02 - 116.03 c)
Max. rate of gas pressure fluctuation	psi/sec	0.145
Maximum Intercooler 2nd stage inlet water temperature	°F	122
Spec. fuel consumption of engine	BTU/bhp.hr	5,657
Specific lube oil consumption	g/bhp.hr	0.15
Max. Oil temperature	°F	~ 176
Jacket-water temperature max.	°F	~ 203
Filling capacity lube oil (refill)	gal	~ 202

c) Lower gas pressures upon inquiry
d) based on methane number calculation software AVL 3.2 (calculated without N2 and CO2)

JENBACHER

0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 620 GS-J715
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		20
Bore	in	7.48
Stroke	in	8.66
Piston displacement	cu.in	7,613
Nominal speed	rpm	1,500
Mean piston speed	in/s	433
Length	in	218
Width	in	75
Height	in	100
Weight dry	lbs	33,069
Weight filled	lbs	35,274
Moment of inertia	lbs-ft²	1642.63
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage		24

Thermal energy balance

Power input	MBTU/hr	26,028
Intercooler	MBTU/hr	4,621
Lube oil (with gearbox)	MBTU/hr	1,221
Jacket water	MBTU/hr	2,017
exhaust when cooling down 180 °C	MBTU/hr	3,516
exhaust when cooling down 100 °C	MBTU/hr	5,028
Surface heat	MBTU/hr	509

Exhaust gas data

Exhaust gas temperature at full load	[8]	°F	681 / 782 / 891
Exhaust gas mass flow rate, wet		lbs/hr	40,971 / 30,465 / 20,427
Exhaust gas mass flow rate, dry		lbs/hr	38,456 / 28,513 / 19,059
Exhaust gas volume, wet		SCFH	518,287 / 385,715 / 258,874
Exhaust gas volume, dry		SCFH	468,167 / 346,827 / 231,613
Max.admissible exhaust back pressure after y-pipe		mbar	0.725

Combustion air data

Combustion air mass flow rate	lbs/hr	39,758 / 29,522 / 19,767
Combustion air volume	SCFM	8,214 / 6,099 / 4,083
Max. admissible pressure drop at air-intake filter	psi	0.145

basis for exhaust gas data: natural gas: 100% CH4; biogas 65% CH4, 35% CO2

Sound pressure level

Aggregate a)		dB(A) re 20µPa		101
31,5	Hz	dB		88
63	Hz	dB		95
125	Hz	dB		101
250	Hz	dB		99
500	Hz	dB		94
1000	Hz	dB		93
2000	Hz	dB		92
4000	Hz	dB		94
8000	Hz	dB		95
Exhaust gas b)		dB(A) re 20µPa		123
31,5	Hz	dB		112
63	Hz	dB		121
125	Hz	dB		131
250	Hz	dB		119
500	Hz	dB		117
1000	Hz	dB		118
2000	Hz	dB		117
4000	Hz	dB		112
8000	Hz	dB		98

Sound power level

Aggregate	dB(A) re 1pW	122
Measurement surface	m²	125
Exhaust gas	dB(A) re 1pW	131
Measurement surface	m²	6.28

a) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635 and ISO 3744, precision class 3.
b) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635 and ISO 3744, precision class 2.
The spectra are valid for aggregates up to bmep=20 bar. (for higher bmep add safety margin of 1dB to all values per increase of 1 bar pressure).
Engine tolerance ± 3 dB

0.02.01 Technical data of gearbox

Manufacturer		EISENBEISS
Type		~
Gearbox ratio		1:1,2
Efficiency	%	99.59
Mass	lbs	5,071

JENBACHER

*0.03 Technical data of generator

Manufacturer		AVK e)
Type		DIG 142 d/4 e)
Driving power	bhp	4,582
Ratings at p.f. = 1,0	kW	3,307
Ratings at p.f. = 0.9	kW	3,290
Rated output at p.f. = 0.9	kVA	3,655
Rated reactive power at p.f. = 0.9	kVar	1,592
Rated current at p.f. = 0.9	A	153
Frequency	Hz	60
Voltage	kV	13.8
Speed	rpm	1,800
Permissible overspeed	rpm	2,250
Power factor (lagging - leading) (UN)		0,8 - 0,95
Efficiency at p.f. = 1,0		96.8%
Efficiency at p.f. = 0.9		0.0%
Moment of inertia	lbs-ft²	3916.11
Mass	lbs	21,729
Radio interference level to EN 55011 Class A (EN 61000-6-4)		N
Cable outlet		~
Ik" Initial symmetrical short-circuit current	kA	1.20
Is Peak current	kA	3.08
Insulation class		H
Temperature (rise at driving power)		F
Maximum ambient temperature	°F	104

Reactance and time constants at rated output (saturated)

xd direct axis synchronous reactance	p.u.	1.752
xd' direct axis transient reactance	p.u.	0.211
xd" direct axis sub transient reactance	p.u.	0.141
x2 negative sequence reactance	p.u.	0.167
Td" sub transient reactance time constant	ms	28
Ta Time constant direct-current	ms	50
Tdo' open circuit field time constant	s	3.25

e) JENBACHER reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

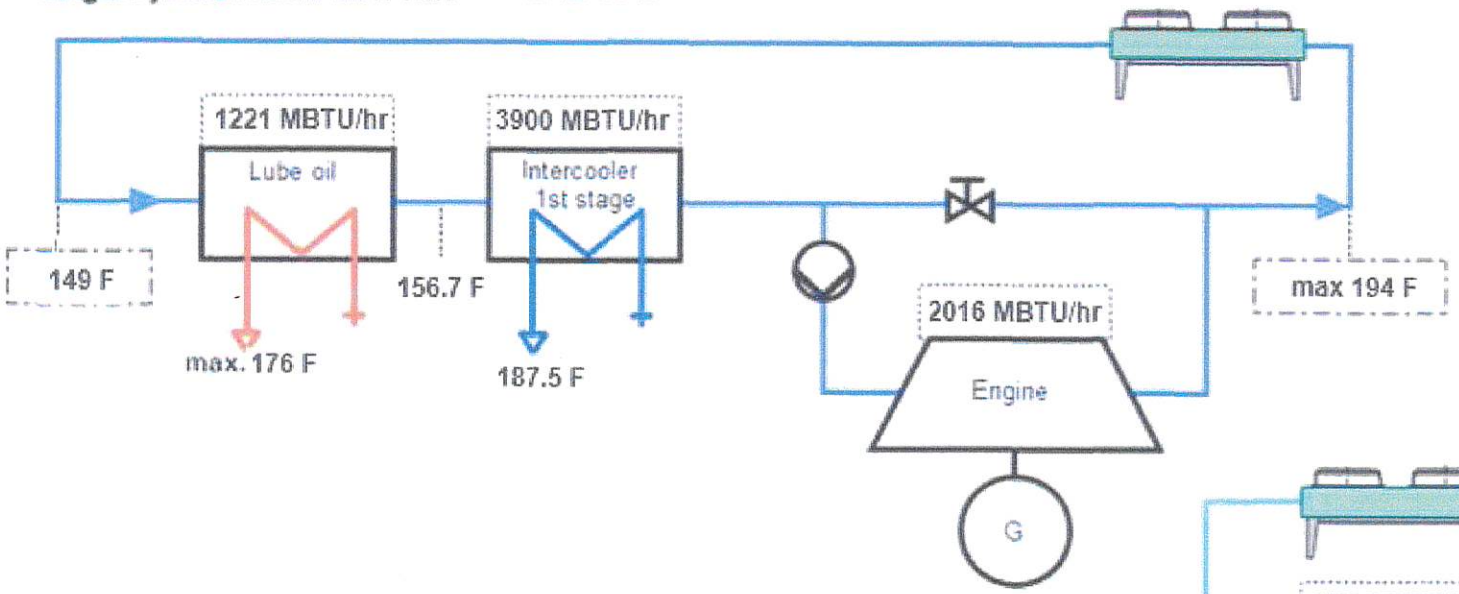
JENBACHER

connection variant 1K
⇨ J 620 GS-J715

Engine jacket water cooling circuit (calculated with Glycol 37%)

Heat to be dissipated = 7,138 MBTU/hr
(+12/-8 % tolerance)

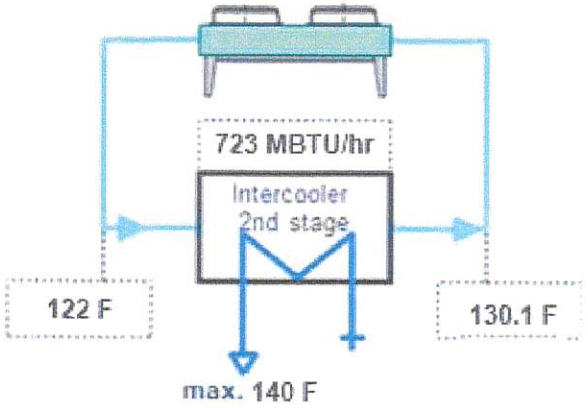
Engine jacket water flow rate = 354.6 GPM



Low temperature circuit (calculated with Glycol 37%)

Heat to be dissipated = 723 MBTU/hr
(+12/-8 % tolerance)

Cooling water flow rate = 198.1 GPM



0.05 Cooling water circuit

Oil - heat (Engine jacket water cooling circuit)

Nominal output	MBTU/hr	1,221
Max. Oil temperature	°F	176
Loss of nominal pressure of engine jacket water	psi	5.80
Safety valve - max press. set point	bar	50.75

Engine jacket water - heat (Engine jacket water cooling circuit)

Nominal output	MBTU/hr	2,016
Max. engine jacket water temperature (outlet engine)	°F	194
Engine jacket water flow rate	GPM	354.6
Safety valve - max press. set point	MBTU/hr	50.75

Mixture Intercooler (1st stage) (Engine jacket water cooling circuit)

Nominal output	MBTU/hr	3,900
Max. inlet cooling water temp. (intercooler)	°F	147.02
Nominal pressure of cooling water / (max. operating pressure)	lbs	145
Loss of nominal pressure of engine jacket water	psi	7.25
Safety valve - max press. set point	psi	50.75

Mixture Intercooler (2nd stage) (Low temperature circuit)

Nominal output	MBTU/hr	723
Max. inlet cooling water temp. (intercooler)	°F	122
Aftercooler water flow rate	GPM	198.1
Nominal pressure of cooling water / (max. operating pressure)	lbs	145
Intercooler water pressure drop	psi	8.70
Safety valve - max press. set point	bar	50.75

The final pressure drop will be given after final order clarification and must be taken from the P&ID order documentation.

0.10 Technical parameters

The following "Technical Instruction (TA) of JENBACHER" form an integral part of the contract and must be strictly observed:

TA 1000-0004 - Preservation of Jenbacher modules
TA 1100-0110 – Boundary Conditions for Jenbacher Gas Engines
TA 1100-0111 – General Conditions – Operation and Maintenance
TA 1100-0112 – Installation of Jenbacher Units

These Technical Instructions reference other guides and instructions which can be provided upon request. These instructions should be carefully reviewed by all personnel involved with the application, installation design, installation construction, and overall maintenance of any Jenbacher gas engine

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures as well as the methane number and subject to technical development and modifications. For isolated operation an output reduction may apply according to the block load diagram. Before being able to provide exact output numbers, a detailed site load profile needs to be provided (motor starting curves, etc.).

All pressure indications are to be measured and read with pressure gauges (psig).

[1] At nominal speed and standard reference conditions ICFN according to ISO 3046-1, respectively.
[2] According to ISO 3046-1, respectively, with a tolerance of +**5** %.
Efficiency performance is based on a new unit (immediately upon commissioning).Effects of degradation during normal operation can be mitigated through regular service and maintenance work.

[3] Average value between oil change intervals according to maintenance schedule, without oil change amount
[4] At p. f. = 1.0 according to IEC 60034-1:2017 with relative tolerances, all direct driven pumps are included
[5] Total output with a tolerance of +12/-8 %
[6] According to above parameters [1] through [5]
[7] As a guiding value at p.f. 0.8 and only valid for (engine, generator, TCM). Other peripheral equipment is not considered.
[8] Exhaust temperature with a tolerance of ±8 %
Note: an optimized operating mode to minimize methane slip can result in changed exhaust gas data (exhaust gas temperature, NOx emissions, etc.) and must be taken into account in the design of the exhaust gas aftertreatment
[9] Mixture temperature at:
If the engine is designed for intake air temperatures of > 34°F, then the stated mixture heat of the 1st stage is to be increased from 25°F in 2%/°F increments. The additional temperature must be added to the resulting full load point.

Radio interference level
The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

Definition of output

- ISO-ICFN continuous rated power:
  Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.
- Standard reference conditions:

Barometric pressure:	14.5 psi (1000 mbar) or 328 ft (100 m) above sea level
Air temperature:	77°F (25°C) or 298 K
Relative humidity:	30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)

Pressure:	1 atmosphere (1013.25 mbar)
Temperature:	32°F (0°C)

Loss of engine performance

a) Performance reduction due to gas quality

If the reference methane number is not reached and the knock control responds, the ignition timing at full performance is adjusted in conjunction with the engine management system; only then is performance reduced.

H2 admixtures in the range of 3–5 Vol% into the natural gas network are generally regarded as non-critical. Prerequisites for this are rates of change according to TA 1000-0300, as well as the knock resistance (minimum methane number) of the natural gas-H2 mixture according to the specification. For reliable compliance with required NOx emissions, the JENBACHER LEANOX^{plus} control is recommended (measurement of NOx emissions and correction of the LEANOX controller). Higher H2 addition rates into the natural gas network must be assessed on a project-specific basis.

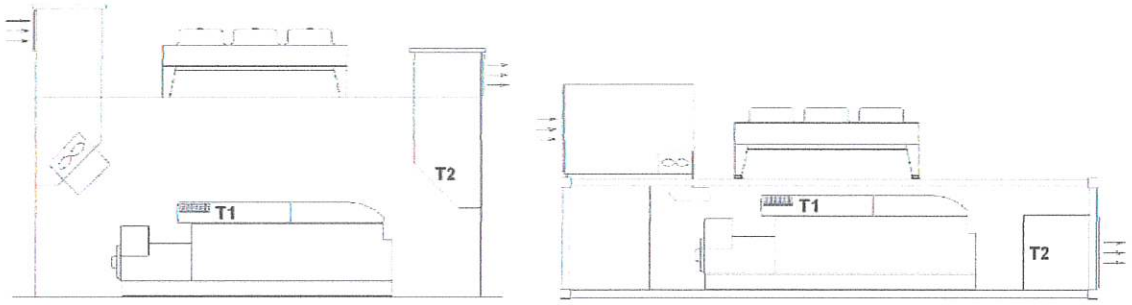
b) Performance reduction due to voltage and frequency limits

If the voltage and frequency limits for generators specified in IEC 60034-1 Zone A are exceeded, performance is reduced.

c) Performance reduction due to environmental conditions

The ratings in the specification are valid for full load operation at a site installation of 1000 ft (300 m) and an air intake temperature of T1 < 104F (40C). At T1 > 104F (40C), an output deration of approximately 0.8%/F (1.44%/C) will occur

Engine room outlet temperature: **140°F** (T2) -> engine stop



The minimum recommended air change ratio (C) must be observed to maintain the required air quality and prevent unwanted gas accumulations (refer to Section ⇨ Potentially explosive Atmospheres as per TA1100-0110). The calculation is based on TA 1100-0110 and is C_{min}= 50h^{-1} for JENBACHER modules.

Parameters for the operation of JENBACHER gas engines
The genset fulfills the limits for mechanical vibrations according to ISO 8528-9.
The following "Technical Instruction of JENBACHER" forms an integral part of a contract and must be strictly observed: **TA 1000-0004, TA 1100 0110, TA 1100-0111**, and **TA 1100-0112.**
Transport by rail should be avoided. See **TA 1000-0046** for further details

Failure to adhere to the requirements of the above-mentioned TA documents can lead to engine damage and may result in loss of warranty coverage.

The engine is tested on the test stand with a specific natural gas. The natural gas as used by the Seller on the test stand may differ from the gas as ultimately used by the Customer. For this reason, performance and efficiency levels, exhaust-gas temperatures, gas consumption, etc. may deviate from the parameters specified in the contract.

Ready for H2 means a possible adaptation up to 100vol% H2 operation. Performance data, timeline and costs can be determined on a project-specific basis.

Parameters for the operation of control unit and the electrical equipment
Relative humidity 50% by maximum temperature of 104°F.
Altitude up to 2000m above the sea level.

0.20 Mode of Operation

Pure Island Mode
The genset is operating as standalone solution, or together with other power generation equipment, connected to a load without any connection to the utility. The unit(s) can perform "Black-out" start without external auxiliary power supply to the "dead busbar". A single unit is controlled by the dedicated genset controller DIA.NE XT4, for multiple units a higher-level control system needs to be provided either by JENBACHER or the customer to synchronize the gensets among each other.

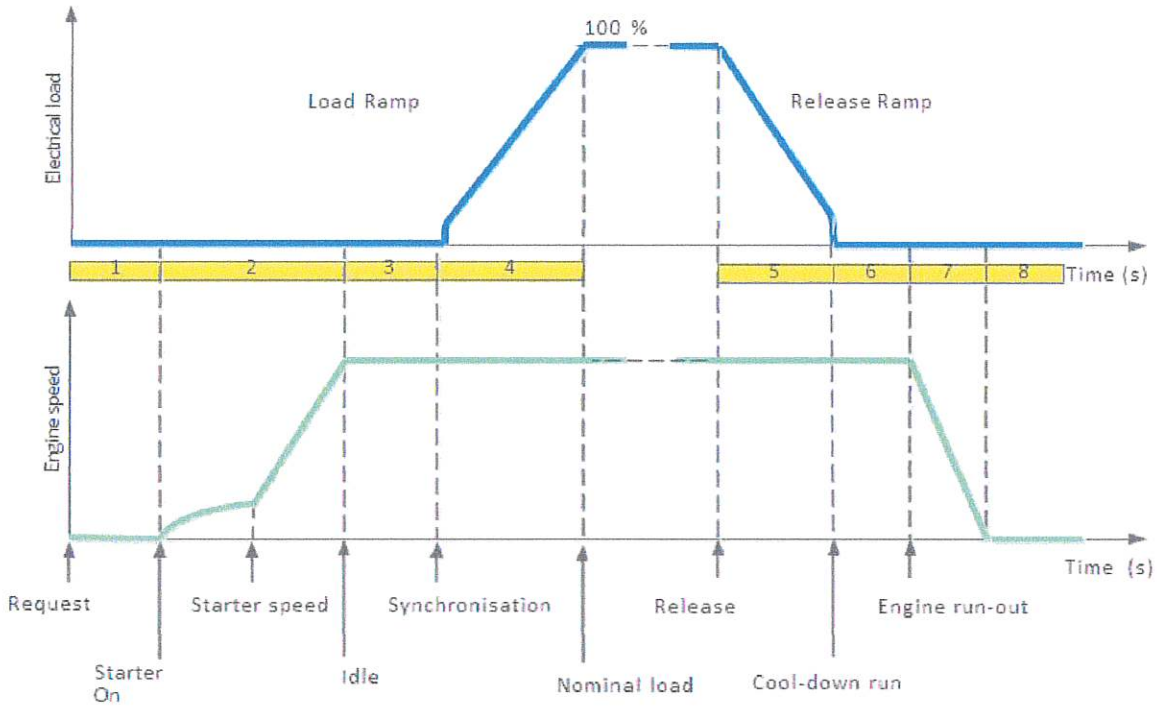
The load adding and shedding capabilities of the genset documented in
- TA 2108-0031 - general island operation
- TA 2108-0027 for type 2 engines
- TA 2108-0025 for type 3 engines
- TA 2108-0029 for type 4 engines
- TA 2108-0026 for type 6 engines
- TA 2108-0032 for type 9 engines

needs to be considered by the customer in order to ensure proper operation of the equipment.

0.20.01.1 Boundary Conditions

Basic Boundary Conditions for the engine start:

Engine Condition	Oil Temperature (C/F)	Cooling Water Temperature (C/F)
Fast Start Release	> 27 C / 81 F	> 37 C / 98.6 F
Start Enable Auto Start		> 37 C / 98.6 F
Sync Release		> 55 C / 131 F



The following time data of the individual start sections up to the nominal loa are guideline values for a fully automatic start under pre-heated conditions for mains parallel operation. Only the total start time is observed under the various engine conditions. The individual time periods specified in the table therefore do not necessary add up to the specification of the total start time in mains parallel operation.

	Type 620 ***
1) Start preparation [1] *)	70
2) Engage starter until reaching nominal speed [s] *)	40
3) Synchronisation [s] *)	1 - 50
(4) Load application up to nominal load [s] *)	160
Total start-up time from request to nominal load [s]	< 300

*) The times for start preparation and synchronization can vary greatly and depend on project specifications. Th following times for unloading the engine are guide values for the engine/generator combination inertia constant H < kWs/KVA (with LS, CGT and TPDS generators and the hot operating condition

(5) Load reduction ramp [s] ****)	160
(6) Cool-down run [s]	10
(7) Run-down [s]	60
Total time from nominal load to run-down time [s]	220
(8A) gas tightness control [s]	< 100
(8B) Flushing time exhaust tract after shutdown [s]***)	100
(8C) Flushing time exhaust tract after shutdown with SD and WT [s]***)	180
(8D) Flushing time exhaust tract after shutdown with SD, WT, SCR and greenhouse [s]***)	225
(8E) Blocking time for restart [s]	30

***) The exhaust gas purging times apply when the exhaust gas purging fan is installed
The table shows the waiting time between stopping the engine and starting it again, with the gas tightness check (8A), exhaust gas scavenging (8B-D) and blocking time (8E) being carried out in parallel. The flushing time can be extended project specifically depending on the exhaust system.
****) Ramp rate shown in recommended, short reduction rates up to full load rejection possible.

It should also be noted that the exhaust gas purge must be performed after each unsuccessful start attempt once the gas valve has been opened.

****** Mobile Application capabilites based on Annex 13 - Deviation List, Halliburton Specification D01881854 Revision F 221108***

0.30 General information for connection to the public mains

Technical Instruction TA 1530-0188 describes the - possibly optional - functions and parameters for complying with the boundary conditions defined in the country-specific "Grid Codes".

Network operator-dependent requirements must always be coordinated with JENBACHER.

0.30.10 Generator operating range in mains parallel operation

Frequency:
Normal operation fn +/-2% - without power output reduction
Extended operation: fn +4/-6%- with power output reduction between 2 – 10%/Hz
Frequency-measurement resolution: <= 10mHz (resolution)
Generator - voltage range: +/-10% of generator Un
Generator power factor cos phi at the generator terminals: as specified in "0.03 Generator technical data"

FRT (Fault Ride Through) – capability: at mains connection point
Profile 1: 150ms/30%Un (applies to natural gas and biogas)
Profile 2 (150ms/5%Un) and Profile 3 (250ms/5%Un) upon request.

Requirement:
- mains short-circuit power must be at least 5 x SrE or 50MVA
- FRT capability of the onsite auxiliaries

Extended project requirements and country-specific design are optionally possible after consultation and approval with JENBACHER.

0.30.20 Possible mains operator requests

To protect the generating unit in mains parallel operation, appropriate mains protection monitoring functions are necessary to disconnect the generator from the mains in case of a mains fault.

The mains operator-dependent specifications such as e.g.: voltage and frequency range, active power limitation, load ramps, reactive power limitation and control, protection concept, necessary certification or declarations, process data and interfaces are to be specified in project enquiries and must be agreed with JENBACHER before conclusion of the contract.

- Selectivity assessment, protection tests and recurring tests: on-site by the system operator
- Control power provision via pool operator: on request e.g. primary, secondary, tertiary
- Black start capability and countering in own use: on request
- Power generation system (EZA) controller or central control: on-site or possible on request
- Process data scope / remote control:
  - System data must be provided by the connectee for the mains operator.
  - Remote control interface to the mains operator: on-site
  - Interface specification!

Billing measurements - installation, operation, maintenance and remote data transmission: on-site.

Models of genset and generator: simplified models executed as effective value models for mains parallel operation optionally available.
Model formats: Powerfactory, or PSS/E (as of PP23)
Validated genset models in Powerfactory according to FGW TR3, TR4 and TR8 by a body accredited for this purpose according to DIN EN ISO/IEC 17065

Functional scope of the models in mains parallel operation:
- static voltage stability
- dynamic mains support
- Provision of reactive power
- Behaviour at active power setpoint
- Active power adjustment in the event of overfrequency and underfrequency (LFSM-O, LFSM-U)
- Protective devices and settings

0.30.20.01 Active power adjustment in the event of overfrequency and underfrequency

The following functions are available:

- LFSM-U: Limited Frequency Sensitive Mode - Underfrequency
- LFSM-O: Limited Frequency Sensitive Mode - Overfrequency
- FSM

Reduced power output at overfrequency: (LFSM-O function)
The frequency threshold is freely adjustable from fn + (200 - 500mHz) and the static from 2% to 12%.
Unless the relevant mains operator specifies otherwise for the LFSM-O mode, a threshold of fn + 200mHz and a static of 5% is set.

Power increase in the event of underfrequency (LFSM-U function) – (OPTIONAL as of XT4.5)
activated according to the mains operator's specifications
The frequency-sensitive active power feed-in has the effect that the generating plant
also moves permanently up and down on the frequency characteristic curve ("driving on the characteristic curve") in the frequency range between fn - 200mHz (unless otherwise specified by the mains) and fn - 2.5Hz with regard to its maximum possible active power feed-in.
The prerequisite for this is a corresponding power setpoint.

Reduced power output at underfrequency:
below 98% of fn, reduction by standard 10% of maximum capacity per Hz. Reduction up to maximum fn - 6%.
Lower reduction ramps of 2 - 10%/Hz on request
The FSM function is available as an option

The power generation system is capable of continuing to operate at this minimum power when the minimum power for controllable operation is reached.

1.00 Scope of supply - Module

Design:
The module is built as a compact package. The engine base is bolted to the gearbox/generator base. The Engine output shafting is connected through a coupling to a gearbox. A second coupling is then provided connecting the gearbox to the generator. To provide the best possible isolation from the transmission of vibrations, the engine rests on the engine base-frame by means of anti-vibration mounts. The remaining vibrations are eliminated by mounting the complete module (engine and gearbox/generator frames) on isolating pads (e.g. Sylomer). This, in principle, allows for placing of the module to be directly on any floor capable of carrying the static load.

1.01 Spark ignited gas engine

Four-stroke, air/gas mixture turbocharged, aftercooled, with high performance ignition system and electronically controlled air/gas mixture system.
The engine is equipped with the most advanced

LEANOX® LEAN-BURN COMBUSTION SYSTEM

developed by JENBACHER.

1.01.01 Engine design

Engine block
Single-piece crankcase and cylinder block made of special casting; crank case covers for engine inspection, welded steel oil pan.

Crankshaft and main bearings
Drop-forged, precision ground, surface hardened, balanced; main bearings (upper bearing shell: grooved bearing / lower bearing shell: sputter bearing) arranged between crank pins, drilled oil passages for forced-feed lubrication of connecting rods.

Vibration damper
Maintenance free viscous damper

Flywheel
With ring gear for starter motor and additionally screwed on.

Pistons
Two-part steel piston with oil passages for cooling; piston rings made of high-quality material, main combustion chamber specially designed for lean burn operation.

Connecting rods
Drop-forged, heat-treated, big end diagonally split and toothed. Big end bearings (upper bearing shell: sputter bearing / lower bearing shell: sputter bearing) and connecting rod bushing for piston pin.

Cylinder liner
Chromium alloy gray cast iron, wet, individually replaceable.

Cylinder head
Specially designed and developed for JENBACHER-lean burn engines with optimized fuel consumption and emissions; water cooled, made of special casting, individually replaceable; Valve seats and valve guides and spark plug sleeves individually replaceable; exhaust and inlet valve made of high quality material; Pre-chamber with check-valve.

Crankcase breather
Connected to combustion air intake system

Valve train
Camshaft, with replaceable bushings, driven by crankshaft through intermediate gears, valve lubrication by splash oil through rocker arms.

Combustion air/fuel gas system
Multipoint fuel injection by cylinder individual Port Injecten valves to allow highly accurate and dynamic control of fuel composition. Exhaust driven turbocharger with Wastegate, water-cooled intercooler.

Ignition system
Most advanced, fully electronic high-performance ignition system, external ignition control.
MORIS / SEMIC: Automatically, cylinder selective registration and control of the current needed ignition voltage.

Lubricating system
Gear-type lube oil pump to supply all moving parts with filtered lube oil, pressure control valve, pressure relief valve and full-flow filter cartridges. Cooling of the lube oil is arranged by a heat exchanger.

Engine cooling system
Electrical jacket water pump, complete with distribution pipework and manifolds.

Exhaust system
Turbocharger and exhaust manifold

Exhaust gas temperature measuring
Thermocouple for each cylinder

Electric actuator
For electronic speed and output control

Electronic speed monitoring for speed and output control
By magnetic inductive pick up over ring gear on flywheel

Starter motor
Engine mounted electric starter motor

1.01.03 Engine accessories

Insulation of exhaust manifold:
Insulation of exhaust manifold is easily installed and removed

Sensors at the engine:
- Jacket water temperature sensor
- Jacket water pressure sensor
- Lube oil temperature sensor
- Lube oil pressure sensor
- Mixture temperature sensor
- Charge pressure sensor
- Minimum and maximum lube oil level switch
- Exhaust gas thermocouple for each cylinder
- Knock sensors
- Gas mixer / gas dosing valve position reporting.
- Air Filter DP sensor
- Crankcase pressure sensor

Actuator at the engine:
- Actuator - throttle valve
- Bypass-valve for turbocharger
- Control of the gas mixer / gas dosing valve

1.01.04 Standard tools (per installation)

The tools required for carrying out the most important maintenance work are included in the scope of supply and delivered in a toolbox.

1.02 Generator-Medium Voltage

The 2-bearing generator consists of the main generator (built as rotating field machine), the exciter machine (built as rotating armature machine) and the digital excitation system.
The digital regulator is powered by an auxiliary winding at the main stator or a PMG system

Main components:
- Enclosure of welded steel construction
- Stator core consist of thin insulated electrical sheet metal with integrated cooling channels.
- Stator winding with 2/3 Pitch
- Rotor consist of shaft with shrunken laminated poles, Exciter rotor, PMG (depending on Type) and fan.
- Damper cage
- Excitation unit with rotating rectifier diodes and overvoltage protection
- Dynamically balanced as per ISO 1940, Balance quality G2,5
- Drive end bracket with re greaseable antifriction bearing
- Non-drive end bracket with re grease antifriction bearing
- Cooling IC01 - open ventilated, air entry at non-drive end, air outlet at the drive end side

- Main terminal box includes main terminals for power cables
- Regulator terminal box with auxiliary terminals for thermistor connection and regulator.
- Anti-condensation heater
- 3 PT100 for winding temperature monitoring+3 PT100 Spare
- 2 PT100 for bearing temperature monitoring
- Current transformer for protection and measuring in the star point
  xx/5A, 5P10 15VA, xx/5A, 1FS5, 15VA

Electrical data and features:

- Standards: IEC 60034, EN 60034, ISO 8528-3, ISO 8528-9
- Voltage adjustment range: +/- 10 % of rated voltage (continuous)
- Frequency: -6/+4% of rated frequency
- Overload capacity: 10% for one hour within 6 hours, 50% for 30 seconds
- Asymmetric load: max. 8% I2 continuous, in case of fault I2 x t=20
- Altitude: < 1000m
- Max permitted generator intake air temperature: 5°C - 40°C
- Max. relative air humidity: 90%
- Voltage curve THD Ph-Ph: <3% at idle operation and <3% at full load operation with linear symmetrical load
- Generator suitable for parallel operating with the grid and other generators
- Sustained short circuit current at 3-pole terminal short circuit: minimum 3 times rated current for 5 seconds.
- Over speed test with 1.2 times of rated speed for 2 minutes according to IEC 60034

Operation of a generator with an external earth fault relay in a non-earthed (IT) network is limited to a maximum of 200 hours beyond its service life.

Digital Excitation system ABB Unitrol 1010 mounted within the AVR Terminal box with following features:

- Compact and robust Digital Excitation system for Continuous output current up to 10 A (20A Overload current 10s)
- Fast AVR response combined with high excitation voltage improves the transient stability during LVRT events.
- The system has free configurable measurement and analog or digital I/Os. The configuration is done via the local human machine interface or CMT1000
- Power Terminals
  3 phase excitation power input from PMG or auxiliary windings
  Auxiliary power input 24VDC
- Excitation output
- Measurement terminals: 3 phase machine voltage, 1 phase network voltage, 1 phase machine current
- Analog I/Os: 2 outputs / 3 inputs (configurable), +10 V / -10 V
- Digital I/O: 4 inputs only (configurable), 8 inputs / outputs (configurable)
- Serial fieldbus: RS485 for Modbus RTU or VDC (Reactive power load sharing for up to 31 JENBACHER engines in island operation), CAN-Bus for dual channel communication
- Regulator Control modes: Bump less transfer between all modes
  Automatic Voltage Regulator (AVR) accuracy 0,1% at 25°C ambient temperature
  Field Current Regulator (FCR)

Power Factor Regulator (PF)
Reactive Power Regulator (VAR)
- Limiters: Keeping synchronous machines in a safe and stable operation area
  Excitation current limiter (UEL min / OEL max)
  PQ minimum limiter
  Machine current limiter
  V / Hz limiter
  Machine voltage limiter
- *Voltage matching during synchronization*
- Rotating diode monitoring
- Dual channel / monitoring: Enables the dual channel operation based on self-diagnostics and setpoint follow up over CAN communication. As Option available
- Power System Stabilizer (PSS) is available as option. Compliant with the standard IEEE 421.5-2005 2A / 2B, the PSS improves the stability of the generator over the highest possible operation range.
- Computer representation for power system stability studies: ABB 3BHS354059 E01
- Certifications: CE, cUL certification according to UL 508c (compliant with CSA), DNV Class B,

- **Commissioning and maintenance Tool CMT1000** (for trained commissioning/ maintenance personal)
- With this tool the technician can setup all parameters and tune the PID to guarantee stable operation. The CMT1000 software allows an extensive supervision of the system, which helps the user to identify and locate problems during commissioning on site. The CMT1000 is connected to the target over USB or Ethernet port, where Ethernet connection allows remote access over 100 m.
- Main window
  - Indication of access mode and device information.
  - Change of parameter is only possible in CONTROL access mode.
  - LED symbol indicates that all parameters are stored on non-volatile memory.
- Setpoint adjust window
  - Overview of all control modes, generator status, active limiters status and alarms.
  - Adjust set point and apply steps for tuning of the PID.
- Oscilloscope
- 4 signals can be selected out of 20 recorded channels. The time resolution is 50 ms. Save files to your PC for further investigation.
- Measurement
  - All measurements on one screen.

Routine Test

Following routine tests will be carried out by the generator manufacturer
- Measuring of the DC-resistance of stator and rotor windings
- Check of the function of the fitted components (e.g., RTDs, space heater etc.)
- Insulation resistance of the following components
  Stator winding, rotor winding
  Stator winding RTDs
  Bearing RTDs
  Space heater
- No Load saturation characteristic (remanent voltage)
- Stator voltage unbalance
- Direction of rotation, phase sequence
- High voltage test of the stator windings (2 x Unom. + 1000 V) and the rotor windings (min. 1500 V)

1.03 Module equipment

Module frame
Welded steel profile frame for mounting the engine, generator and heat exchangers

Flexible coupling
Plug-in, backlash-free coupling with torque limiter, connecting the engine and generator. The coupling isolates the generator from the main harmonic vibrations of the alternating torque of the engine.

Coupling
With torque limiter, to connect the gearbox and generator

Coupling housing
For covering both couplings

Flexible mounting
Rubber rails spaced evenly at the centre of gravity between the engine and the frame and the generator and the frame respectively, and Sylomer strips between the module frame and the foundation base plate to insulate against vibrations

Gearbox
Single-stage spur gear box with upper drive shaft and incorporating its own lubricating oil supply, mounted on the module frame. The lubricating oil heat exchanger is integrated in the hot water circuit. The transmission ratio is 1:1.2.

Exhaust gas piping on the module
Connection to the turbocharger, including a compensator for taking up the thermal expansion and for isolation against vibrations

Intake air filter
Dry air filter with replaceable filter cartridges, flexible connections to the gas mixer, maintenance indicator for filter inspection.

Exhaust system flushing:
The exhaust system is purged after a false start; this is achieved either with an exhaust gas purge fan or by turning the engine with the gas valves closed

Interface cabinet
Fully enclosed sheet steel upright cabinet, door with rubber sealing strip. Mounted on the module, wired and ready for operation.

Paintwork: RAL 7035

Degree of protection: IP54 outside, IP20 inside (protection against accidental direct contact with live components)

Designed to comply with EN 61439-2 / IEC 61439-2
Ambient temperature 5 - 40°C, 70% relative humidity.

Dimensions:

- Height: 51 in
- Width 47 in
- Depth: 16 in

Control current supplied from the battery charger.

Power supply to the auxiliaries: (from the supplier of the power supply systems for the auxiliaries)
3 x **480** / **277** V, **60** Hz, 50 A

Contains:

- Terminal strip
- Decentralised input/output modules connected via a data bus interface to the central engine control system in the module control cabinet
- Speed detection
- Relays, fuses, miniature circuit breakers, engine emergency circuit breaker for controlling valves and auxiliaries
- Air-conditioning unit **(optional)**

1.03.01 Engine jacket water system

Closed cooling circuit, consisting of:

- Expansion tank
- Filling device (check and pressure reducing valves, pressure gauge)
- Safety valve(s)
- Thermostatic valve
- Required pipework on module
- Vents and drains
- Electrical jacket water pump, including check valve
- Jacket water preheat device

1.03.02 Automatic lube oil replenishing system incl. extension tank

Automatic lube oil replenishing system:
Includes float valve in lube oil feed line, including inspection glass. Electric monitoring system will be provided for engine shut-down at lube oil levels "MINIMUM" and "MAXIMUM". Solenoid valve in oil feed line is only activated during engine operation. Manual override of the solenoid valve, for filling procedure during oil changes is included.

Oil drain
By set mounted cock

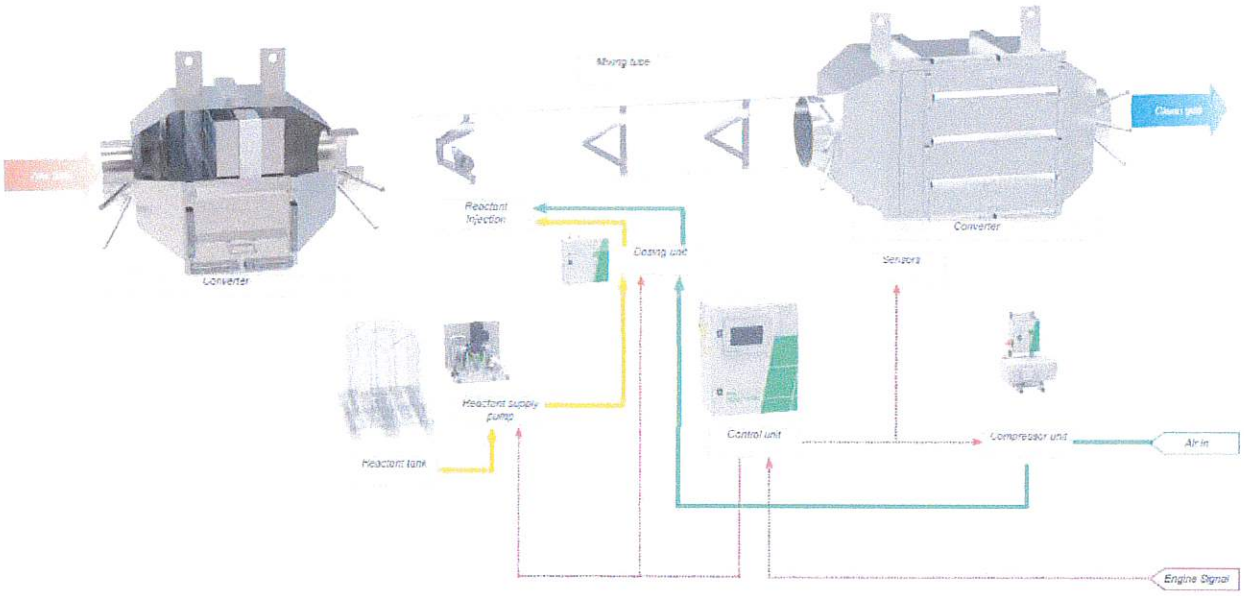
Oil sump extension tank (delivered loose) 250 gal
To increase the time between oil changes

Pre-lubrication- and aftercooling oil pump:
Mounted on the module base frame; it is used for pre-lubrication and aftercooling of the turbochargers.
Period of operation: Pre-lubrication: 1 minute both pumps
Aftercooling: 15 minutes from engine stop only the **480/277** V pump

Consisting of:
- 1 piece oil pump 1500 W, **480/277** V
- 1 piece oil pump 1500 W, 24 V
- All necessary vents
- Necessary pipework

1.03.04 Oxidation Catalyst / SCR Catalytic Converter

A Selective Catalytic reactor system with Oxidation Catalyst functionality is included. Depending on the agreed version, this functional unit includes an integrated primary silencer.



The SCR Oxi-Kat system is comprised of the following elements

Pre-Oxidation Converter:
- Located directly after the engine exhaust
- Contains 2 layers of oxidation catalyst consisting of a metal carrier body (OXI) or a metal frame and ceramic support structure (ASC) with precious metal coating to reduce CO and CH2O emissions.
- The catalyst elements are supplied separately and installed in the Pre-Oxidation Converter housing after the engine has been commissioned and adjusted via a service door.

Urea Mixing Section:
- Located directly after the Pre-Oxidation Converter
- Contains urea injection dosing nozzles and mixing structures to promote efficient mixing of the exhaust gases with the injected 32.5% urea solution.

SCR converter:
- Located immediately downstream of the mixing section
- Houses 3 layers of SCR catalyst to convert the nitrogen oxides in the exhaust stream into environmentally neutral nitrogen in a catalytic converter with the aid of the reducing agent urea.
- Ammonia Slip Control elements are located within the SCR converter.
- The SCR converter will also provide a exhaust noise silencing feature

Set-up:
- SCR catalytic converter housing for outdoor installation
- the urea metering panel is intended for installation close to the injection point (supplied within the container)

- the urea pump panel is intended for installation close to the urea tank (supplied within the container)

Scope of supply:
- Pre-Oxidation Converter
- SCR housing made of material 1.4301 for horizontal installation
- 1x pressure sensors to the SCR housing
- 2x temperature sensors to the SCR housing
- 1x NOx sensor for emission data acquisition on DIA.NE according to 44-BImSchV
- Injection module with crossflow mixer for on-site welding into the exhaust gas pipe
- Dosing lance for injecting urea into the exhaust gas stream. (supplied separately for on-site installation in the injection module)
- Urea pump panel for the urea delivery from the storage tank to the dosing panel (separately supplied, design as per TA 1531-0017)
- Urea dosing panel completely assembled and pre-installed for urea dosing (separately supplied)
  - Filter
  - Reducing agent dosing pump
  - Reducing agent pressure monitoring
  - Constant pressure valve
  - Intake filter
  - Compressed-air compressor
  - Compressed-air monitoring
- SCR - catalyst elements
- Oxi or ASC - catalyst elements
- Catalyst installation with sealing, system testing and commissioning
- Day tank for urea (inside container)
- Engineering & Documentation
- Packing / Despatch

Control:
- on the module control system DIA.NE XT4
- There are two toggle switches on the CPU module:
- Switch 1 ON/OFF
- Switch 2 Switching the "RUN/STOP/COPY" operating modes
- Yellow LED Battery min.
- Green LED „RUN“ Program is being processed
- Red LED „STOP“ Program failure and/or switch 2 to „STOP“

Notes:
- this position does not include a urea storage tank and piping for urea supply
- all system parts and pipelines exposed to urea must be protected against frost by the customer.

1.05.02 Gas train >500mbar (7.3psi) (NFPA 37)

Pre-assembled, delivered loose, for installation into gas pipework to the engine.

Consisting of:

- **Main gas train:**
  - Manual shut off valve
  - Gas filter, filter fineness <3µm – duplex Filter (incl block and bleed – manually operated)
  - T-piece to the pre-chamber gas train or pre-chamber gas compressor
  - Gas admission pressure regulator
  - Pressure gauge with push button valve
  - High pressure regulator with safety-cut-off-valve (SAV)
  - Calming distance with reducer
  - Safety-blow-off-valve (SBV)
  - Pressure gauge with push button valve; after pressure regulator
  - Automatic shut-off valves
  - Leakage detector
  - Gas pressure regulator
  - Gas pressure switches (min., max.)
  - TEC JET
  - Gas flow meter
  - p/t compensation

The gas train complies with DIN - DVGW regulations.

- **Pre-chamber gas train:**
  - Manual shut off valve
  - Gas filter, filter fineness <3µm
  - Solenoid valves
  - Pressure regulator
  - Calming distance with reducer
  - Pressure gauge with push button valve

Pre chamber gas pressure regulator (incl. stabilization section) assembled at the flexible connection pre chamber gas.

1.07 Painting

• Quality:	Oil resistant prime layer Synthetic resin varnish finishing coat	
• Colour:	Engine:	RAL 6018 (green)
	Base frame:	RAL 6018 (green)
	Generator:	RAL 6018 (green)
	Module interface panel:	RAL 7035 (light grey)
	Control panel:	RAL 7035 (light grey)

1.11 Engine generator control panel per module- DIA.NE XT4(+) incl. Single synchronization of the generator breaker

Dimensions:

- Height: 2310 mm (including 200 mm (8 in) pedestal *)
- Width: 800 -1200mm *)
- Depth: 600 mm *)

Protection class:

- external IP42
- Internal IP 20 (protection again direct contact with live parts)

*) Control panels will be dimensioned on a project specific basis. Actual dimensions will be provided in the preliminary documentation for the project.

Control supply voltage from starter and control panel batteries: 24V DC

Auxiliary equipment supply (by the supplier of the auxiliary equipment supply system)
The following network forms are possible for the supply of the auxiliary equipment. Depending on these, appropriate protective measures are provided:

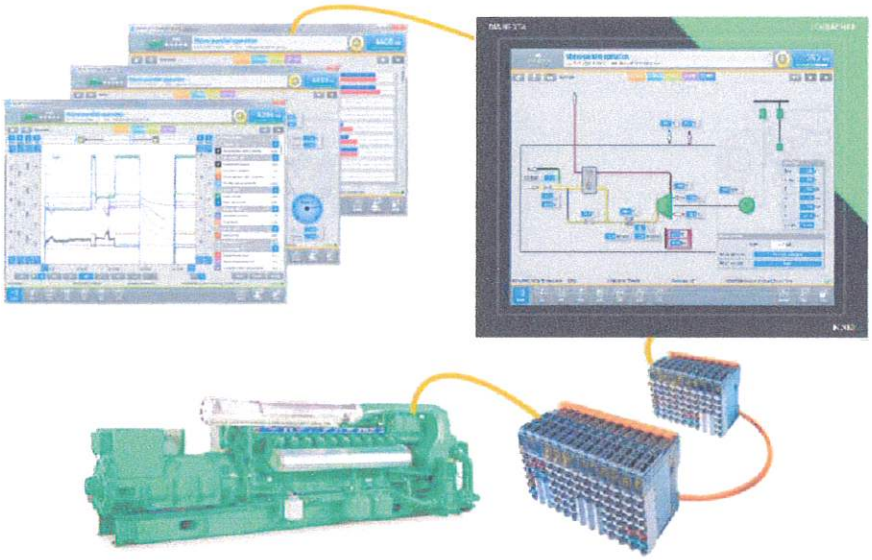
TN- S (L1/2/3, N, PE)

- Power supply via the module control cabinet via connection terminals or directly at the 3-pole mains disconnection unit. Protection against electric shock by automatic disconnection with miniature circuit breaker or fuse.
- Additional protection for sockets with fault current breaker (RCD) type A, 30 mA
- Option:
  - According to national requirements or customer wishes, a 4-pole mains disconnecting device can also be used. Especially if the neutral conductor is not considered to be reliably earthed.
  - Downstream outputs for auxiliary equipment with neutral conductors are fused using 2 or 4 poles.

3 x **480/277** V, **60** Hz

Consisting of:
Motor - Management - System DIA.NE

Setup:
- Touch display visualization
- Central engine and unit control



Touch Display Screen:

15“ industrial colour graphics display with resistive touch screen.

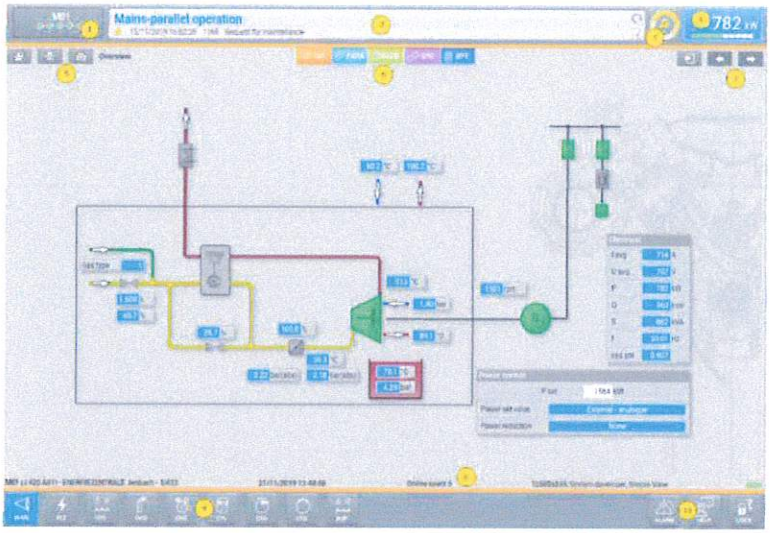
Protection class of DIA.NE XT panel front: IP 65

The screen shows a clear and functional summary of the measurement values and simultaneously shows a graphical summary.

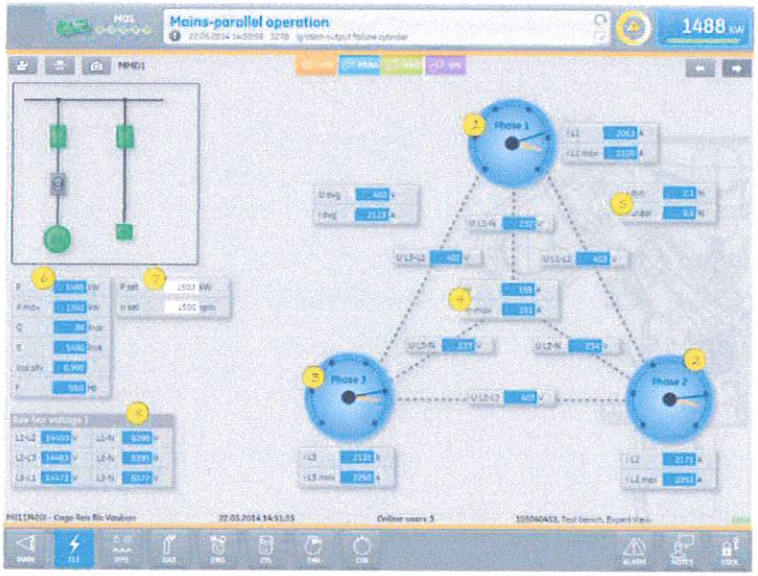
Operation is via the screen buttons on the touch screen
Numeric entries (set point values, parameters…) are entered on the touch numeric pad or via a scroll bar.
Determination of the operation mode and the method of synchronization via a permanently displayed button panel on the touch screen.

Main screens (examples):

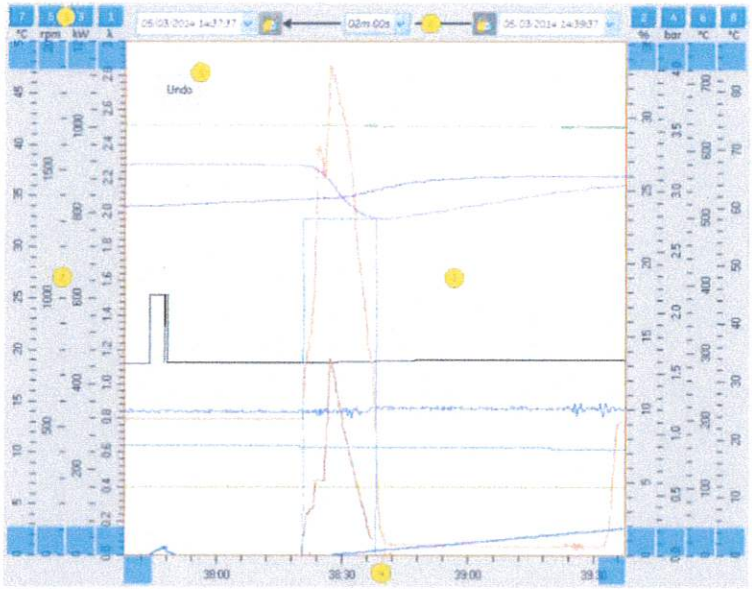
Main: Display of the overview, auxiliary's status, engine start and operating data.



ELE: Display of the generator connection with electrical measurement values and synchronization status



Trending
Trend with 100ms resolution



Measurement values:

- 500 data points are stored
- Measurement interval = 200ms
- Raw data availability with 200ms resolution: 24 hours + max. 50.000.000 changes in value at shut down (60 mins per shut down)
- Compression level 1: min, max, and average values with 1000ms resolution: 1 day
- Compression level 2: min, max, and average values with 30s resolution: 1 month
- Compression level 3: min, max, and average values with 10min resolution: 10 years

Messages:
1.000.000 message events

Actions (operator control actions):
100.000 Actions

System messages:
100.000 system messages

Central engine and module control:

A control system with modular design handles all activities for module and engine-side sequencing control (start preparation, start, stop, cooling-down running, control of auxiliary systems), as well as all control functions.

Interfaces:

- Ethernet (twisted pair) for remote monitoring access
- Ethernet (twisted pair) for connection between engines

- Ethernet (twisted pair) for the Powerlink connection to the control input and output modules.

Connection to the local building management system according to the JENBACHER option list (OPTION)
- MODBUS-RTU Slave
- MODBUS-TCP Slave,
- PROFIBUS-DP Slave (120 words),
- PROFIBUS-DP Slave (192 words),
- ProfiNet Slave
- OPC UA Server (on request)

Control functions:
- Speed control in idle and in island mode
- Power output control in grid parallel operation, or according to an internal or external set point value on a case by case basis
- LEANOX control system which controls boost pressure according to the power at the generator terminals, and controls the mixture temperature according to the engine driven air-gas mixer
- Knocking control: in the event of knocking detection, ignition timing adjustment, power reduction and mixture temperature reduction (if this feature is installed)
- Load sharing between engines in island mode operation (option)
- Linear power reduction in the event of excessive mixture temperature and misfiring
- Linear power reduction according to CH4 signal (if available)
- Linear power reduction according to gas pressure (option)
- Linear power reduction according to air intake temperature (option)

Multi-transducer to record the following alternator electrical values:
- Phase current (with slave pointer))
- Neutral conductor current
- Voltages Ph/Ph and Ph/N
- Active power (with slave pointer)
- Reactive power
- Apparent power
- Power factor
- Frequency
- Active and reactive energy counter

Additional 0 (4) - 20 mA interface for active power as well as a pulse signal for active energy

The following alternator monitoring functions are integrated in the multi-measuring device:
- Overload/short-circuit [51], [50]
- Over voltage [59]
- Under voltage [27]
- Asymmetric voltage [64], [59N]
- Unbalance current [46]
- Excitation failure [40]
- Over frequency [81>]
- Under frequency [81<]

Lockable operation modes selectable via touch screen:

- "OFF" operation is not possible, running units will shut down immediately;
- "MANUAL" manual operation (start, stop) possible, unit is not available for fully automatic operation.
- "AUTOMATIC" fully automatic operation according to external demand signal:

Demand modes selectable via touch screen:

- external demand off („OFF")
- external demand on („REMOTE")
- overide external demand („ON")

Malfunction Notice list:

According to "Fault message list" (part of the documentation)

Surveillances

- Priority 1: (ignition off, generator switch open, solenoid valves closed)
  e.g. overspeed
- Priority 2: (solenoid valves closed, generator switch open at P < 10% Pn)
  e.g. oil pressure min.
- Priority 3: (request off, normal shutdown with cooling run)
  e.g. oil temperature max.
- Priority 4: (Warning)
  e.g. cooling water temperature min.

Remote signals:
(volt free contacts)
1NO = 1 *normally open*; 1NC = 1 *normally closed*

• Ready for automatic start (to Master control)	1NO
• Operation (engine running)	1NO
• Demand auxiliaries	1NO
• Collective signal "shut down"	1NC
• Collective signal "warning"	1NC

External (by others) provided command/status signals:

• Engine demand (from Master control)	1S
• Auxiliaries demanded and released	1S

Single synchronizing Automatic

For automatic synchronizing of the module with the generator circuit breaker to the grid by PLC- technology, integrated within the module control panel.

Consisting of:

- Hardware extension of the programmable control for fully automatic synchronization selection and synchronization of the module and for monitoring of the generator circuit breaker closed signal.
- Lockable synchronization selection via touch screen with the following selection modes:

- "MANUAL" Manual initiation of synchronization via touch screen button followed by fully automatic synchronization of the module
- "AUTOMATIC" Automatic module synchronization, after synchronizing release from the module control
- "OFF" Selection and synchronization disabled
  Control of the generator circuit breaker according to the synchronization mode selected via touch screen.
- "Generator circuit breaker CLOSED/ Select" Touch-button on DIA.NE XT
- "Generator circuit breaker OPEN" Touch-button on DIA.NE XT
- Measurement Generator breaker closing time last synchronization

Status signals:
- Generator circuit breaker closed
- Generator circuit breaker open

Remote signals:
(volt free contacts)
- Generator circuit breaker closed 1 NO

The following reference and status signals must be provided by the switchgear supplier:

- Generator circuit breaker CLOSED/OPEN each 1 NO
- Generator circuit breaker READY TO CLOSE 1 NO
- Mains circuit breaker CLOSED/OPEN each 1 NO

- Mains voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Busbar voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Generator voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Generator voltage via voltage transformers 3x 100V or 110V/3 homopolar voltage for 59N for medium voltage generators

Voltage transformer in the star/star connection with minimum 50VA and Class 0,5

The following volt free interface-signals will be provided by JENBACHER to be incorporated in switchgear:

- CLOSING/OPENING command for generator circuit breaker (permanent contact) 1 NO + 1 NC
- Signal for circuit breaker undervoltage trip 1 NO

Maximum distance between module control panel and engine/interface panel:	30m
Maximum distance between module control panel and power panel:	50m
Maximum distance between module control panel and master control panel:	50m
Maximum distance between alternator and generator circuit breaker:	30m

1.11 Motor control panel – Container design

Sheet metal IEC enclosure, components and assembly UL listed.
For distribution and protection of the module and container auxiliaries.
With cubicle lighting.

Dimensions:

Height:	79 inch (2000 mm)
Width:	39-47 inch (1000-1200 mm)
Depth:	24 inch (600 mm)

Equipment:
Equipped with IEC type starters for each motor
With safety disconnect switches for every load
With step down transformer 480/120V, 4kVA for container consumers

1.11.01 Remote messaging over MODBUS-TCP

Data transfer from the JENBACHER module control system to the customer's on-site central control system via MODBUS TCP using the ETHERNET 10 BASE-T/100BASE-TX protocol TCP/IP.

The JENBACHER module control system operates as a SLAVE unit.
The data transfer via the customer's MASTER must be carried out in cycles.

Data transmitted:
Fault messages, operating messages, measured values (generator power, oil pressure, oil temperature, cooling water pressure, cooling water temperature, etc.) according to JENBACHER standard (interface list).

JENBACHER limit of supply:
RJ45 socket at the interface module in the module control cabinet

1.11.06 Remote Data-Transfer with DIA.NE XT4

General
DIA.NE XT4 offers remote communication using an Ethernet connection.

1.) DIA.NE XT4 HMI
DIA.NE XT4 HMI is the Human-Machine-Interface of DIA.NE XT4 engine control and visualization system for JENBACHER gas engines.
The system offers extensive facilities for commissioning, monitoring, servicing and analysis of the site.
By installation of the DIA.NE XT4 HMI client program it can be used to establish connection to site, if connected to a network and access rights are provided.
The system runs on Microsoft Windows Operating systems (Windows 7, Windows 8, Windows 10)

Function
Functions of the visualization system at the engine control panel can be used remotely. These functions provide control, monitoring, trend indications, alarm management, parameter management, and access to long term data recording. By providing access to multiple systems, also with multiple clients in parallel, additional useful functions are available like

- Multi-user system
- Remote control
- Print and export functions
- Data backup.

The DIA.NE XT4 is available in several languages.

Remote Operation:
Option1 - remote request/remote blocking (remote start/stop)
If the operating mode selector switch on the module control cabinet is set to "Automatic" and the request mode selector is set to "Remote", the module can be enabled (requested) or blocked (derequested) by a control element (button) on the DIA.NE XT4 HMI client. The request can come from a Windows PC in the local network or over a secure myPlant remote connection. The myPlant remote connection requires the myPlant Care package as a prerequisite (not included in the price)
Note:
This option also allows an additional on-site request (from the hardware or a data bus) or self-managed operation (JENBACHER station control, mains import control, etc.) to be implemented.

Option2 – Remote Acknowledgement (remote reset)
Error messages can also be acknowledged remotely on the DIA.NE XT4 HMI client, apart from those error messages incorporated in the safety loop - see TA 1100-0111, Section 12, for more information. Remote acknowledgement can come from a Windows PC in the local network or over a secure myPlant remote connection. A myPlant remote connection - myPlant care package is required to use the "remote reset" over the Internet (not included in the price). Use of this function requires an agreement to be concluded between the customer and JENBACHER laying down the procedure to be followed in the event of damage caused by a remote acknowledgement (preserving evidence) and how to establish responsibility. Proof of OPT training (operator training) and TJE (training on the job) is also required.

Scope of supply

- Software package DIA.NE XT4 HMI Client Setup (Download)
- Number of DIA.NE XT4 HMI - Client user license (Simultaneous right to access of one user to the engine control)

Nr. of license	Access
1	1 Users can be logged in at the same time with a PC (Workplace, control room or at home).
2 - "n" (Optional)	2- "n" Users can be logged in at the same time with a PC (Workplace, control room or at home). If 2- "n" users are locally connected at Computers from office or control room, then it is not possible to log in from home.

Caution! This option includes the DIA.NE XT4 HMI client application and its license only – NO secured, encrypted connection will be provided by JENBACHER! A secured, encrypted connection – which is mandatory – has to be provided by the customer (via LAN connection or customer-side VPN), or can be realized by using option myPlant™.

Customer requirements

- Broad band network connection via Ethernet(100/1000BASE-TX) at RJ45 Connector (ETH1) at DIA.NE XT4 server inside module control panel
- Standard PC with keyboard, mouse or touch and monitor (min. resolution 1024*768)
- Operating system Windows 7, Windows 8, Windows 10
- DirectX 9.0 c compatible or newer 3D display adapter with 64 MB or higher memory

2.) myPlant™

myPlant* is the remote data transfer and diagnostics solution from JENBACHER

	BASIC	CARE	PROFESSIONAL
basic / advanced monitoring			
Live operating status	✓	✓	✓
Historic and live data trending		✓	✓
Alarm management and notification	Alarm management only	✓	✓
Access to all engine documents	✓	✓	✓
Mobile app	✓	✓	✓
Daily status logbooks	✓	✓	✓
Remote access to engine controller		✓	✓
Fleet management		✓	✓
Engine status notifications (SMS/Email)		✓	✓
increased productivity / strong performance			
Recommended maintenance[1] (coming soon)	✓	✓	✓
Support case management[1]	✓	✓	✓
Predictive maintenance for spark plugs, oil and air filters[2]	Spark plugs lifetime prediction only	✓	✓
Oil & coolant quality monitoring[3]		✓	✓
Fleet emission monitoring[4]	Engine emission monitoring only	✓	✓
artificial intelligence & predictive analytics			
Operator analytics package			✓
Historic performance analysis			✓
User-defined monitoring			✓
On demand: Access to myPlant data via API (Application Programming Interface) service[5]			✓

[1] Available soon for JENBACHER direct markets only
[2] Spark plugs, oil and air filters data might not always be available and is depending on the engine version/type ant the sensors installed
[3] Oil and coolant reports are available in myPlant for the following laboratories: Spectro, JetCare, Polaris, MIC GSM
[4] May require additional hardware installation for emission monitoring (available as upgrade)
[5] Might require development work on customer/service provider side and includes 70 API calls per engine per month

Scope of supply

- Access to myPlant™
- Integration of the plant in the myPlant™ system
- Access to Basic and Care level as per new installation contract
- Access to Professional level via separate contract

Equipment to be provided by the customer

- Permanent Internet connection (wired or wireless)
  (see also option 4)
- Technical requirements as per TA 2300-0008
- Outward data connection (from the plant server to the Internet) - INWARD connections are NOT PERMITTED!

CAUTION: The customer must take technical precautions to ensure that direct access to the plant server from the Internet is prevented (e.g. by means of a firewall):
This security measure CANNOT be assumed and guaranteed by JENBACHER

3.) Mobile Internet (OPTION)
Connection Plant - Customer via secured Internet - connection
See also technical instruction **TA 2300 - 0006**

Scope of delivery

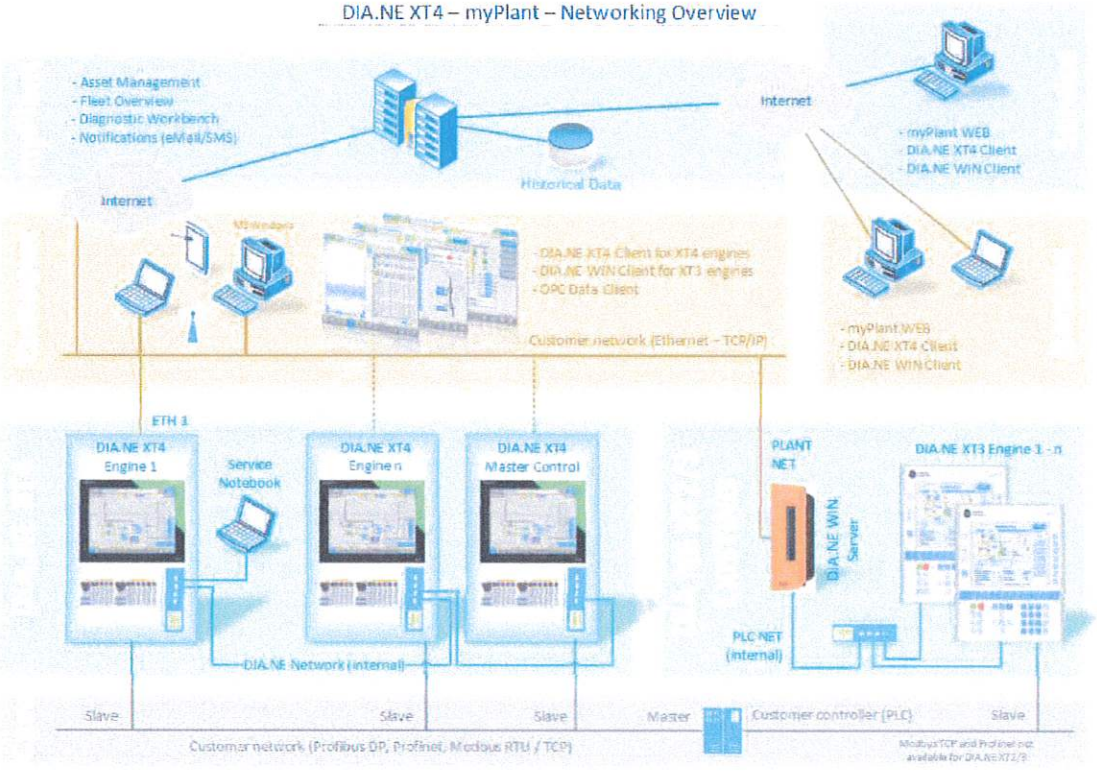
- Mobile Internet router with antenna to connect to the DIA.NE Server XT4

Customer requirements

- SIM card for 3G / 4G

4.) Network overview

For information only!



1.11.13 Out-of-step protection / pole slip protection (integrated in DIA.NE XT4)

ANSI Function Code 78

- 3-phase monitoring, integrated in DIA.NE XT4 controller
- Uses voltage measurement at the generator and engine speed measurement (supplied by JENBACHER).
- Allows real-time calculation of rotor angle during dynamic operations
- Allows safe detection of a pole slip risk and allows operation up to the maximum limit value
- Acting on generator circuit breaker and generator de-excitation.
- Alarm message on the DIA.NE screen.
- Active in Grid and Island parallel operation

OPTIONAL on special release:
separate digital protection relay (ATTENTION: different detection as generator and mains voltage are evaluated. Tripping only possible if pole slip has occurred)

Following monitoring are integrated in the DIA.NE generator protection package

- Load angle / pole slip monitoring
- Exciter failure monitoring [ANSI 40]

1.11.14 Generator Overload / Short Circuit Protection

ANSI Function Code 50/51

- Digital protection relay, 3-phase, integrated into the module control panel.
- Connected to the protective current transformers in the generator star point
- Acting on the generator circuit breaker and on the generator de-excitation
- Alarm message on the DIA.NE screen

Characteristics / settings:

- Setting for overload: to 1,1 times of the generating set rated current,
- Dependent time characteristic acc. to IEC 60255-151: very inverse, time multiplier setting 0,6.
- Setting for short circuit: to 2,0 times of generating set rated current,
- Independent time characteristic: 300 ms (800 ms when dynamic network support).

1.11.15 Generator Differential Protection

ANSI function code 87

- Digital protection relay, 3-phase, integrated into the module control panel.
- Connected to the protective current transformers in the generator star point (JENBACHER scope of supply) and to the protective current transformers in the generator circuit breaker panel (current transformers by client, secondary 1A, optionally: 5A).
- Acting on the generator circuit breaker and on the generator de-excitation
- Alarm message identified on the DIA.NE screen

In plants with a unit generator-transformer configuration the protection is realized as generator/transformer differential protection.

1.11.25 Control Strategy and Options (USA)

Unit Additional Features and Options

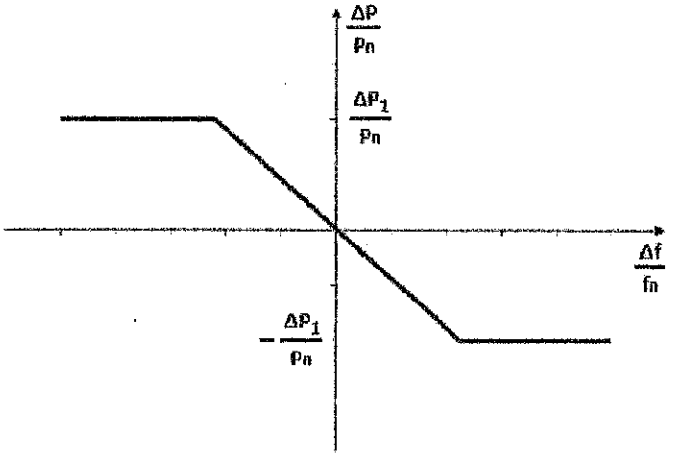
- *Air Conditioning Unit to be provided for M1+ cabinet*

1.11.34 Frequency sensitive control (FSM)

The **FSM** function is used to support the stabilization of the frequency around the nominal value by moving the active power operating point when the frequency moves outside a settable dead band.
In case of over frequency, the active power frequency response is limited by the minimum regulating level. (e.g. Pmin 50%)
In case of under frequency, the active power frequency response is limited by the maximum capacity which is available. (e.g. Pn 100%)

The frequency thresholds and the droop settings are specified in the national Grid Codes and/or are specified by the network operator in the connection agreement.
Possible dead band can be set between 0 and 500 mHz

Active power frequency response capability of power-generating modules in **FSM**:



	NC RfG (Article 15)
active power range ΔP1/Pn	1,5 – 10 %
droop Δf/fn : ΔP/Pn [%]	2 - 12 %

1.20.03 Starting system

Starter battery:
6 piece 12 V AGM battery, 125 Ah (according to DIN 72311).

Battery voltage monitoring:
Monitoring by PLC.

Battery charging equipment:
Capable for charging the starter battery with I/U characteristic and for the supply of all connected D.C. consumers.
Charging device is mounted inside of the module interface panel or module control panel.

- **General data:**

• Power supply	**3 x 320 - 575 V, 47 - 63 Hz**
• max. power consumption	1040 W / 1550 W (5 sec)
• Nominal D.C. voltage	24 V(+/-1%)
• Voltage setting range	24V to 28V (adjustable)
• Nominal current (max.)	2 x 40 A
• Degree of protection	IP20 to IEC 60529
• Operating temperature	32 °F – 158 °F (0 °C - 70 °C)
• Protection class	1
• Humidity class	3K3, no condensation.
• Natural air convection	
• Standards	EN60950,EN50178 UL/cUL (UL508 / UL 60950-1)

Signalling:
Green Led: Output voltage > 21.6V

Control accumulator:
- Pb battery 24 VDC/18 Ah

1.20.05 Electric jacket water preheating

Installed in the jacket water cooling circuit, consisting of:
- Heating elements
- Water circulating pump

The jacket water temperature of a stopped engine is maintained between 133 °F (56°C) and 140°F (60°C), to allow for immediate loading after engine start.

1.20.08 Flexible connections

Following flexible connections per module are included in the JENBACHER -scope of supply:

No.	Connection	Unit	Dimension	Material
2	Warm water in-/outlet	**DN/PN**	**100/10**	Stainless steel
1	Exhaust gas outlet	**DN/PN**	**600/10**	Stainless steel
1	Fuel gas inlet	**DN/PN**	**100/10**	Stainless steel
2	Intercooler in-/outlet	**DN/PN**	**65/10**	Stainless steel
2	Lube oil connection	**mm**	**28**	Hose

Seals and flanges for all flexible connections are included.

2.00 Electrical equipment

Totally enclosed floor mounted sheet steel cubicle with front door wired to terminals. Ready to operate, with cable entry at bottom. Naturally ventilated or with forced ventilation.

Protection:	IP 42 external, NEMA 12	
	IP 20 internal (protection against direct contact with live parts)	

Design according to EN 61439-2 / IEC 61439-2 / UL 508 A and ISO 8528-4.
Ambient temperature 41 - 104 °F (5 - 40 °C), 70 % Relative humidity

Standard painting:	Panel:	RAL 7035
	Pedestal:	RAL 7020 (Rittal TS8)
		RAL 7020 (Rittal VX25)

2.12 Gas warning device

Function:
The gas warning device continuously monitors the radiated air in the engine room and warns against gases which are injurious to persons' health and against explosive gas concentrations.
The measuring head (catalytic sensor) is attached on the covering or nearby the ground, dependent upon the gas source.

Scope of supply:
- Alarm unit voltage: 24VDC
- 2 Gas sensor(s)

2.13 Smoke warning device

Function:
The smoke warning device in combination with the optical smoke detector (installed in the control room) and the thermal smoke detector (installed in the engine room) provide extensive early warning signal.

Design:
The device has an optical display for alarm and operation.
The smoke warning device is installed in a plastic housing.

Scope of supply:
- Alarm unit voltage: 24 V
  3 Smoke detector(s)

3.01 Lube oil system

Consisting of:
- 250 gal fresh oil tank
- Combined electric driven fresh oil and waste oil pump
- Level switches
- Shut-off devices
- Complete pipe work between oil tanks and module

Through simple switch over of the pumps following functions are given:
- Filling of the fresh oil tank from a cask
- Filling of the lube oil tank from a cask
- Filling of the oil pan from a cask
- Emptying of the oil pan into a cask
- Emptying of the waste oil tank into a cask

3.03.01 Exhaust gas silencer

Material:
Stainless steel

Consisting of:
- Exhaust gas silencer
- Flanges, seals, fixings

Insulation:
The insulation for reducing surface irradiations (heat and sound) of the exhaust gas silencer is not included in our scope of supply and must be provided locally. The insulation (4 inch (100 mm) rock wool covered with 0,03 inch (0,75 mm) galvanized steel sheet) is required to keep the sound pressure level of the container (55 dB(A) in 32 ft (10 m)).

3.03.05 Exhaust gas blow-off valve

When the risk of backfires in the exhaust gas system exists an exhaust gas blow-off valve must be installed. The exhaust gas can be released to atmosphere in case of a backfire.
The blow-off valve should be installed as close to the engine exhaust exit as possible.

Scope:
1.piece Exhaust gas blow-off valve

3.10.03 Cooling system – dual-circuit radiator

The heat produced by the engine (jacket water, lube oil, intercooler) is dissipated through a radiator, installed outside.

Consisting of:
- Radiator
- Pump
- Electrical control
- Expansion tank

The radiator is designed for an ambient temperature of max. 110°F.

3.20 Container Type 6 – 1 container layout

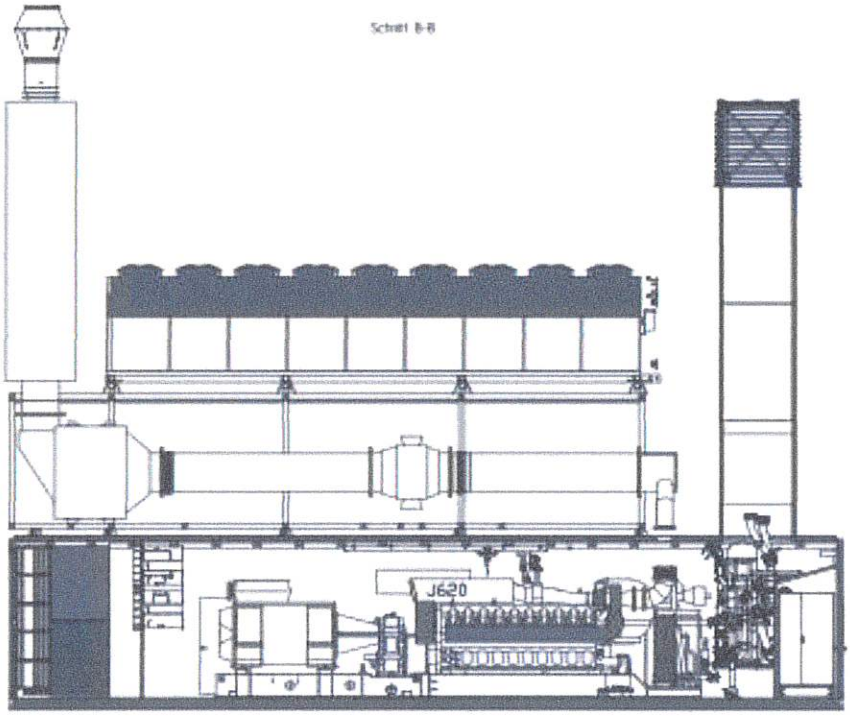
STEEL-CONTAINER for module
Consisting of 1 Containers:

- Engine module (air intake, engine & generator on a frame, lube oil supply/-disposal, control room, air outlet)
- Roof components (exhaust after-treatment, exhaust gas silencer, radiator, ventilation exhaust ducting)

The engine module is in main container. All interconnecting piping and electrical connections that tie to roof mounted equipment will be pre-wired to the main container and are included.

Mounted on the roof:

- Dual circuit Radiator for emergency cooling and intercooler 2nd stage
- Silencer
- Exhaust after-treatment
- Air exhaust ducting



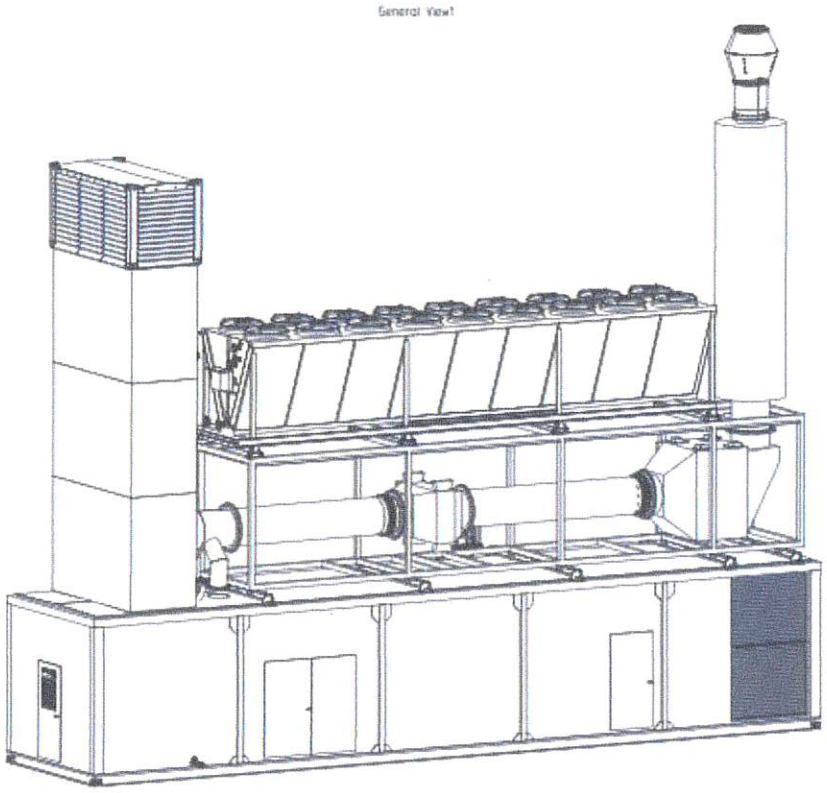


Figure 1: 1-container layout

Figure 1 shows the Jenbacher turn key type 6 ecosystem including all auxiliaries and serviceability systems.

3.20.01 Boundary Conditions

Sound pressure level:
65 dB (A) at 32ft (10m) (surface sound pressure level according to DIN 45635).
Other sound pressure levels are available upon request.

Ambient conditions:
The container is designed for an ambient temperature from 32°F (0°C) to 110°F (43°C).
Engine specific temperatures for full load and derating factors can be found under match code 0.10. Winding rating will be 115 mph (184 km/hr)

3.20.02 Container Design Details

The engine module houses interconnected water piping, lube oil management, air inlet and outlet systems, gas supply system, and compartment ventilation.
A full control room with electrical cabinets is located in front of the generator.

Base frame and floor construction

Container base frame:
The base frame consists of two continuous longitudinal bars with steady transverse bars for the admission of switchgears, auxiliaries and other internal equipment.
The lower side of the base frame is insulated with 1.97 inch (50 mm) sandwich panels.

Container floor construction:
- Engine room: 0.12 inch (3 mm) galvanized steel sheets edged to on close floor pan. The whole floor construction is executed as a fully isolated oil retention tray to hold back liquids from the genset.
- Control room: 1.57 inch (40 mm) false floor tiles plates, above anti-static PU-floor covering, color grey

Walls

Walls engine module:
- Walls consist of 4 inch (100 mm) thick sandwich elements.
- These sandwich elements consist of rock-wool insulation and galvanized steel sheet inside and outside.

Walls ventilation module:
- Walls consist of 3.15 inch (80 mm) thick sandwich elements.
- These sandwich elements consist of rock-wool insulation and galvanized steel sheet inside and outside.

Roof

- The structure of the roof-level frame is almost identical to that of the base frame (shorter base frame and higher distance between transverse bars).
- The same sandwich panels as used for the walls are fitted above the transverse bars.
- Two 1.97 inch (50 mm) thick noise insulating elements on top of each other is mounted on the roof of the ventilation module. On the upper side of the roof a 0.031 inch (0.8 mm) aluminum sheet metal is placed to ensure that the roof is waterproof.

Doors

- Door leaf surface: galvanized steel; material thickness 0.039 inch (1 mm), composite structure cemented all over and absolutely level with sealing plate. Door leaf rebated.
- Rubber sealing in the frame and in the door leaf rebate. Thickness of door leaf: 2.44 inch (62 mm).
- Structural bonders: Ball-bearing structural bonders of stainless steel for three-dimensional adjustment.
- Movable wing: with panic bolt function D, with anti-panic bar inside **(option)**, door handles inside and outside.
- Step grids at doors and rain sheds above doors is installed for weather protection.

External doors:
1 piece: h = 80.7 inch (2050 mm), w = 78.74 inch (2000 mm)
5 pieces: h = 80.7 inch (2050 mm), w = 39.37 inch (1000 mm)

Internal door:
1 piece: h = 80.7 inch (2050 mm), w = 31.5 inch (800 mm)

Openings and Installations:
- Openings for cable inlet in the base frame provided for generator cable, building supply and control cable. For transport purposes the openings are sealed with sheet-metal.
- Cooling water piping for equipment cooling customized for whole enclosure, connecting point on exterior container wall.
- Gas supply pre-installed, connecting point on exterior container wall.
- Oil supply and disposal pre-installed, connecting point on exterior container wall.
- Exhaust gas opening equipped with rain protection hood and water barrier.
- All front walls can be removed for maintenance purposes.
- All supply air and exhaust air openings are provided with rain protection hoods.

Surface treatment:
- The complete steel construction of the container is hot-dip-galvanized to comply with EN ISO 1461.
- The thin plates of the sandwich elements are galvanized to a thickness of 590.55 µin (15 µm).
- Painting according to EN ISO 12944-5:2018.

Base frame (inside & outside):
- Hot dip galvanized according to EN ISO 1461; Thickness of layer is 1771.65 – 3346.45 µin (45 to 85 µm) depending on the sheet metal thickness.

Walls/Doors:
- Galvanized steel according to EN 10147 (275g/m² zinc); Thickness of layer is 590.55 µin (15 µm).

Painting

Inside:
- Primer and painted in RAL 9002

Outside:
- Primer and painted in RAL 9002
- C3M corrosion protection.
- C4H corrosion protection for <1.9 miles (3000 m) distance to sea. **(option)**

Container Heating:
(Convective heating / Total heating capacity depends on site conditions);

The engine room and control room are equipped with electrical heating convectors to ensure a constant temperature inside of the container in case of cold outside temperatures.

Fire protection classification:
The container is not classified for fire protection.

3.20.03 Electrical Details

Illumination System:
Moisture proof luminaires (protection class: IP65 / 46W / LED technology)

Distribution:
- The engine module and ventilation module are equipped with LED luminaires (6000lm color 840) installed inside of the container on the sidewalls.

Emergency lighting:
- Luminaires with accumulator application with autonomous operation of 3 hours (LED)

Emergency exit labelling (LED):
- An EXIT lamp is installed above each escape route door
- 1 piece hand lamp with charging station in the electrical control room

Container exterior lighting **(option)**:
The entrance area of the enclosure is illuminated by LED spotlights. On project specific basis a motion detector or a twilight switch can be installed outside.

Sockets:
- Surface mounted sockets (230V/16A) at all doors of the enclosure
- Personal protection by fault current circuit breaker (30mA).

Light-switch:
- A light switch is installed at each door inside of the container

Emergency stop button:
- An emergency stop button is installed at each door inside and outside of the container

3.20.04 Ventilation System

Container ventilation – Engine Room:
The ventilation system consists of a variable frequency drive (VFD) controlled air flow system through the whole engine room to maintain adequate airflow and to ensure the cooling of the whole engine and auxiliaries.

Air intake filtration:
- The air intake system is equipped with class G4 filters.

Removal of radiation heat in engine room by:
- Axial-high performance fans
  (Number of fans and type depending on engine setup and site conditions)

Control:
- Air Intake flaps operate through E-actuating drive (230V or 24V).
- Fans and flaps are controlled by DIA.NE XT controls.
- Axial-high performance fans are frequency controlled.

Container ventilation system – Control Room:
Removal of radiation heat in control room by
- 1 piece Axial-ventilator
- Air condition for control room

Air duct:
- Supply air: 1 piece axial-ventilator with filter in external located weather protection hood
- Exhaust air: 1 piece electrically controlled (open/closed) air flap

Control:
- By temperature control

3.20.05 Serviceability Systems

Crane system:
Every mobile power plant is equipped with a maintenance service crane located in the engine room with a maximum load of 1433 lbs (650 kg).

External ladder:
An access ladder with fall restraint cage designed of aluminum is mounted on the outside of the containerized unit to ensure full service accessibility.

Guarding rails:
The whole unit is - where needed - enclosed with guarding rails at the ventilation module. Hot dip galvanized, without lacquering.

External working platform:
Where needed for service purposes, a full working platform including walkways is installed.

3.20.06 Lifting/Shipping/Packaging

Lifting points:
Four lifting points are integrated in the roof frame on every single module.
A lifting instruction is included as a standard in the technical documentation.

Shipping

Engine module:
The fully containerized genset including mounted generator (valid for J612-J620) and all interconnections to the ventilation module is shipped as one package.

Roof Elements:
The containerized Emissions treatment system will ship, as will the separately installed enclosure air exhaust ducting, engine exhaust stack with silencer, and finally the pre-assembled V-Cooler. All piping, cabling and interconnections of these items will be provided.

Documentation

Quality documentation as well as operator's manual (Description, usage, spare parts overview, operating manuals, drawings, datasheets etc.) is supplied.

Tagging electrical/mechanical as well as labelling of pipework according media type and flow direction (DIN 2403).

3.20.07 Additional Settings

Lighting protection system:
A lightning protection rod in accordance with IEC 62305 LPS III (147.6 ft (45 m)) is mounted on the outside of the container.

Weather protection:
The entrance area in front of every double door is protected through additional weather protection equipment to create a protected environment for maintenance activities.

E-Installation with UL/CSA components:
Electrical installation of UL/CSA certified components (illumination system, cabling, switches, sockets, ventilation system, air condition devices and other project/site specific components)

3.72 Type 6 Engine Options

The following Type 6 additional options are provided:

- Type 6 Humidity Package - The humidity sensor measures the humidity in the intake air and as a first action increases ICWT (if an electrical control valve is installed in the low temperature intercooler circuit) and in case this is not sufficient/possible, power output is reduced

3.73 Type J620 EPA Certification

The J620 engine will carry an EPA Non-Road Mobile Certification provided that, to the extent such certification would require deliveries to be delayed, INNIO or Jenbacher, may provide VoltaGrid proof that each Product has received a temporary exemption for field testing of such units. INNIO shall provide VoltaGrid with all requested documents and correspondence with any regulators or certification agencies to confirm the status of each Product.

4.00 Delivery, installation, and commissioning

4.01 Carriage
According to contract.

4.02 Unloading
Unloading, moving of equipment to point of installation, mounting and adjustment of delivered equipment on intended foundations is not included in JENBACHER scope of supply.

4.03 Assembly and installation
Assembly and installation of all JENBACHER -components is not included in JENBACHER scope of supply.

4.04 Storage
The customer is responsible for secure and appropriate storage of all delivered equipment.

4.05 Start-up and commissioning
Start-up and commissioning with the JENBACHER start-up and commissioning checklist isis not included.
Plants with island operation require internet connection.

4.06 Trial run
After start-up and commissioning, the plant will be tested in an 8-hour trial run. The operating personnel will be introduced simultaneously to basic operating procedures.
Is not included in JENBACHER scope of supply.

4.07 Emission measurement with exhaust gas analyzer
Emission measurement by JENBACHER personnel, to verify that the guaranteed toxic agent emissions have been achieved (costs for measurement by an independent agency will be an extra charge).

5.02 Factory tests and inspections

The individual module components shall undergo the following tests and inspections:

5.02.01 Engine tests
Carried out as combined Engine- and Module test based on ISO 3046-3 at JENBACHER test bench. The following tests are made at 100% load, and the results are reported in a test certificate:

- Engine output
- Fuel consumption
- Jacket water temperatures
- Lube oil pressure
- Lube oil temperatures
- Boost pressure
- Exhaust gas temperatures, for each cylinder

5.02.02 Generator tests
Carried out on the premises of the generator supplier.

5.02.03 Module tests

The engine will be tested with natural gas (methane number 94). The performance data achieved at the test bench may therefore vary from the data as defined in the technical specification due to differences in fuel gas quality.

Carried out as combined Engine- and Module test commonly with module control panel at JENBACHER test bench, based on ISO 8528-6. The following tests are made and the results are reported in a test certificate:

Visual inspection of scope of supply per specifications.

- Functional tests per technical specification of control system.
  - Starting in manual and automatic mode of operation
  - Power control in manual and automatic mode of operation
  - Function of all safety systems on module
- Measurements at 100% load:
  - Frequency
  - Voltage
  - Current
  - Generator output
  - Power factor
  - Fuel consumption
  - Lube oil pressure
  - Jacket water temperature
  - Boost pressure
  - Mixture temperature
  - Exhaust emission (NOx)

The module test for operating frequenzy 50 Hz and 6,3-6,6kV / 10,5kV-11kV will be carried out with the original generator, except if it is not possible because of the delivery date. Then a test generator will be used for the module test.

To prove characteristics of the above components, which are not tested on the test bench by JENBACHER, the manufacturers' certificate will be provided.

In the case of a container unit the above mentioned test procedure for the module is performed in Jenbach. JENBACHER reserves the right to perform the functional test of the container in a facility elsewhere.

5.03 Documentation

List of standard pre-documentation provided based on the technical status at the time of order receipt:

- Module drawing **1)**
- Technical diagram **1)**
- Drawings of the cabinet views **3**
- Electrical interface list **2)**
- Technical specification of the control system **2)**

Before delivery (depending on progress in ordering the components, on request)

- Technical drawings for BoP components/accessories supplied separately (if included in scope of supply of INNIO Jenbacher GmbH & Co OG) **1)**

Upon delivery

- Circuit diagrams **3)**
- Cable list **3)**

Delivered with the engine

- Brief instructions (transport, erection, moving) **1)**

For commissioning

- Operation and maintenance instructions **4)**
- Spare parts catalogue **4)**
- Original supplier operation and maintenance instructions for any BoP components (installed in the INNIO Jenbacher GmbH & Co OG scope of supply) as Appendix **1)**

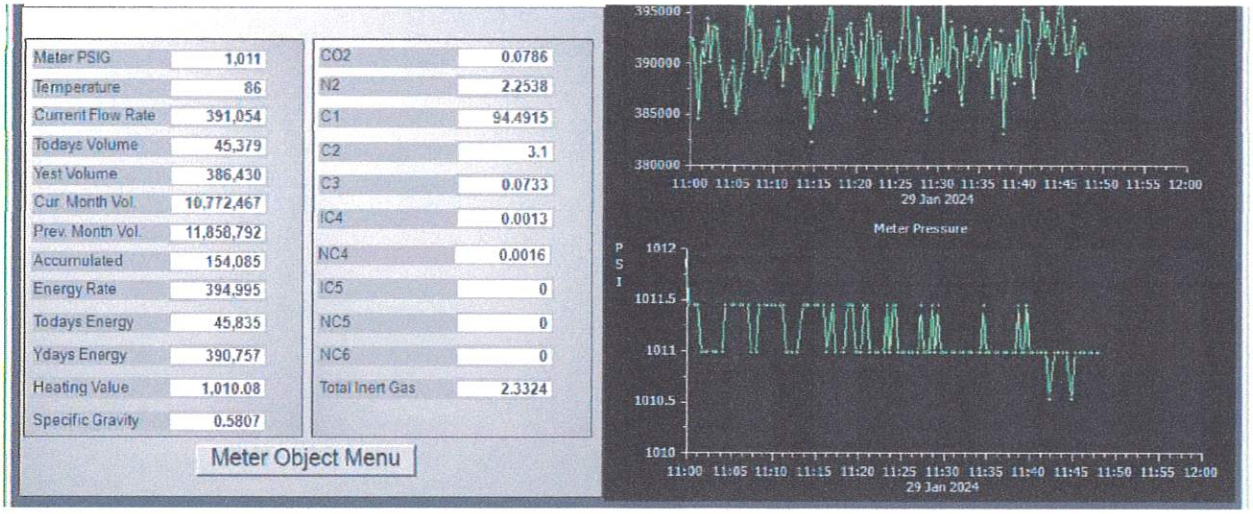
All the components found in the INNIO Jenbacher GmbH & Co OG scope of supply are described in the operation and maintenance instructions, and in the spare parts catalogue.
In addition, the manufacturer's original operation and maintenance instructions will be provided for every BoP component, in German and English as standard, as an Appendix for the operation and maintenance manual provided.

Additional costs of producing or providing the required documents using the KKS (power station coding system) and/or integration in subcontractors' documentation, or additional approval, design and proof of testing documentation must be negotiated or ordered separately.

This standard offer does not include:

- Approval documentation
- Design documentation
- Proof of testing documentation
- Printed copies and digital off-line versions (e.g. printed versions, CD, pdf, etc.) must be negotiated separately and ordered accordingly.

Annex TS1 Gas Sample :



Revision

00	Initial specification	23rd of May 2024	TH
01	Updated scope and description – SCR, Container, Gas sample, MC 1.05 Gas train-duplex Gas filter	28th of May 2024	TH
02	Updated 0.10 room temperature value, Revised 0.20.01 Boundary Conditions for mobile engine specific details for engine timing, Revised 1.05.02 to include flow meter, p/t Revised 3.20.01 to include wind rating Added 3.73, EPA certified road mobile added	30 May 2024	TH

INNIO JENBACHER

ATTACHMENT 5 Emission letter

25/09/2025

INNIO Jenbacher confirms that the pollutants, in the amounts listed below, are confirmed as valid "NOT TO EXCEED" values, for stationary applications per engine for the:

VG Covington GA Opportunity, J620-J7xx engines, operated at 3307kWe gross at 700 ft above sea level / 105°F

Emission values (as half hour average values) *):

Pollutant	lb/hr	tpy
NOX	0,15	0,66
CO	0,62	2,84
VOC (as NMNEHC, expressed as C)	0,15	0,66
PM2.5	0,1	0,44
PM10	0,1	0,44
SO2**)	0,05	0,22

Pollutant	Testing by
NOx	EPA method 7E, or EN 14792 (CLD)
CO	EPA method 10, or DIN EN 15058 (NDIR)
VOC (NMNEHC)	Evaluated using single determination of C_xH_y from dry exhaust gas with GC-WLD or GC-FID. Every component must be calibrated. Collective test over 30 minutes or the average of 10 single measurements within 30 minutes
CH2O	VDI3862-Page 2 (AHMT), or 4 (DNPH), or 8 (FTIR) or equivalent US measurement method, e.g. FTIR according EPA method 320
PM2.5 / PM10	EN-13284-1
SO2 **)	Wet sampling and ion-chromatography variant according ISO11632 or DIN EN 14791

*) Emission values account no measurement tolerances.

**) No guarantee as main impacting factor is typically the Sulphur content of the fuel. Lubrication oil Sulphur is a minor factor and depends on brand and type.

Definitions:

NOx	as NO2
NMNEHC	Non-Methane-Non-Ethane-Hydrocarbons (only C_xH_y species with x>2 + C2H4), calculated as C
CH2O	Formaldehyde

The following criteria apply for demonstration purposes:

1) Operation will be on Combustion Air and Natural Gas which must meet the INNIO Jenbacher gas quality requirements stated in the Technical Instruction 1000-0300.
2) Emission values are based on the fuel gas analysis (Appendix I).
3) Based on the nominal mass flow provided by the project specific data sheets.
4) For operation between 85% and 100% rated stable load (not for transient load events in Island mode).

5) The emission values apply after the ATS has reached the specified functional temperature, the reductant dosing release was given, and the Emissions Controller has balanced all actuators to the target value.
6) To manage the drift in emission quality of the engine, resulting from an expected upward drift coming from fuel or oil deposits build up in the engine, VoltaGrid shall regularly monitor and control emissions.
7) VoltaGrid shall manage this drift through regular maintenance and repair schedules along with the use of genuine INNIO Jenbacher parts and components.
8) NOx drift can be compensated up to a certain extent, by calibration of engine operating parameters in the DIA.NE XT controls system by specially trained qualified personnel.
9) Excessive deposits resulting from gas or oil related contamination may require the cleaning of the combustion chamber, turbochargers and aftertreatment system.
10) Maintenance and component repairs for the INNIO Jenbacher Gas Engines and ATS equipment is carried out by qualified personnel strictly according to the schedule and repair requirements set by INNIO Jenbacher along with the use of genuine INNIO Jenbacher parts and components.
11) Testing to determine compliance with this commitment will be at the expense of the customer and accomplished by a certified laboratory chosen by the customer. The engine/installation is to be in good working order consistent with INNIO Jenbacher recommended maintenance practices prior to any testing. INNIO Jenbacher reserves the right to participate and/or challenge the results of any testing.

If the engine fails to meet the emissions representations the customer must provide the following supporting documentation to INNIO Jenbacher:

1) Fuel gas samples
2) Complete maintenance records
3) A full report including the calculations and results of any emissions testing.

INNIO Jenbacher will be given a reasonable amount of time to take any or all of the following actions:

- Perform additional testing in an effort demonstrate the emissions representations. If this testing demonstrates compliance with no adjustments required to the engine, customer will pay for added testing. If testing fails to demonstrate compliance with the emissions representations, the testing will be paid for by INNIO Jenbacher.
- Make such adjustments to the engine so as to bring the engine into compliance with the emissions limits provided in this letter.

In case the must meet emission performance guarantees are not achieved after the cure period INNIO Jenbacher will replace the affected Unit.

Declaration (acc. ISO/IEC 17050-1:2004)

We hereby confirm that stationary Jenbacher Gas Engines are labelled as follows:

"THIS ENGINE IS EXCLUDED FROM THE REQUIREMENT OF 40 CFR PART 1048 AS A "STATIONARY ENGINE". INSTALLING OR USING THIS ENGINE IN ANY OTHER APPLICATION MAY BE A VIOLATION OF FEDERAL LAW SUBJECTED TO CIVIL PENALTY AND THE OWNER/OPERATOR MUST COMPLY WITH THE REQUIREMENT OF CFR PART 60. THIS ENGINE IS NOT PART OF A REQUIRED OR VOLUNTARY CERTIFICATION PROGRAM AND IS CLASSIFIED AS NON-CERTIFIED PER 40 CFR PART 60, SUBPART JJJJ".

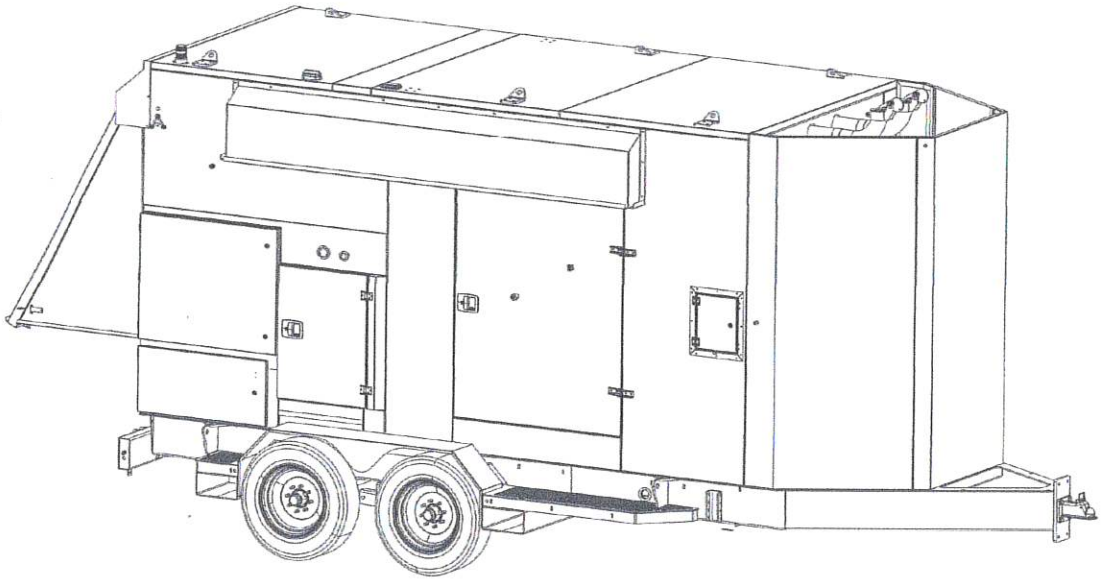
INNIO Jenbacher GmbH & Co OG
Achenseestrasse 1-3
6020 Jenbach Released by:
Martin Widner

Appendix I (Binding fuel gas composition used for emissions prediction):

Natural Gas: average for Station 120 (16.06.2025 - 10.09.2025)

Component	Vol% or Mol%
Methane (CH4)	94.982
Ethane (C2H6)	3.17
Propane (C3H8)	0.182
Iso-Butane (C4H10)	0.027
n-Butane (C4H10)	0.022
Iso-Pentane (C5H12)	0.008
n-Pentane (C5H12)	0.004
CO2	1.107
N2	0.486
Sulfur	not detectable

MESA SOLUTIONS®



Mobile Generator Set

Specifications

Manual Version 1.1
Product Revisions 002, 003
August 2025

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Model Numbers Covered by this Manual (Mobile Generator Set)

The final two digits indicate the product's revision number.

A101001-03

A101002-02, A101002-03

A101003-02, A101003-03

A101005-02, A101005-03

A101006-02, A101006-03

A101009-02, A101009-03

A101010-02, A101010-03

A101011-02, A101011-03

A101012-02, A101012-03

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Version History

Manual Version Number	Description	Reviewed By/ Date	Approved By/Date	Release Date
1.0	Product Revisions 002 & 003	Oji Farrier - 02/21/2025	Andrew Lipe - 02/24/2025	03/07/2025
1.1	Removed model A101007-02 from model number index. **Engine Information** Added "gal" measurement to 'Engine Oil Capacity'. Added "°F" measurement to 'Coolant Operating Temp'. Revised swapped measurements for 'Bore'. Combustion Air Requirement Revised formatting for 'Engine Prime Power' ratings. Removed duplicate 'Coolant Flow Rate (60 Hz)' specification from '60 Hz Engine Specs' table. Removed 'Heat Rejected' rows from '60 Hz Engine Specs' table. Updated wording for 'Fan Speed' - moved location to 'Cooling System' table. Removed duplicate 'Max Fan Power' specification from '60 Hz Engine Specs' table. Exhaust Heat Rejection Rate Exhaust Gas Mass Flow Updated wording for 'Max Exhaust Backpressure' - moved location to 'Exhaust System' table. Added psi measurement for 'Max Exhaust Backpressure'. Updated wording for 'Exhaust Stack Length'. Updated 'Cooling Fan Air Flow (60 Hz)' specification to "35,000cfm (980 m3/min)". Updated 'Max Fan Power (60 Hz)' specification to "46.49 HP (36.47 kW)". Updated 'Max Fuel Supply Pressure' to "60 psi (414 kPA)". Added optimal fuel supply pressure range. Added Minimum Fuel Pressure to EFR specifications at 0.5 kPA). **Alternator Information:** Updated 'Excitation Type" to "Auxiliary Winding, Permanent Magnet". **Dimensions and Weights:** Added note specifying weight type definitions. Revised "Dimension" language in trailer-mounted dimensions table. Updated trailer-mounted weights to reflect wet weights and shipping weights. Added skid-mounted section with images, dimension table, and weight table. **Derates** Added GV22PU Derate Table.	Aaron Carter Shawn Dalke Cross True Rustam Akhmetianov Aubrey Morrison Ethan Rutledge Aurora Bowden Bobby Bryant 08/06/2025	Andrew Lipe - 08/07/2025	08/08/2025

Specifications

Generator Set Information

Electrical Specifications, 60Hz	
Switch Position 1 (480V High Wye)	
Voltage (V)	480/277
Prime Power Rating NG @ 60Hz	390 kWe (488 kVA)
Prime Power Rating LP @ 60Hz	315 kWe (394 kVA)
Power Factor	0.8
Rated Full Load Current	587 A
All Power Ratings Tested per ISO 8528-6:2023 at an elevation of 5,000 ft (1,524 m). Refer to derate table for performance at increased elevation. Due to breaker limitations, PRP (Prime Rated Power) ratings do not include a 10% overload capability.	

Electrical Specifications, 50Hz	
Switch Position 1 (400V High Wye)	
Voltage (V)	400/230
Prime Power Rating NG @ 50Hz	325 kWe (406 kVA)
Prime Power Rating LP @ 50Hz	254 kWe (318 kVA)
Power Factor	0.8
Rated Full Load Current	587 A
All Power Ratings Tested per ISO 8528-6:2023 at an elevation of 5,000 ft (1,524 m). Refer to derate table for performance at increased elevation. Due to breaker limitations, PRP (Prime Rated Power) ratings do not include a 10% overload capability.	

Fuel Consumption (HHV, BTU/hr)	
Fuel Consumption @ 60Hz	
NG Heat Rate @ 100% PRP	4,742,067 BTU/hr
NG Heat Rate @ 75%	3,724,507 BTU/hr
NG Heat Rate @ 50%	2,740,103 BTU/hr
LP Heat Rate @ 100%	3,841,674 BTU/hr
LP Heat Rate @ 75%	3,053,714 BTU/hr
LP Heat Rate @ 50%	2,306,604 BTU/hr
Fuel Consumption @ 50Hz	
NG Heat Rate @100%	4,120,696 BTU/hr
NG Heat Rate @ 75%	3,243,370 BTU/hr
NG Heat Rate @ 50%	2,379,328 BTU/hr
LP Heat Rate @ 100%	3,263,958 BTU/hr
LP Heat Rate @ 75%	2,595,586 BTU/hr
LP Heat Rate @ 50%	1,940,173 BTU/hr
Tested per ISO 8528-5:2022 FUEL SPECIFICATION: Gas properties for fuel consumption data: NG: Density = 0.737 kg/m3, HHV = 1041 Btu/scf (39 MJ/m3); Propane: Density = 1.845 kg/m3, HHV = 2538 Btu/scf (95 MJ/m3); LPG (60-40): Density = 2.060 kg/m3, HHV = 2817 Btu/scf (105 MJ/m3)	

Noise Ratings	
@ 0% PRP	
Average dB @ 1m	88.1
Average dB @ 7m	76.7
@ 100% PRP	
Average dB @ 1m	90.4
Average dB @ 7m	79.8
Tested per ISO 11200	

Control System	
Controller Type	Deep Sea Electronics 8610MKII Generator Set Controller
Remote Start/Stop	Remote Start Capable Through Dry Contact or Modbus
Synchronizing & Load Sharing	Automatic w/ Sync Check
Telemetry & Remote Monitoring	4G and SATCOM Remote Monitoring
Voltage Regulator	Digital, Deep Sea Electronics A109

Engine Information

GV22PU (Prime Rated Power)	
Engine Manufacturer	Mesa Solutions/Hyundai Doosan Infracore
Engine Controller Type	Woodward PG+
Engine Oil Capacity	Min 8.72 gal (33L) - Max 10.65 gal (40L)
Coolant Operating Temperature	Thermostat Cracking at 160 °F (71 °C) Full Open at 185 °F (85 °C)
Radiator Coolant Capacity	21 gal (80 L)
Total Coolant Capacity	51 gal (193 L)
Fuel Quality Limits	NG: 700-1,800 BTU LP: 2,500 BTU
Bore	5.04 in (128 mm)
Direction of Rotation	Counter-Clockwise At Flywheel

Oil System	
Lube Oil Specifications	SAE 15W-40 Low Ash Gas Engine Oil (.25 - .5% by wt), API CD/CF or Higher
Engine Oil Capacity	10.65 gal (40 L)
Day Tank Oil Capacity	26 gal (98 L)
Total Oil Capacity	36.65 gal (139 L)

Exhaust System	
Exhaust Stack - Single/Dual	Dual
Exhaust Stack Length	120 in (305 cm)
Exhaust Stack Diameter	4 in (10.2 cm)
Max Exhaust Backpressure	2.18 psi (15 kPA)
Exhaust Gas Temp, Max (Pre-Catalyst)	1,202 °F (650 °C)

Cooling System	
Coolant Specifications	Havoline Universal Antifreeze/Coolant - Premixed 50/50
Engine Coolant Capacity	14 gal (53 L)
Coolant Flow Rate	165 gal/min (625 L/min)
Cooling Fan Air Flow	35,000 cfm (980 m3/min)
Fan Speed	1,720 RPM
Fan Power	46.49 hp (36.47 kW)

Emissions Control	
AFR Controller	Yes, w/ No Customer Interface
NSCR Catalyst	Yes
Emissions Certification	EPA Certification

Fuel System	
Fuel Type(s)	Natural Gas, Propane (HD5)
Fuel Water Content	Acceptable: Saturated Fuel Not Acceptable: Water Condensation in Fuel Lines/Engine
Fuel Supply Connection(s)	NG: 2" NPT Female LP: #6 SAE Male
Min Fuel Supply Pressure	8 psi (55 kPA)
Max Fuel Supply Pressure	60 psi (414 kPA)
NOTE The ideal fuel supply pressure for optimal system performance is between 20 psi (138 kPA) and 50 psi (345 kPA).	
Natural Gas Engine Fuel Pressure to EFR	
Min Rated Load Max Rated Load	2 inWC (0.5 kPA) 18 inWC (4.5 kPA)
Liquid Propane Engine Fuel Pressure to EFR	
Min Rated Load Max Rated Load	2 inWC (0.5 kPA) 16 inWC (4 kPA)

Battery	
Voltage	12 V
Group Size	31
Cold Cranking Amps	950 A
Required Quantity	2
Connection	Series (24 V)

Notes	
1	Cooling fan specifications are for 110 °F at radiator, 1000 ft elevation, and 60 Hz.
2	All values in the following section are for informational purposes only and are non-binding.
3	Production tolerances account for power variations ± 5%. Altitude, temperature, and gas quality derates may need to be applied.
4	For any temperature above the rated maximum manifold air temperature, please refer to the manifold air temperature derate table.
5	Natural gas testing was performed with pipeline quality natural gas.
6	Mechanical Power Rating (kWm) does not account for fan or generator set losses.
7	RPM Ranges are as defined by ISO 8528-5:2018.

Alternator Information

Alternator (General)	
Alternator Manufacturer	WEG
Alternator Model	AG10-280MN70AI
Alternator Phase	3-phase
Insulation Class	H
Stator Winding	2/3 Pitch
Temp. Rise/Ambient	125/104 °F (40 °C)
Alternator Style	Single Bearing, Weatherproof, IP23
Excitation Type	Brushless, Auxiliary Coil (iPMG)
Coupling System	Close Coupled, Flex Plate
Overspeed Capability	2,250 RPM
PF at rated kW	0.8 PF
Alternator Real Power Rating	456 kWe
Alternator Apparent Power Rating	570 kVA

Termination Information

Camlock			
	L1/L2/L3	N	G
Ampacity	400 A	400 A	400 A
Quantity	3	3	3
Polarity	Female		

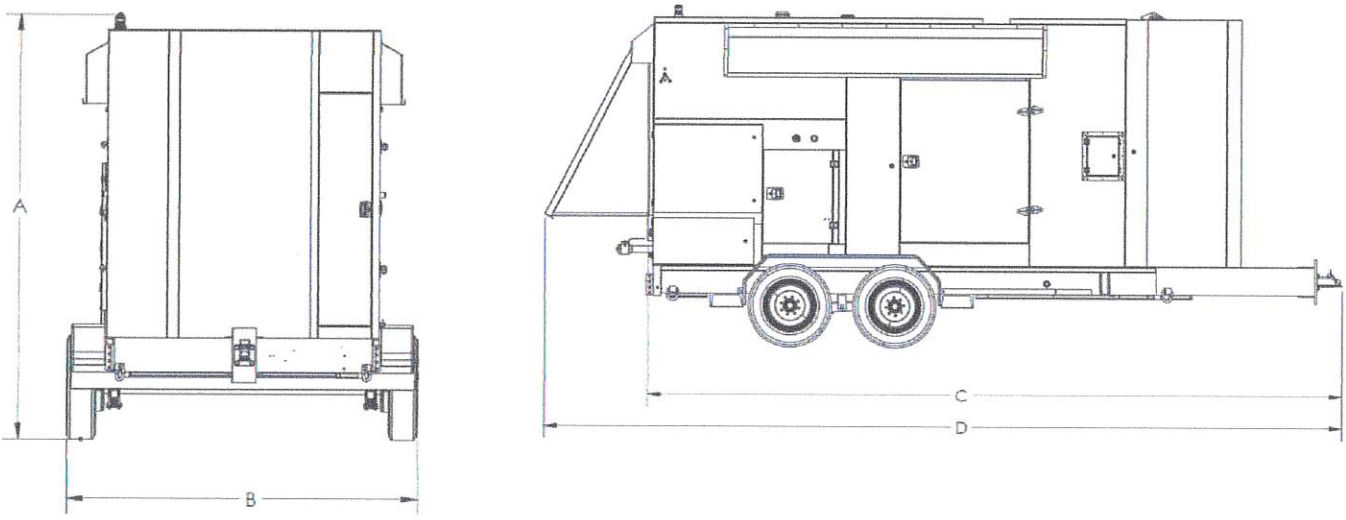
Mechanical Lug			
	L1/L2/L3	N	G
Connections	4	4	4
Conductor Range	2AWG-600MCM	2AWG-600MCM	2AWG-600MCM
Tightening Torque	375 in-lb (42 Nm)		

Dimensions and Weights

NOTE
Mesa Wet Weight - Total weight of fully assembled generator, including all fluids.

Mesa Shipping Weight - Total weight of fully assembled generator, including all fluids (except day tank oil).

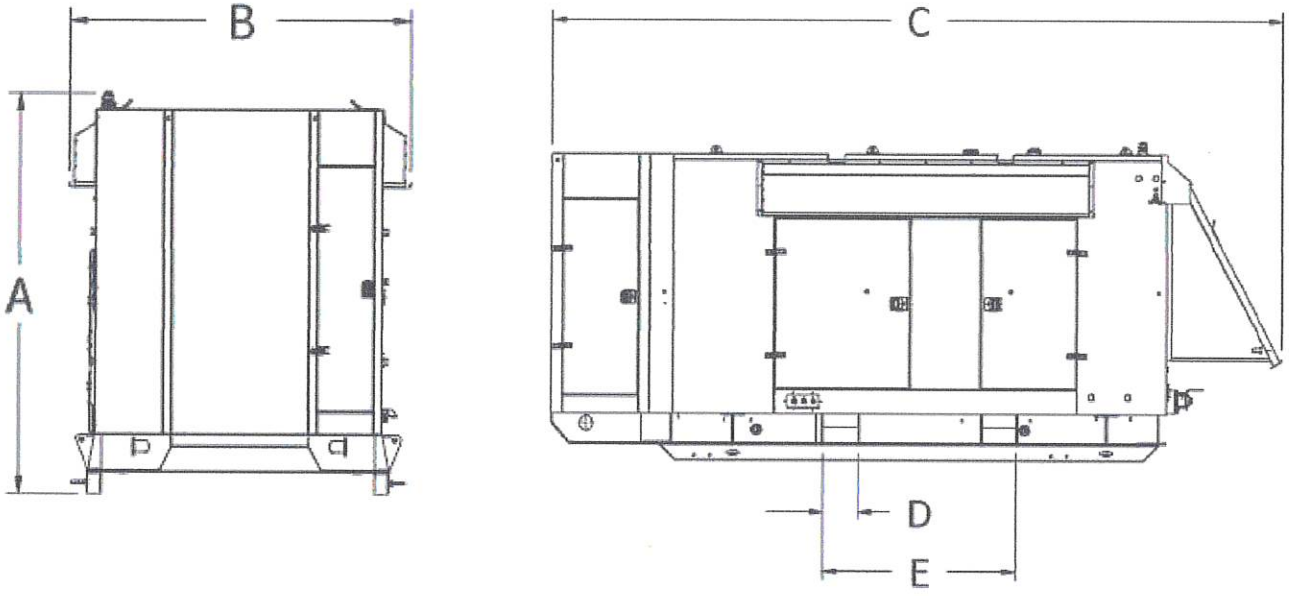
Trailer-Mounted



Dimension "A"	Dimension "B"	Dimension "C"	Dimension "D"
124 in (315 cm)	103 in (262 cm)	260 in (660 cm)	291 in (739 cm)

Revision Number	Mesa Wet Weight	Mesa Shipping Weight
Rev 002	15,714 lb (7,128 kg)	15,516 lb (7,038 kg)
Rev 003	15,732 lb (7,136 kg)	15,534 lb (7,046 kg)

Skid-Mounted



Dimension "A"	Dimension "B"	Dimension "C"	Dimension "D"	Dimension "E"
111 in (282 cm)	96 in (242 cm)	255 in (648 cm)	12 in (30 cm)	68 in (172 cm)

Revision Number	Mesa Wet Weight	Mesa Shipping Weight
Rev 002	14,558 lb (6,603 kg)	14,360 lb (6,514 kg)
Rev 003	14,567 lb (6,607 kg)	14,378 lb (6,522 kg)

Derates

GV22PU Derate Table

GV22PU Derate Table							
Altitude (m)	Temp (°C)						
	0	10	20	25	30	40	50
	Engine Derate Power Multiplier (Power Output = Multiplier X Rated Power)						
0	1.00	1.00	1.00	1.00	1.00	1.00	0.98
100	1.00	1.00	1.00	1.00	1.00	1.00	0.98
200	1.00	1.00	1.00	1.00	1.00	1.00	0.98
300	1.00	1.00	1.00	1.00	1.00	1.00	0.98
400	1.00	1.00	1.00	1.00	1.00	1.00	0.98
500	1.00	1.00	1.00	1.00	1.00	1.00	0.98
600	1.00	1.00	1.00	1.00	1.00	1.00	0.98
700	1.00	1.00	1.00	1.00	1.00	1.00	0.97
800	1.00	1.00	1.00	1.00	1.00	0.99	0.96
900	1.00	1.00	1.00	1.00	0.99	0.98	0.95
1000	0.99	0.99	0.99	0.99	0.98	0.97	0.94
1100	0.98	0.98	0.98	0.98	0.97	0.96	0.93
1200	0.97	0.97	0.97	0.97	0.96	0.95	0.92
1300	0.96	0.96	0.96	0.96	0.95	0.94	0.91
1400	0.95	0.95	0.95	0.95	0.94	0.93	0.90
1500	0.94	0.94	0.94	0.94	0.93	0.92	0.89
1600	0.93	0.93	0.93	0.93	0.92	0.91	0.88
1700	0.92	0.92	0.92	0.92	0.91	0.90	0.87
1800	0.91	0.91	0.91	0.91	0.90	0.89	0.86
1900	0.90	0.90	0.90	0.90	0.89	0.88	0.85
2000	0.89	0.89	0.89	0.89	0.88	0.87	0.84
2100	0.88	0.88	0.88	0.88	0.87	0.86	0.83
2200	0.87	0.87	0.87	0.87	0.86	0.85	0.82
2300	0.86	0.86	0.86	0.86	0.85	0.84	0.81
2400	0.85	0.85	0.85	0.85	0.84	0.83	0.80
2500	0.84	0.84	0.84	0.84	0.83	0.82	0.79
2600	0.83	0.83	0.83	0.83	0.82	0.81	0.78
2700	0.82	0.82	0.82	0.82	0.81	0.80	0.77
2800	0.81	0.81	0.81	0.81	0.80	0.79	0.76
2900	0.80	0.80	0.80	0.80	0.79	0.78	0.75
3000	0.79	0.79	0.79	0.79	0.78	0.77	0.74

Customer Support

For customer support, contact Mesa Natural Gas Solutions.

Mesa Natural Gas Solutions, LLC
6392 Byrd Drive
Loveland, CO 80538

Toll free: 844-247-MESA (6372)
www.mesangs.com

GV22PU Zero-Hour Emissions (NG)

EPA Family: SMSAB22.0V22 (2025)						
Test Conditions: 60Hz, 10.5in Mesa Catalysts, Pipeline NG Emergency Standby Power[1]: 510 kWm						
Brake Specific Emissions	Natural Gas					
	Uncontrolled[5]		Controlled		Catalyst Efficiency	
	(g/kW-hr)		(g/kW-hr)		%	
	D2	D1	D2	D1	D2	D1
NO_x	19.92	19.19	0.068	0.112	99.9	99.9
NMHC[2]	0.363	0.214	0.079	0.053	99.8	99.8
CO	17.30	14.35	0.020	0.027	99.9	99.9
CO_2	645.6	585.5	725.9	640.6	98.9	98.9
N_2O	0.007	0.005	0.043	0.053	93.9	89.4
NO_x + THC	22.23	20.61	1.263	0.911	99.9	99.9
NO_x + NMHC	20.29	19.40	0.148	0.165	99.9	99.9
THC	2.305	1.423	1.195	0.799	99.5	99.4
CH_4	1.942	1.209	1.116	0.746	99.4	99.4
BSFC[3]	248.0	223.5	266.2	234.7	98.9	98.9

NOTES:

(1) Mechanical power rating does not account for alternator efficiency or fan losses.
(2) NMHC is used in place of VOC for this report.
(3) BSFC is the weighted composite fuel consumption over the emission cycle.
(4) D2 and D1 are weighted composite emissions test cycles from ISO 8178.
(5) All values in this section are for information purposes and are non-binding.



GV22PU Zero-Hour Emissions (NG)

EPA Family: SMSAB22.0V22 (2025)						
Test Conditions: 60Hz, 10.5in Mesa Catalysts, Pipeline NG Emergency Standby Power[1]: 684 hp						
Brake Specific Emissions	Natural Gas					
	Uncontrolled[5]		Controlled		Catalyst Efficiency	
	(g/hp-hr)		(g/hp-hr)		%	
	D2	D1	D2	D1	D2	D1
NO_x	14.86	14.308	0.051	0.084	99.9	99.9
NMHC[2]	0.271	0.160	0.059	0.040	99.8	99.8
CO	12.90	10.70	0.015	0.020	99.9	99.9
CO_2	481.4	436.6	541.3	477.7	98.9	98.9
N_2O	0.005	0.004	0.032	0.040	93.9	89.4
NO_x + THC	16.58	15.37	0.942	0.679	99.9	99.9
NO_x + NMHC	15.13	14.47	0.110	0.123	99.9	99.9
THC	1.719	1.061	0.891	0.596	99.5	99.4
CH_4	1.448	0.902	0.832	0.556	99.4	99.4
BSFC[3]	184.9	166.7	198.5	175.0	98.9	98.9

NOTES:

(1) Mechanical power rating does not account for alternator efficiency or fan losses.
(2) NMHC is used in place of VOC for this report.
(3) BSFC is the weighted composite fuel consumption over the emission cycle.
(4) D2 and D1 are weighted composite emissions test cycles from ISO 8178.
(5) All values in this section are for information purposes and are non-binding.



GV22PU Zero-Hour Emissions (LP)

EPA Family: SMSAB22.0V22 (2025)				
Test Conditions: 60Hz, 10.5in Mesa Catalysts, LP Emergency Standby Power[1]: 420 kWm (563hp)				
Brake Specific Emissions	LP			
	Controlled			
	(g/kW-hr)		(g/hp-hr)	
	D2	D1	D2	D1
NO_x	0.088	0.131	0.066	0.098
NMHC[2]	0.069	0.043	0.051	0.032
CO	0.037	0.045	0.028	0.034
CO_2	892.2	782.4	665.3	583.4
N_2O	0.139	0.138	0.104	0.103
NO_x + THC	0.219	0.219	0.163	0.163
NO_x + NMHC	0.157	0.173	0.117	0.129
THC	0.131	0.089	0.098	0.066
CH_4	0.062	0.046	0.046	0.034
BSFC[3]	298.5	261.7	222.6	195.1

NOTES:

(1) Mechanical power rating does not account for alternator efficiency or fan losses.
(2) NMHC is used in place of VOC for this report.
(3) BSFC is the weighted composite fuel consumption over the emission cycle.
(4) D2 and D1 are weighted composite emissions test cycles from ISO 8178.
(5) All values in this section are for information purposes and are non-binding.



Algas-SDI

Burner Emissions Estimate

Customer:	VoltaGrid	**Job Name:**	
Attn:	Craig Morton	**Date:**	October 22, 2025
		By:	
Burner Model:	SH400-LN		
Max. Firing Rate:	4.0 mmBTU/hr		
Gas Flow:	4,000 scfh		
Fuel:	Natural Gas		

Application Details:

	ppm-vol.dry (at 3% O2)	Pounds per 1,000,000 BTU's	TOTAL Pounds / Hour @ 100% Firing Rate
PM-10 (Particulate)	--	0.0076	**0.030**
CO (Carbon Monoxide)	50	0.0370	**0.148**
SOx (<17 ppm Sulfur in Fuel)	2	0.0030	**0.012**
VOC (Non-Methane)	--	0.0055	**0.022**
NOx (Nitrogen Compounds)	10	0.0121	**0.049**
CO2 (Carbon Dioxide)	--	114.75	**459**
H2O (Water)	--	91.35	**365**

Note: These values are no guarantees. Actual emissions may vary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2021 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Caterpillar Inc.**
(U.S. Manufacturer or Importer)

Certificate Number: MCPXB97.6CZL-008

Effective Date: 05/24/2021

Expiration Date: 12/31/2021

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 05/24/2021

Revision Date: N/A

Manufacturer: Caterpillar Inc.
Engine Family: MCPXB97.6CZL
Mobile/Stationary Certification Type: Mobile
Fuel : Natural Gas (CNG/LNG)
Emission Standards :
Mobile Part 1048
NMHC + NOx (g/kW-hr) : 2.7
CO (g/kW-hr) : 4.4
Emergency Use Only :

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 1048, 1065, 1068, and 60 (stationary only and combined stationary and mobile) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 1048 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1048 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1048. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1048. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1048.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

GAS ENGINE TECHNICAL DATA

G3520

CATERPILLAR®

ENGINE SPEED (rpm):	1800	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	11.5:1	APPLICATION:	GENSET
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	CONTINUOUS
AFTERCOOLER - STAGE 2 INLET (°F):	130	FUEL:	NAT GAS
AFTERCOOLER - STAGE 1 INLET (°F):	192	FUEL SYSTEM:	CAT LOW PRESSURE WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210		
ASPIRATION:	TA	FUEL PRESSURE RANGE (psig):	1.5-5.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	85
CONTROL SYSTEM:	ADEM4 W/ IM	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	DRY	ALTITUDE CAPABILITY AT 77°F INLET AIR TEMP. (ft):	656
COMBUSTION:	LOW EMISSION	POWER FACTOR:	0.8
NOx EMISSION LEVEL (g/bhp-hr NOx):	1.0	VOLTAGE (V):	440-13800

RATING		NOTES	LOAD	100%	75%	50%
GENSET POWER	(WITHOUT FAN)	(1) (2)	ekW	2600	1950	1300
GENSET POWER	(WITHOUT FAN)	(1) (2)	KVA	3250	2438	1625
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	3628	2727	1833
GENERATOR EFFICIENCY		(1)	%	96.1	95.9	95.1
GENSET EFFICIENCY (@ 1.0 Power Factor)	(ISO 3046/1)	(3) (4)	%	39.8	39.0	37.3
THERMAL EFFICIENCY		(3) (5)	%	45.0	46.0	47.1
TOTAL EFFICIENCY (@ 1.0 Power Factor)		(3) (6)	%	84.8	85.0	84.4
ENGINE DATA						
GENSET FUEL CONSUMPTION	(ISO 3046/1)	(7)	Btu/ekw-hr	8637	8795	9208
GENSET FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/ekw-hr	8847	9010	9432
ENGINE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/bhp-hr	6340	6443	6689
AIR FLOW (77°F, 14.7 psia)	(WET)	(8)	ft3/min	7628	5784	3963
AIR FLOW	(WET)	(8)	lb/hr	33824	25645	17570
FUEL FLOW (60°F, 14.7 psia)			scfm	424	324	226
COMPRESSOR OUT PRESSURE			in HG(abs)	108.1	83.2	59.8
COMPRESSOR OUT TEMPERATURE			°F	382	313	241
AFTERCOOLER AIR OUT TEMPERATURE			°F	141	136	131
INLET MAN. PRESSURE		(9)	in HG(abs)	97.0	72.4	49.4
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(10)	°F	141	136	131
TIMING		(11)	°BTDC	25	25	25
EXHAUST TEMPERATURE - ENGINE OUTLET		(12)	°F	852	888	921
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(13)	ft3/min	20028	15605	10961
EXHAUST GAS MASS FLOW	(WET)	(13)	lb/hr	34980	26528	18187
MAX INLET RESTRICTION		(14)	in H2O	10.04	10.04	10.04
MAX EXHAUST RESTRICTION		(14)	in H2O	20.07	20.07	20.07
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(15) (16)	g/bhp-hr	1.00	1.00	1.00
CO		(15) (17)	g/bhp-hr	1.30	1.34	1.41
THC (mol. wt. of 15.84)		(15) (17)	g/bhp-hr	2.17	2.50	2.86
NMHC (mol. wt. of 15.84)		(15) (17)	g/bhp-hr	0.18	0.20	0.23
NMNEHC (VOCs) (mol. wt. of 15.84)		(15) (17) (18)	g/bhp-hr	0.07	0.08	0.09
HCHO (Formaldehyde)		(15) (17)	g/bhp-hr	0.18	0.20	0.22
CO2	NOMINAL	(15) (19)	g/bhp-hr	370	376	390
EXHAUST OXYGEN		(15) (20)	% DRY	9.9	9.7	9.4
LAMBDA		(15) (20)		1.83	1.81	1.78
GREENHOUSE GAS DATA - ENGINE OUT						
CO2e	NOMINAL	(19)	g/bhp-hr	411	424	445
ENERGY BALANCE DATA						
LHV INPUT		(21)	Btu/min	383377	292826	204368
HEAT REJECTION TO JACKET WATER (JW)		(22) (30)	Btu/min	41920	35858	28708
HEAT REJECTION TO ATMOSPHERE	(INCLUDES GENERATOR)	(23)	Btu/min	15464	12480	11460
HEAT REJECTION TO LUBE OIL (OC)		(24) (30)	Btu/min	10709	9598	8237
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(25) (26)	Btu/min	123735	98738	70823
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(25)	Btu/min	94057	75741	54716
HEAT REJECTION TO A/C - STAGE 1 (1AC)		(27) (30)	Btu/min	24469	11978	3226
HEAT REJECTION TO A/C - STAGE 2 (2AC)		(28) (31)	Btu/min	17990	12048	6754
PUMP POWER		(29)	Btu/min	1231	1231	1231

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. Standard reference conditions of 77°F, 29.60 IN HG barometric pressure. No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level as 100% load. Tolerances are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3. Published part load data is with air fuel ratio control.

For notes information consult page 3.

FUEL USAGE GUIDE

CAT METHANE NUMBER	<33	33	35	40	45	50	55	60	65	70	75	80	85	100
SET POINT TIMING	-	19	19	19	19	19	19	19	19	19	22	23	25	25
DERATION FACTOR	0.00	0.55	0.57	0.59	0.64	0.69	0.74	0.82	0.90	1.00	1.00	1.00	1.00	1.00

ALTITUDE DERATION FACTORS

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.79	0.75	No Rating	No Rating	No Rating	No Rating
120	1.00	1.00	1.00	0.98	0.94	0.90	0.85	0.81	0.76	No Rating	No Rating	No Rating	No Rating
110	1.00	1.00	1.00	1.00	1.00	0.94	0.89	0.83	0.78	0.52	No Rating	No Rating	No Rating
100	1.00	1.00	1.00	1.00	1.00	0.99	0.92	0.86	0.79	0.63	No Rating	No Rating	No Rating
90	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.87	0.81	0.70	No Rating	No Rating	No Rating
80	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.89	0.82	0.75	No Rating	No Rating	No Rating
70	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.90	0.84	0.77	0.52	No Rating	No Rating
60	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.91	0.85	0.79	0.57	No Rating	No Rating
50	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.92	0.86	0.80	0.66	No Rating	No Rating

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.32	1.37	1.42	1.47	1.51	1.57	1.59	1.59	1.59	No Rating	No Rating	No Rating	No Rating
120	1.26	1.30	1.35	1.40	1.45	1.50	1.52	1.52	1.52	No Rating	No Rating	No Rating	No Rating
110	1.19	1.24	1.28	1.33	1.38	1.43	1.45	1.45	1.45	1.45	No Rating	No Rating	No Rating
100	1.13	1.17	1.22	1.26	1.31	1.36	1.39	1.39	1.39	1.39	No Rating	No Rating	No Rating
90	1.06	1.11	1.15	1.20	1.24	1.29	1.32	1.32	1.32	1.32	No Rating	No Rating	No Rating
80	1.00	1.04	1.09	1.13	1.18	1.22	1.25	1.25	1.25	1.25	No Rating	No Rating	No Rating
70	1.00	1.00	1.02	1.06	1.11	1.15	1.18	1.18	1.18	1.18	1.18	No Rating	No Rating
60	1.00	1.00	1.00	1.00	1.04	1.08	1.11	1.11	1.11	1.11	1.11	No Rating	No Rating
50	1.00	1.00	1.00	1.00	1.00	1.02	1.04	1.04	1.04	1.04	1.04	No Rating	No Rating

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor and full load set point timing required for a given fuel. Note that deration and set point timing adjustment may be required as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar methane number calculation.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider seperately, limitations due to fuel characteristics and air system limitations. The fuel usage guide deration establishes fuel limitations. The altitude/temperature deration factors and the RPC (reference to the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the altitude/temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an altitude/temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored.

To determine the actual power available, take the lowest factor between 1) and 2).

1) Fuel usage Guide Deration

2) 1-((1-Altitude/Temperature Deration) + (1-RPC))

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for inlet air temp and altitude conditions. See notes 30 and 31 for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

INLET AND EXHAUST RESTRICTIONS FOR ALTITUDE CAPABILITY:

The altitude derate chart is based on the maximum inlet and exhaust restrictions provided on page 1. Contact factory for restrictions over the specified values. Heavy Derates for higher restrictions will apply.

NOTES:

1. Generator efficiencies, power factor, and voltage are based on standard generator. [Genset Power (ekW) is calculated as: Engine Power (bkW) x Generator Efficiency], [Genset Power (kVA) is calculated as: Engine Power (bkW) x Generator Efficiency / Power Factor]
2. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.
3. Efficiency represents a Closed Crankcase Ventilation (CCV) system installed on the engine.
4. Genset Efficiency published in accordance with ISO 3046/1, based on a 1.0 power factor.
5. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, 1st stage aftercooler, and exhaust to 248°F with engine operation at ISO 3046/1 Genset Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.
6. Total efficiency is calculated as: Genset Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.
7. ISO 3046/1 Genset fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal genset and engine fuel consumption tolerance is ± 2.5% of full load data at the specified power factor.
8. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
9. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
10. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
11. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
12. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
13. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
14. Inlet and Exhaust Restrictions are maximum allowed values at the corresponding loads. Increasing restrictions beyond what is specified will result in a significant engine derate.
15. Emissions data is at engine exhaust flange prior to any after treatment.
16. NOx values are the maximum values expected under steady state conditions.
17. CO, THC, NMHC, NMNEHC, and HCHO are the maximum values expected under steady state conditions. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
18. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
19. Nominal values at standard lab conditions. Site specific results may vary
20. Exhaust Oxygen tolerance is ± 0.5; Lambda tolerance is ± 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
21. LHV rate tolerance is ± 2.5%.
22. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
23. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
24. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
25. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
26. Heat rejection to exhaust (LHV to 77°F) value shown includes unburned fuel and is not intended to be used for sizing or recovery calculations.
27. Heat rejection to A/C - Stage 1 based on treated water. Tolerance is ±5% of full load data.
28. Heat rejection to A/C - Stage 2 based on treated water. Tolerance is ±5% of full load data.
29. *Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.*
30. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (OC x 1.2) + (1AC x 1.05) + [0.73 x (1AC + 2AC) x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
31. Total Second Stage Aftercooler Circuit heat rejection is calculated as: (2AC x 1.05) + [(1AC + 2AC) x 0.27 x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

Caterpillar: Confidential Green

FREE FIELD MECHANICAL & EXHAUST NOISE

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2600	100	3628	128.2	99.8	107.1	101.7	104.9	111.5	115.9	109.8	112.1	115.4	114.4
1950	75	2727	126.0	100.3	107.4	100.9	103.7	110.0	116.2	110.4	112.5	115.0	113.4
1300	50	1833	124.5	100.1	107.1	99.3	103.6	109.6	115.8	109.5	112.3	114.4	112.7

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2600	100	3628	116.9	115.0	116.3	116.5	115.5	116.1	115.4	115.8	121.3	116.6	109.8
1950	75	2727	115.2	113.1	114.3	115.1	113.9	113.8	112.5	116.2	112.8	110.8	105.0
1300	50	1833	113.9	111.9	111.9	111.4	111.4	111.8	112.9	113.0	108.8	107.7	103.8

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2600	100	3628	127.4	92.8	110.6	118.1	116.3	119.3	112.9	115.6	113.1	115.0	114.7
1950	75	2727	127.1	95.0	110.1	121.2	117.8	119.5	119.6	115.7	113.7	112.6	111.2
1300	50	1833	120.0	93.9	109.6	113.3	110.9	111.4	110.1	109.3	105.7	104.9	104.4

EXHAUST: Sound Power (1/3 Octave Frequencies)

Gen Power Without Fan	Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2600	100	3628	116.6	118.3	116.5	113.7	111.1	108.5	103.6	97.5	90.3	78.9	67.1
1950	75	2727	110.2	110.5	109.2	108.3	106.3	103.8	99.9	94.7	86.4	79.3	74.8
1300	50	1833	104.2	104.5	103.7	104.9	104.7	101.7	96.7	90.1	79.7	73.6	71.7

SOUND PARAMETER DEFINITION:

Sound Power Level Data - DM8702-03

Sound power is defined as the total sound energy emanating from a source irrespective of direction or distance. Sound power level data is presented under two index headings:
Sound power level -- Mechanical
Sound power level -- Exhaust

Mechanical: Sound power level data is calculated in accordance with ISO 3747. The data is recorded with the exhaust sound source isolated.

Exhaust: Sound power level data is calculated in accordance with ISO 6798 Annex A. Exhaust data is post-catalyst on gas engine ratings labeled as "Integrated Catalyst".

Measurements made in accordance with ISO 3747 and ISO 6798 for mechanical and exhaust sound level only. Frequency bands outside the displayed ranges are not measured, due to physical test, and environmental conditions that affect the accuracy of the measurement. No cooling system noise is included unless specifically indicated. Sound level data is indicative of noise levels recorded on one engine sample in a survey grade 3 environment.

How an engine is packaged, installed and the site acoustical environment will affect the site specific sound levels. For site specific sound level guarantees, sound data collection needs to be done on-site or under similar conditions.

APPENDIX D
SCREEN3 OUTPUT

11/04/25
12:08:23

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

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SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	18.9000
STK INSIDE DIAM (M)	=	0.7600
STK EXIT VELOCITY (M/S)	=	21.8000
STK GAS EXIT TEMP (K)	=	634.2611
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 16.609 M**4/S**3; MOM. FLUX = 31.701 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
10.	0.000	1	1.0	1.0	320.0	187.49	6.18	5.42	NO
100.	0.4160E-01	5	1.0	1.2	10000.0	89.31	21.02	20.42	NO
200.	4.374	3	10.0	10.7	3200.0	35.44	23.92	14.52	NO
300.	9.777	3	10.0	10.7	3200.0	35.44	34.62	20.87	NO
400.	10.53	3	8.0	8.5	2560.0	39.57	45.04	27.10	NO
500.	10.00	3	8.0	8.5	2560.0	39.57	55.09	32.97	NO
600.	9.723	3	5.0	5.3	1600.0	51.98	65.40	39.47	NO
700.	9.162	3	4.5	4.8	1440.0	55.66	75.23	45.35	NO
800.	8.608	4	8.0	8.8	2560.0	38.93	55.87	27.39	NO
900.	8.362	4	8.0	8.8	2560.0	38.93	62.15	30.02	NO
1000.	7.954	4	8.0	8.8	2560.0	38.93	68.37	32.60	NO
1100.	7.735	4	5.0	5.5	1600.0	50.94	74.87	35.33	NO

1200.	7.529	4	5.0	5.5	1600.0	50.94	80.96	37.23	NO
1300.	7.278	4	5.0	5.5	1600.0	50.94	87.00	39.09	NO
1400.	7.003	4	5.0	5.5	1600.0	50.94	93.00	40.90	NO
1500.	6.749	4	4.5	5.0	1440.0	54.50	99.07	42.89	NO
1600.	6.508	4	4.5	5.0	1440.0	54.50	104.99	44.61	NO
1700.	6.281	4	4.0	4.4	1280.0	58.95	111.00	46.59	NO
1800.	6.081	4	4.0	4.4	1280.0	58.95	116.85	48.24	NO
1900.	5.878	4	4.0	4.4	1280.0	58.95	122.66	49.85	NO
2000.	5.693	4	3.5	3.9	1120.0	64.68	128.61	51.83	NO
2100.	5.532	4	3.5	3.9	1120.0	64.68	134.37	53.38	NO
2200.	5.370	4	3.5	3.9	1120.0	64.68	140.09	54.91	NO
2300.	5.474	5	1.0	1.2	10000.0	89.31	110.47	41.48	NO
2400.	5.636	5	1.0	1.2	10000.0	89.31	114.67	42.26	NO
2500.	5.782	5	1.0	1.2	10000.0	89.31	118.85	43.03	NO
2600.	5.913	5	1.0	1.2	10000.0	89.31	123.03	43.80	NO
2700.	6.030	5	1.0	1.2	10000.0	89.31	127.19	44.55	NO
2800.	6.133	5	1.0	1.2	10000.0	89.31	131.33	45.30	NO
2900.	6.223	5	1.0	1.2	10000.0	89.31	135.47	46.04	NO
3000.	6.302	5	1.0	1.2	10000.0	89.31	139.59	46.77	NO
3500.	6.546	5	1.0	1.2	10000.0	89.31	160.02	50.31	NO
4000.	6.600	5	1.0	1.2	10000.0	89.31	180.18	53.68	NO
4500.	6.464	5	1.0	1.2	10000.0	89.31	200.10	56.52	NO
5000.	6.279	5	1.0	1.2	10000.0	89.31	219.78	59.23	NO
5500.	6.066	5	1.0	1.2	10000.0	89.31	239.26	61.82	NO
6000.	5.841	5	1.0	1.2	10000.0	89.31	258.55	64.31	NO
6500.	5.832	6	1.0	1.4	10000.0	74.90	185.04	41.83	NO
7000.	5.812	6	1.0	1.4	10000.0	74.90	197.64	43.08	NO
7500.	5.737	6	1.0	1.4	10000.0	74.90	210.15	44.16	NO
8000.	5.651	6	1.0	1.4	10000.0	74.90	222.56	45.21	NO
8500.	5.557	6	1.0	1.4	10000.0	74.90	234.89	46.22	NO
9000.	5.459	6	1.0	1.4	10000.0	74.90	247.13	47.19	NO
9500.	5.357	6	1.0	1.4	10000.0	74.90	259.29	48.14	NO
10000.	5.254	6	1.0	1.4	10000.0	74.90	271.37	49.07	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:

411.	10.54	3	8.0	8.5	2560.0	39.57	46.25	27.81	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)

SIMPLE TERRAIN 10.54 411. 0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

11/03/25
15:27:59

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

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SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	5.5000
STK INSIDE DIAM (M)	=	0.7100
STK EXIT VELOCITY (M/S)	=	13.3000
STK GAS EXIT TEMP (K)	=	731.7611
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 9.855 M**4/S**3; MOM. FLUX = 8.926 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
10.	0.000	1	1.0	1.0	320.0	124.67	5.65	4.82	NO
100.	39.68	4	20.0	20.0	6400.0	10.27	8.27	4.77	NO
200.	58.10	4	20.0	20.0	6400.0	10.27	15.65	8.66	NO
300.	45.02	4	15.0	15.0	4800.0	12.57	22.72	12.30	NO
400.	37.56	4	10.0	10.0	3200.0	17.18	29.65	15.64	NO
500.	32.28	4	8.0	8.0	2560.0	20.40	36.40	18.79	NO
600.	27.76	4	5.0	5.0	1600.0	29.33	43.26	22.28	NO
700.	25.76	4	5.0	5.0	1600.0	29.33	49.66	24.98	NO
800.	23.42	4	5.0	5.0	1600.0	29.33	55.99	27.63	NO
900.	21.46	4	4.5	4.5	1440.0	31.98	62.34	30.42	NO
1000.	19.84	4	4.0	4.0	1280.0	35.29	68.66	33.20	NO
1100.	18.38	4	3.5	3.5	1120.0	39.55	74.94	35.48	NO

1200.	17.16	4	3.5	3.5	1120.0	39.55	81.03	37.38	NO
1300.	16.02	4	3.5	3.5	1120.0	39.55	87.06	39.23	NO
1400.	15.14	4	3.0	3.0	960.0	45.22	93.25	41.44	NO
1500.	14.57	5	1.0	1.0	10000.0	69.22	75.91	33.34	NO
1600.	15.12	5	1.0	1.0	10000.0	69.22	80.24	34.32	NO
1700.	15.57	5	1.0	1.0	10000.0	69.22	84.56	35.29	NO
1800.	15.95	5	1.0	1.0	10000.0	69.22	88.86	36.24	NO
1900.	16.25	5	1.0	1.0	10000.0	69.22	93.14	37.18	NO
2000.	16.48	5	1.0	1.0	10000.0	69.22	97.42	38.12	NO
2100.	16.57	5	1.0	1.0	10000.0	69.22	101.67	38.95	NO
2200.	16.75	6	1.0	1.0	10000.0	58.38	71.05	27.34	NO
2300.	17.10	6	1.0	1.0	10000.0	58.38	73.84	27.80	NO
2400.	17.41	6	1.0	1.0	10000.0	58.38	76.62	28.26	NO
2500.	17.68	6	1.0	1.0	10000.0	58.38	79.40	28.72	NO
2600.	17.92	6	1.0	1.0	10000.0	58.38	82.17	29.17	NO
2700.	18.13	6	1.0	1.0	10000.0	58.38	84.93	29.61	NO
2800.	18.31	6	1.0	1.0	10000.0	58.38	87.68	30.05	NO
2900.	18.46	6	1.0	1.0	10000.0	58.38	90.42	30.49	NO
3000.	18.59	6	1.0	1.0	10000.0	58.38	93.16	30.92	NO
3500.	18.51	6	1.0	1.0	10000.0	58.38	106.73	32.68	NO
4000.	18.19	6	1.0	1.0	10000.0	58.38	120.12	34.34	NO
4500.	17.73	6	1.0	1.0	10000.0	58.38	133.36	35.91	NO
5000.	17.18	6	1.0	1.0	10000.0	58.38	146.45	37.40	NO
5500.	16.60	6	1.0	1.0	10000.0	58.38	159.41	38.82	NO
6000.	16.01	6	1.0	1.0	10000.0	58.38	172.24	40.18	NO
6500.	15.41	6	1.0	1.0	10000.0	58.38	184.96	41.49	NO
7000.	14.84	6	1.0	1.0	10000.0	58.38	197.57	42.76	NO
7500.	14.24	6	1.0	1.0	10000.0	58.38	210.08	43.85	NO
8000.	13.68	6	1.0	1.0	10000.0	58.38	222.50	44.90	NO
8500.	13.16	6	1.0	1.0	10000.0	58.38	234.83	45.92	NO
9000.	12.66	6	1.0	1.0	10000.0	58.38	247.07	46.90	NO
9500.	12.19	6	1.0	1.0	10000.0	58.38	259.23	47.85	NO
10000.	11.75	6	1.0	1.0	10000.0	58.38	271.32	48.78	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:

160.	62.18	4	20.0	20.0	6400.0	10.27	12.82	7.19	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)

SIMPLE TERRAIN 62.18 160. 0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

11/03/25
14:13:06

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

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SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	4.1000
STK INSIDE DIAM (M)	=	0.3600
STK EXIT VELOCITY (M/S)	=	6.5000
STK GAS EXIT TEMP (K)	=	477.5945
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.798 M**4/S**3; MOM. FLUX = 0.840 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
10.	0.1878E-02	3	10.0	10.0	3200.0	5.30	1.48	0.93	NO
100.	472.0	4	8.0	8.0	2560.0	5.87	8.23	4.70	NO
200.	400.3	4	2.5	2.5	800.0	11.34	15.70	8.75	NO
300.	323.0	4	1.5	1.5	480.0	16.16	22.87	12.57	NO
400.	268.3	4	1.5	1.5	480.0	16.16	29.66	15.65	NO
500.	232.0	4	1.0	1.0	320.0	22.19	36.51	19.01	NO
600.	202.1	4	1.0	1.0	320.0	22.19	43.03	21.83	NO
700.	174.2	4	1.0	1.0	320.0	22.19	49.46	24.58	NO
800.	150.2	4	1.0	1.0	320.0	22.19	55.81	27.28	NO
900.	130.1	4	1.0	1.0	320.0	22.19	62.10	29.92	NO
1000.	129.2	6	1.0	1.0	10000.0	26.98	34.51	15.41	NO
1100.	130.8	6	1.0	1.0	10000.0	26.98	37.54	16.20	NO

1200.	130.7	6	1.0	1.0	10000.0	26.98	40.55	16.97	NO
1300.	129.5	6	1.0	1.0	10000.0	26.98	43.54	17.72	NO
1400.	127.4	6	1.0	1.0	10000.0	26.98	46.51	18.46	NO
1500.	124.7	6	1.0	1.0	10000.0	26.98	49.46	19.18	NO
1600.	121.7	6	1.0	1.0	10000.0	26.98	52.40	19.89	NO
1700.	118.4	6	1.0	1.0	10000.0	26.98	55.33	20.58	NO
1800.	114.9	6	1.0	1.0	10000.0	26.98	58.24	21.26	NO
1900.	111.4	6	1.0	1.0	10000.0	26.98	61.13	21.93	NO
2000.	107.9	6	1.0	1.0	10000.0	26.98	64.01	22.59	NO
2100.	104.3	6	1.0	1.0	10000.0	26.98	66.88	23.15	NO
2200.	100.8	6	1.0	1.0	10000.0	26.98	69.73	23.70	NO
2300.	97.39	6	1.0	1.0	10000.0	26.98	72.57	24.24	NO
2400.	94.17	6	1.0	1.0	10000.0	26.98	75.40	24.77	NO
2500.	91.08	6	1.0	1.0	10000.0	26.98	78.22	25.28	NO
2600.	88.13	6	1.0	1.0	10000.0	26.98	81.03	25.79	NO
2700.	85.31	6	1.0	1.0	10000.0	26.98	83.83	26.30	NO
2800.	82.62	6	1.0	1.0	10000.0	26.98	86.61	26.79	NO
2900.	80.05	6	1.0	1.0	10000.0	26.98	89.39	27.28	NO
3000.	77.59	6	1.0	1.0	10000.0	26.98	92.16	27.76	NO
3500.	67.02	6	1.0	1.0	10000.0	26.98	105.85	29.71	NO
4000.	58.66	6	1.0	1.0	10000.0	26.98	119.35	31.52	NO
4500.	51.94	6	1.0	1.0	10000.0	26.98	132.66	33.22	NO
5000.	46.43	6	1.0	1.0	10000.0	26.98	145.82	34.83	NO
5500.	41.86	6	1.0	1.0	10000.0	26.98	158.83	36.35	NO
6000.	38.01	6	1.0	1.0	10000.0	26.98	171.70	37.80	NO
6500.	34.74	6	1.0	1.0	10000.0	26.98	184.46	39.19	NO
7000.	31.93	6	1.0	1.0	10000.0	26.98	197.10	40.53	NO
7500.	29.54	6	1.0	1.0	10000.0	26.98	209.64	41.68	NO
8000.	27.46	6	1.0	1.0	10000.0	26.98	222.08	42.78	NO
8500.	25.63	6	1.0	1.0	10000.0	26.98	234.43	43.85	NO
9000.	24.00	6	1.0	1.0	10000.0	26.98	246.69	44.88	NO
9500.	22.55	6	1.0	1.0	10000.0	26.98	258.88	45.87	NO
10000.	21.24	6	1.0	1.0	10000.0	26.98	270.98	46.84	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:

52.	515.6	3	8.0	8.0	2560.0	5.87	6.95	4.21	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

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*** SUMMARY OF SCREEN MODEL RESULTS ***
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CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)

SIMPLE TERRAIN 515.6 52. 0.

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** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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