



Wexpro Company
333 South State Street
Salt Lake City, Utah 84111
United States

August 14, 2024

BY U.S. CERTIFIED MAIL, RETURN RECEIPT REQUESTED

Part 71 Permit Contact, Air Permitting and Monitoring Branch, 8ARD-PM
U.S. Environmental Protection Agency Region 8
1595 Wynkoop Street
Denver, Colorado 80202-1129

RE: Wexpro Company
Island Compressor Station (Uintah County, Utah)
Title V Permit No. V-UO-00011-2018.00
Minor Permit Modification Request

To whom it may concern:

Wexpro Company (Wexpro) is submitting a request for a minor permit modification of Title V Permit No. V-UO-00011-2018.00 for the Island Compressor Station. The minor permit modification request is being made pursuant of Condition VI.I and 40 CFR Part 71.7(e)(1).

The following information is provided as required by Condition VI.I.(3)(a): A description of the change and both the current and proposed potential to emit; a regulatory review of the applicable federal air quality requirements to provide appropriate explanation of the requested minor permit modification; and a description of the source's suggested draft permit as required by VI.I.(3)(b).

Based on the nature of the change and the current permit conditions from Consent Decree No. 2:08-CV-00167-TS-PMV, Wexpro plans to continue to comply with the conditions in the existing permit that are affected by the facility's designation as a major source of hazardous air pollutants (HAPs) until such time as the source designation is evaluated and/or revised to reflect the facility's area source status.

Wexpro Company – Island Compressor Station Minor Permit Modification Request
August 14, 2024
Page 2

Dominion Energy is submitting this report on behalf of Enbridge, Inc. during a transitional support period. If you should have any questions, please contact Katie Brown at 804-201-8531 or at katherine.v.brown@dominionenergy.com.

Sincerely,

A handwritten signature in black ink, appearing to read "L. Barry Goodrich".

L. Barry Goodrich
Manager, Air

Cc: Suman Kunwar, EPA Region 8 (via email, kunwar.suman@epa.gov)
Lonnie Favel, Ute Indian Tribe (via email, lonnief@utetribes.com)

Federal Operating Permit Program (40 CFR Part 71)
CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

This form must be completed, signed by the "Responsible Official" designated for the facility or emission unit, and sent with each submission of documents (i.e., application forms, updates to applications, reports, or any information required by a part 71 permit).

A. Responsible Official

Name: (Last) Rasmussen (First) Brady (MI) B

Title Wexpro Vice President and General Manager

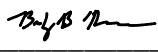
Street or P.O. Box 915 N Eldridge Parkway, Suite 1100

City Houston State TX ZIP 77079 -

Telephone (801) 324 - 2565 Ext. _____ Facsimile (____) ____ - _____

B. Certification of Truth, Accuracy and Completeness (to be signed by the responsible official)

I certify under penalty of law, based on information and belief formed after reasonable inquiry, the statements and information contained in these documents are true, accurate and complete.

Name (signed) 

Name (typed) Brady Rasmussen Date: ____ / ____ / ____

Minor Permit Modification Change Description

Wexpro plans to install a new 1,480-horsepower Waukesha natural gas-fired compressor engine (C300) to increase overall compression at the facility. The following is a description of the modified engine:

- Design: 4-stroke, rich-burn
- Horsepower (at 1,200 RPM): 1,480
- Make: Waukesha
- Model: L7042GSI
- Serial Number: WAU-1654195
- Manufacture Date: 09/2022
- Model Year: 2022
- Emission Control Equipment: Air-Fuel Ratio Controller with Non-Selective Catalyst Reduction

A summary describing the current and proposed potential to emit are attached. The new engine will be subject to emissions standards under 40 CFR Part 60, Subpart JJJJ.

Applicable Requirements Review

A regulatory review of the applicable federal air quality requirements of this minor permit modification request is provided in the following sections. The purpose of this section is to provide appropriate explanation regarding the applicability or non-applicability of these regulations to the request.

40 CFR Part 52 – Prevention of Significant Deterioration (PSD)

This facility is not a source listed in one of the twenty-eight (28) PSD categories; therefore, PSD requirements are triggered if the potential to emit (PTE) exceeds 250 tons per year (tpy) of any criteria pollutant or 100,000 tpy of carbon dioxide equivalent (CO₂e). Based on these thresholds, with federally enforceable controls, this facility remains a synthetic minor stationary source with respect to the Prevention of Significant Deterioration (PSD) Program

New Source Performance Standards (NSPS)

40 CFR Part 60, Subpart A – General Provisions: New Source Performance Standards (NSPS) Subpart A, General Provisions, apply to any stationary source that contains an affected facility to which a NSPS is applicable. As discussed below, this facility is subject to the requirements under Subpart JJJJ; therefore, the requirements under Subpart A apply.

40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines: This subpart applies to manufacturers, owners and operators of stationary spark ignition (SI) internal combustion engines (ICE), which commenced construction on or after June 12, 2006, and were manufactured on or after

July 1, 2008 (100-500 hp), on or after January 1, 2008 (lean burn, 500-1350 hp), or on or after July 1, 2007 (rich burn, > 500 hp and lean burn, > 1,350 hp). Based on the manufacture year of the replacement engine, this unit is an affected facility under Subpart JJJJ.

40 CFR Part 60, Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015: This subpart applies to “affected facilities” including but not limited to pneumatic controllers, pneumatic pumps, storage vessels, reciprocating compressors, centrifugal compressors with wet seals, and components at onshore natural gas processing plants and compressor stations, which commenced construction, were modified, or were reconstructed after September 18, 2015. Increasing compression horsepower of the existing compressor engine will meet the definition of a modification as specified in 40 CFR Part 60, Subpart OOOOa, therefore, the facility will be subject to the requirements for fugitive emissions as well as the requirements for reciprocating compressors under Subpart OOOOa.

40 CFR Part 60, Subpart OOOOb – Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification or Reconstruction Commenced After December 6, 2022: This subpart establishes emission standards and compliance schedules for the control of the pollutant greenhouse gases (GHG). The greenhouse gas standard in this subpart is in the form of a limitation on emissions of methane from affected facilities in the crude oil and natural gas source category that commence construction, modification, or reconstruction after December 6, 2022. This subpart also establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from affected facilities in the crude oil and natural gas source category that commence construction, modification, or reconstruction after December 6, 2022. Therefore, the facility will be subject to the requirements under this subpart.

National Emission Standard for Hazardous Air Pollutants (NESHAPS)

40 CFR Part 63, Subpart A – General Provisions: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart A, General Provisions, apply to any stationary source that contains an affected facility to which a NESHAP is applicable. As discussed below, this facility is subject to a NESHAP; therefore, the requirements of Subpart A apply.

40 CFR Part 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines: This subpart applies to stationary reciprocating internal combustion engines (RICE) at major and area sources of hazardous air pollutants (HAPs). Potential HAP emissions are below major source thresholds with federally enforceable controls in place, however, the facility is currently classified as an existing affected major source of HAPs per Consent Decree 2:08-CV-00167-TS-PMW, 17(b) and therefore it is Wexpro's understanding that the engine will comply with major source requirements under Subpart ZZZZ for a four-stroke rich-burn engine greater than 500 horsepower until such time as the source designation is evaluated and/or revised to reflect the facility's area source status.

40 CFR Part 64 – Compliance Assurance Monitoring

Compliance Assurance Monitoring (CAM) requirements apply to a pollutant-specific emission unit (PSEU) at a major source that is required to obtain a Part 70 or Part 71 permit if the unit satisfies all of the following criteria:

- The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate thereof);
- The unit uses a control device to achieve compliance with any such emission limitation or standard; and
- The unit has potential pre-control device emission of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

The compressor engine has potential pre-control device emission totals for NO_x and CO that are greater than 100 tons per year and uses a control device to achieve compliance. However, EPA concluded in the Response to Comments for the original permit application that a CAM plan is not required due to the requirements of the continuous compliance monitoring needed to comply with CAM have been met by NESHAP ZZZZ and the former consent decree requirements. The engine will continue to comply with NESHAP ZZZZ continuous monitoring requirements.

Emissions Summary

The Island Compressor Station emissions estimates include all the sources listed below. A summary of total emissions (allowable with federally enforceable controls) listed by individual pollutant is found in Table 1. A summary of emissions (potential to emit with federally enforceable controls) listed by source is found in Table 2. Detailed emission calculations are provided in Appendix A.

Table 1. Facility Emissions Summary
(Federally Enforceable, Significant Emission Units)

Pollutant	Allowable Emissions (tpy)
Nitrogen Oxides (NOx)	32.49
Carbon Monoxide (CO)	64.53
Volatile Organic Compounds (VOCs)	9.08
Sulfur Dioxide (SO2)	0.08
Particulate Matter, Less than 10 µm (PM10)	2.52
Formaldehyde (HCHO)	0.78
Lead (Pb)	0.0
Fluorides (gaseous and particulate)	0.0
Sulfuric Acid Mist (H2SO4)	0.0
Hydrogen Sulfide (H2S)	0.0
Total Reduced Sulfur (TRS)	0.0
Reduced Sulfur Compounds	0.0
Total Hazardous Air Pollutants (HAPs)	2.19

Table 2. Facility Equipment Emissions Summary for Significant Emissions Units

Controlled Emissions									
Emission Source ID	Emission Source Description	NOx	CO	VOC	PM10	SO2	Toluene	HCHO¹	HAPs
		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
C200	Waukesha 7042GSI	16.22	32.44	2.79	1.27	0.04	0.02	0.19	0.00
C300	Waukesha L7042GSI S4	14.29	28.58	1.86	1.12	0.03	0.02	0.17	0.50
GEN3	Caterpillar G3306B	1.71	3.42	0.19	0.13	0.004	0.004	0.410	0.49
D-1	15-MMscfd TEG Dehydration Unit	-	-	1.85	-	-	0.37	-	0.87
R-1	One 0.25-MMBtu/hr Dehydrator Reboiler	0.11	0.09	0.01	0.01	0.001	3.7E-06	8.05E-05	0.002
T-1 & T-2	Two 400-bbl Condensate Tanks	-	-	0.11	-	-	0.003	-	0.01
T-3 - T-9	Misc. Chemical Tanks	-	-	1.53	-	-	-	-	-
EL	Fugitive Equipment Leaks	-	-	2.28	-	-	0.09	-	0.31
FL-1	Flare Emissions from Dehy Control	0.23	0.07	0.00	-	-	-	0.00	0.00
C-1	Combustor Emissions from Tank Control	0.04	0.01	0.00	-	-	-	0.00	0.00
LO	Truck Loadout	-	-	0.29	-	-	-	-	-
CB	Compressor Blowdowns	-	-	0.79	-	-	-	-	0.04
ESD	Emergency Shutdowns	-	-	0.17	-	-	-	-	0.01
ES	Engine Start-ups	-	-	0.03	-	-	-	-	0.002
GP	Gas Driven Pumps	-	-	0.48	-	-	-	-	0.02
Total:		32.60	64.62	12.38	2.53	0.08	0.50	0.78	2.27
Total (significant units):		32.49	64.53	9.08	2.52	0.08	0.50	0.78	2.19
Net Change (significant units):		14.29	28.58	1.86	1.12	0.03	0.02	0.17	0.50
Note: PM Emission Factor includes condensible and filterable; and PM=PM ₁₀ =PM _{2.5}									
¹ HCHO is included as the HAP with the single greatest emission rate.									

Description of Source's Suggested Draft Permit

Based on the year of manufacture for the replacement engine, the engine is subject to the requirements of 40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines and must meet the NO_x, CO and VOC emissions standards for engines that are Non-Emergency SI Natural Gas greater than or equal to 500 hp as specified in Table 1 of Subpart JJJJ. As a result of the change, Wexpro requests that the permit be modified to reflect that the replacement engine is subject to the requirements under Subpart JJJJ. Wexpro also requests that the permit be modified to indicate that the facility is subject to the requirements for reciprocating compressors and facility-wide fugitive emissions under 40 CFR Part 60, Subpart OOOOb. The increase in compression horsepower will result in a modification for reciprocating compressors as defined in Subpart OOOOb.

Appendix A

Emissions Calculations

Wexpro Company

Island Compressor Station

Title V Permit - Emissions Summary for Minor Permit Modification

Uncontrolled Emissions

Emission Source ID	Emission Source Description	NOx	CO	VOC	PM10	SO2	Toluene	HCHO	HAPs
		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
C200	Waukesha 7042GSI	226.30	192.23	0.71	1.09	0.03	0.03	0.71	1.36
C300	Waukesha L7042GSI S4	204.36	163.78	1.86	1.12	0.03	0.03	0.71	1.38
GEN3	Caterpillar G3306B	1.71	3.42	0.21	0.13	0.004	0.004	0.410	0.49
D-1	15-MMscfd TEG Dehydration Unit	-	-	60.46	-	-	14.29	-	34.29
R-1	One 0.25-MMBtu/hr Dehydrator Reboiler	0.11	0.09	0.01	0.01	0.001	-	8.05E-05	0.002
T-1 & T-2	Two 400-bbl Condensate Tanks	-	-	2.17	-	-	0.06	-	0.29
T-3 - T-9	Misc. Chemical Tanks	-	-	1.53	-	-	-	-	-
EL	Fugitive Equipment Leaks	-	-	2.28	-	-	-	-	0.31
FL-1	Flare Emissions from Dehy Control	0.02	0.02	0.00	-	-	-	1.74E-05	-
C-1	Combustor Emissions from Tank Control	0.01	0.006	0.00	-	-	-	5.58E-06	-
LO	Truck Loadout	-	-	0.29	-	-	-	-	-
CB	Compressor Blowdowns	-	-	0.79	-	-	-	-	0.04
ESD	Emergency Shutdowns	-	-	0.17	-	-	-	-	0.01
ES	Engine Start-ups	-	-	0.03	-	-	-	-	0.002
GP	Gas Driven Pumps	-	-	0.48	-	-	-	-	0.02
Total		432.51	359.54	70.99	2.35	0.07	14.42	1.84	38.20

Note: PM Emission Factor includes condensable and filterable; and PM=PM₁₀=PM_{2.5}

Uncontrolled emissions from FL-1 and C-1 only include pilot emissions as tanks and dehydrator are not sent to Flare/Combustor when uncontrolled

HCHO included as the single greatest HAP

Controlled Emissions

Emission Source ID	Emission Source Description	NOx	CO	VOC	PM10	SO2	Toluene	HCHO ¹	HAPs
		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
C200	Waukesha 7042GSI	16.22	32.44	2.79	1.27	0.04	0.02	0.19	0.00
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GEN3	Caterpillar G3306B	1.71	3.42	0.19	0.13	0.004	0.004	0.410	0.49
D-1	15-MMscfd TEG Dehydration Unit	-	-	1.85	-	-	0.37	-	0.87
R-1	One 0.25-MMBtu/hr Dehydrator Reboiler	0.11	0.09	0.01	0.01	0.001	3.7E-06	8.05E-05	0.002
T-1 & T-2	Two 400-bbl Condensate Tanks	-	-	0.11	-	-	0.003	-	0.01
T-3 - T-9	Misc. Chemical Tanks	-	-	1.53	-	-	-	-	-
EL	Fugitive Equipment Leaks	-	-	2.28	-	-	0.09	-	0.31
FL-1	Flare Emissions from Dehy Control	0.23	0.07	0.00	-	-	-	0.00	0.00
C-1	Combustor Emissions from Tank Control	0.04	0.01	0.00	-	-	-	0.00	0.00
LO	Truck Loadout	-	-	0.29	-	-	-	-	-
CB	Compressor Blowdowns	-	-	0.79	-	-	-	-	0.04
ESD	Emergency Shutdowns	-	-	0.17	-	-	-	-	0.01
ES	Engine Start-ups	-	-	0.03	-	-	-	-	0.002
GP	Gas Driven Pumps	-	-	0.48	-	-	-	-	0.02
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Total (significant units):		32.49	64.53	9.08	2.52	0.08	0.50	0.78	2.19
Net Change (significant units):		14.29	28.58	1.86	1.12	0.03	0.02	0.17	0.50

Note: PM Emission Factor includes condensable and filterable; and PM=PM₁₀=PM_{2.5}

¹ HCHO is included as the HAP with the single greatest emission rate.

Wexpro Company

Island Compressor Station

Title V Permit - Emissions Summary for Minor Permit Modification

Unit ID: C300
Unit Descrip: Waukesha L7042GSI
Unit S/N: WAU-1654195
Unit Start-up: TBD
Unit Mfg Date: September 1, 2022
Engine Type: 4SRB
Control Device: AFRC and NSCR

Emission Factors (uncontrolled)	Source
Site Rated Horsepower:	1480 bhp Mfg. data
Name Plate Horsepower:	1480 bhp Mfg. data
NO _x :	14.30 g/hp-hr Mfg. data
CO:	11.46 g/hp-hr Mfg. data
SO ₂ :	5.88E-04 lb/MMBtu AP-42
VOC:	0.13 g/hp-hr Mfg. data
PM	1.94E-02 lb/MMBtu AP-42
HCHO	0.05 g/hp-hr Mfg. data

Note: PM Emission Factor includes condensible and filterable; and PM=PM₁₀=PM_{2.5}

VOC Emission Factor includes NMNEHC from manufacturer data plus HCHO from manufacturer and acrolein and acetaldehyde from AP-42; manufacturer data does not include aldehydes

Exhaust Gas Flow (cfm)	7,316
Fuel Use Rate (scf/hr)	12,369
Annual Fuel Consumption (MMscf/yr)	108.4
Fuel Heating Value (Btu/scf, HHV)	1,066
Fuel Heating Value (Btu/scf, LHV)	963
BSFC @ 100% Load (Btu/hp-hr, LHV)	8,054
BSFC @ 100% Load (Btu/hp-hr, HHV)	8,909
Heat Input (MMBtu/hr, HHV)	13.2
Site Rated Horsepower (bhp)	1,480
Operating Hours	8,760

Pollutant	EF Source	Uncontrolled Emissions				Controlled Emissions			
		Emission Factor	Emissions (lb/hr)	Op. Hrs	tpy	Emission Factor	Emissions (lb/hr)	Op. Hrs	tpy
NO _x	Manufacturer	14.30 g/hp-hr	46.66	8760	204.36	1.00 g/hp-hr	3.26	8760	14.29
CO	Manufacturer	11.46 g/hp-hr	37.39	8760	163.78	2.00 g/hp-hr	6.53	8760	28.58
SO ₂	AP-42, Table 3.2-3 (July 2000)	5.88E-04 lb/MMBtu	0.01	8760	0.03	5.88E-04 lb/MMBtu	0.01	8760	0.03
VOC	Manufacturer	0.13 g/hp-hr	0.42	8760	1.86	0.13 g/hp-hr	0.42	8760	1.86
PM	AP-42, Table 3.2-3 (July 2000)	1.94E-02 lb/MMBtu	0.26	8760	1.12	1.94E-02 lb/MMBtu	0.26	8760	1.12
HCHO	Manufacturer	0.05 g/hp-hr	0.16	8760	0.71	0.01 g/hp-hr	0.04	8760	0.17
Acetaldehyde	AP-42, Table 3.2-3 (July 2000)	2.79E-03 lb/MMBtu	0.04	8760	0.16	1.40E-03 lb/MMBtu	0.02	8760	0.08
Acrolein	AP-42, Table 3.2-3 (July 2000)	2.63E-03 lb/MMBtu	0.03	8760	0.15	1.32E-03 lb/MMBtu	0.02	8760	0.08
Benzene	AP-42, Table 3.2-3 (July 2000)	1.58E-03 lb/MMBtu	0.02	8760	0.09	7.90E-04 lb/MMBtu	0.01	8760	0.05
Ethylbenzene	AP-42, Table 3.2-3 (July 2000)	2.48E-05 lb/MMBtu	0.00	8760	0.00	1.24E-05 lb/MMBtu	0.0002	8760	0.00
Toluene	AP-42, Table 3.2-3 (July 2000)	5.58E-04 lb/MMBtu	0.01	8760	0.03	2.79E-04 lb/MMBtu	0.004	8760	0.02
Xylene	AP-42, Table 3.2-3 (July 2000)	1.95E-04 lb/MMBtu	0.00	8760	0.01	9.75E-05 lb/MMBtu	0.001	8760	0.01
Methanol	AP-42, Table 3.2-3 (July 2000)	3.06E-03 lb/MMBtu	0.04	8760	0.18	1.53E-03 lb/MMBtu	0.02	8760	0.09
1,3-Butadiene	AP-42, Table 3.2-3 (July 2000)	6.63E-04 lb/MMBtu	0.01	8760	0.04	3.32E-04 lb/MMBtu	0.004	8760	0.02
Total HAP:					1.38				0.50

Notes: Controlled Emissions assumes NSCR catalyst removes 92.38 NO_x, 83.1% CO, 76% HCHO and 50% HAPs

Controlled Emission Factor for VOC is based on previous controlled manufacturer's specification; Uncontrolled EF is based on manufacturer specifications for replacement engine

PM Emission Factor includes condensible and filterable; and PM=PM₁₀=PM_{2.5}

HAP Emission Factors provided by AP-42, Table 3.2-2 (7/2000).

Appendix B

Engine Specifications



L7042GSI S4 ReUp - Clay Basin

VHP - L7042GSI S4

Dominion Energy - Juan Aurelio Gary Thompson 307-349-5682 a.godina.Villegas@dominionenergy.com Gas Compression

ENGINE SPEED (rpm):	1200	NOx SELECTION (g/bhp-hr):	Customer Catalyst
DISPLACEMENT (in3):	7040	COOLING SYSTEM:	JW, IC + OC
COMPRESSION RATIO:	8:1	INTERCOOLER WATER INLET (°F):	130
IGNITION SYSTEM:	ESM2	JACKET WATER OUTLET (°F):	180
EXHAUST MANIFOLD:	Water Cooled	JACKET WATER CAPACITY (gal):	100
COMBUSTION:	Rich Burn, Turbocharged	AUXILIARY WATER CAPACITY (gal):	11
ENGINE DRY WEIGHT (lbs):	24250	LUBE OIL CAPACITY (gal):	190
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. EXHAUST BACKPRESSURE (in. H2O):	15
ENGINE SOUND LEVEL (dBA)	104	MAX. AIR INLET RESTRICTION (in. H2O):	15
IGNITION TIMING:	ESM2 Controlled	EXHAUST SOUND LEVEL (dBA)	111

SITE CONDITIONS:

FUEL:	Natural Gas	ALTITUDE (ft):	6510
FUEL PRESSURE RANGE (psig):	30 - 60	MAXIMUM INLET AIR TEMPERATURE (°F):	82
FUEL HHV (BTU/ft3):	1,065.8	FUEL WKI:	88.0
FUEL LHV (BTU/ft3):	963.5		

SITE SPECIFIC TECHNICAL DATA

POWER RATING	UNITS	110% OVERLOAD SITE DATA (See note 18)	MAX RATING AT 100 °F AIR TEMP	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 82 °F		
				100%	75%	50%
CONTINUOUS ENGINE POWER	BHP	1628	1480	1480	1110	747
OVERLOAD	% 2/24 hr	Note 18	10	10	-	-
MECHANICAL EFFICIENCY (LHV)	%	31.9	31.5	31.6	30.2	27.6
CONTINUOUS POWER AT FLYWHEEL	BHP	1628	1480	1480	1110	747

based on no auxiliary engine driven equipment

AVAILABLE TURNDOWN SPEED RANGE	RPM	700 - 1200
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FUEL CONSUMPTION						
FUEL CONSUMPTION (LHV)	BTU/BHP-hr	7973	8097	8054	8423	9232
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	8820	8957	8909	9318	10212
FUEL FLOW	SCFM	225	207	206	162	119

based on fuel analysis LHV

HEAT REJECTION						
JACKET WATER (JW)	BTU/hr x 1000	3770	3591	3511	2927	2335
LUBE OIL (OC)	BTU/hr x 1000	556	549	542	504	436
INTERCOOLER (IC)	BTU/hr x 1000	238	258	205	126	46
EXHAUST	BTU/hr x 1000	3813	3414	3436	2528	1746
RADIATION	BTU/hr x 1000	710	635	688	620	563

EMISSIONS (ENGINE OUT):						
NOx (NO + NO2)	g/bhp-hr	13.43	14.01	14.03	15.74	16.55
CO	g/bhp-hr	11.44	11.70	11.46	11.61	11.86
THC	g/bhp-hr	2.31	2.31	2.26	2.11	1.95
NMHC	g/bhp-hr	0.278	0.276	0.271	0.252	0.234
NM,NEHC (VOC)	g/bhp-hr	0.130	0.129	0.126	0.118	0.109
CO2	g/bhp-hr	488	496	493	516	565
CO2e	g/bhp-hr	539	547	543	562	608
CH2O	g/bhp-hr	0.05	0.050	0.050	0.050	0.050
CH4	g/bhp-hr	2.05	2.03	1.99	1.86	1.72

AIR INTAKE / EXHAUST GAS						
INDUCTION AIR FLOW	SCFM	2376	2194	2182	1712	1262
EXHAUST GAS MASS FLOW	lb/hr	11051	10202	10148	7960	5870
EXHAUST GAS FLOW	ACFM	8060	7359	7316	5519	3924
EXHAUST TEMPERATURE	°F	1181	1163	1162	1100	1044

at exhaust temp, 14.5 psia

HEAT EXCHANGER SIZING ¹²			
TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	4276	4072
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	900	916

COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS		
JACKET WATER PUMP MIN. DESIGN FLOW	GPM	450
JACKET WATER PUMP MAX. EXTERNAL RESTRICTION	psig	16
AUX WATER PUMP MIN. DESIGN FLOW	GPM	79
AUX WATER PUMP MAX. EXTERNAL RESTRICTION	psig	44

All data provided per the conditions listed in the notes section on page three.
 Data Generated by EngCalc Program Version 4.1 INNIO Waukesha Gas Engines, Inc.
 12/6/2021 10:19 AM

L7042GSI S4 ReUp - Clay Basin

VHP - L7042GSI S4

Dominion Energy - Juan Aurelio

Gary Thompson

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Gas Compression

FUEL COMPOSITION

HYDROCARBONS:

		<u>Mole or Volume %</u>
Methane	CH4	93.782
Ethane	C2H6	3.6249
Propane	C3H8	1.1696
Iso-Butane	I-C4H10	0.2061
Normal Butane	N-C4H10	0.2905
Iso-Pentane	I-C5H12	0.0981
Normal Pentane	N-C5H12	0.0773
Hexane	C6H14	0.027
Heptane	C7H16	0
Ethene	C2H4	0
Propene	C3H6	0

SUM HYDROCARBONS 99.276

NON-HYDROCARBONS:

Nitrogen	N2	0.3806
Oxygen	O2	0
Helium	He	0
Carbon Dioxide	CO2	0.34
Carbon Monoxide	CO	0
Hydrogen	H2	0
Water Vapor	H2O	0

TOTAL FUEL 99.996

FUEL:	Natural Gas
FUEL PRESSURE RANGE (psig):	30 - 60
FUEL WKI:	88.0
FUEL SLHV (BTU/ft3):	946.70
FUEL SLHV (MJ/Nm3):	37.23
FUEL LHV (BTU/ft3):	963.46
FUEL LHV (MJ/Nm3):	37.89
FUEL HHV (BTU/ft3):	1065.77
FUEL HHV (MJ/Nm3):	41.91
FUEL DENSITY (SG):	0.60

Standard Conditions per ASTM D3588-91 [60°F and 14.696psia] and ISO 6976:1996-02-01[25, V(0;101.325)].

Based on the fuel composition, supply pressure and temperature, liquid hydrocarbons may be present in the fuel. No liquid hydrocarbons are allowed in the fuel. The fuel must not contain any liquid water. Waukesha recommends both of the following:

1) Dew point of the fuel gas to be at least 20°F (11°C) below the measured temperature of the gas at the inlet of the engine fuel regulator.

2) A fuel filter separator to be used on all fuels except commercial quality natural gas.

Refer to the 'Fuel and Lubrication' section of 'Technical Data' or contact the Waukesha Application Engineering Department for additional information on fuels, or LHV and WKI* calculations.

* Trademark of INNIO Waukesha Gas Engines Inc.

FUEL CONTAMINANTS

Total Sulfur Compounds	0	% volume
Total Halogen as Chloride	0	% volume
Total Ammonia	0	% volume

Total Sulfur Compounds	0	µg/BTU
Total Halogen as Chloride	0	µg/BTU
Total Ammonia	0	µg/BTU

Siloxanes

Tetramethyl silane	0	% volume
Trimethyl silanol	0	% volume
Hexamethyldisiloxane (L2)	0	% volume
Hexamethylcyclotrisiloxane (D3)	0	% volume
Octamethyltrisiloxane (L3)	0	% volume
Octamethylcyclotetrasiloxane (D4)	0	% volume
Decamethyltetrasiloxane (L4)	0	% volume
Decamethylcyclopentasiloxane (D5)	0	% volume
Dodecamethylpentasiloxane (L5)	0	% volume
Dodecamethylcyclohexasiloxane (D6)	0	% volume
Others	0	% volume

Total Siloxanes (as Si) 0 µg/BTU

Calculated fuel contaminant analysis will depend on the entered fuel composition and selected engine model.

No water or hydrocarbon condensates are allowed in the engine. Requires liquids removal.

NOTES

1. All data is based on engines with standard configurations unless noted otherwise.
2. Power rating is adjusted for fuel, site altitude, and site air inlet temperature, in accordance with ISO 3046/1 with tolerance of $\pm 3\%$.
3. Fuel consumption is presented in accordance with ISO 3046/1 with a tolerance of $-0 / +5\%$ at maximum rating. Fuel flow calculation based on fuel LHV and fuel consumption with a tolerance of $-0/+5\%$. For sizing piping and fuel equipment, it is recommended to include the 5% tolerance.
4. Heat rejection tolerances are $\pm 30\%$ for radiation, and $\pm 8\%$ for jacket water, lube oil, intercooler, and exhaust energy.
5. Emission levels for engines with Waukesha supplied 3-way catalyst are given at catalyst outlet flange. For all other engine models, emission levels are given at engine exhaust outlet flange prior to any after treatment. Values are based on a new engine operating at indicated site conditions, and adjusted to the specified timing and air/fuel ratio at rated load. Catalyst out emission levels represent emission levels the catalyst is sized to achieve. Manual adjustment may be necessary to achieve compliance as catalyst/engine age. Catalyst-out emission levels are valid for the duration of the engine warranty. Emissions are at an absolute humidity of 75 grains H₂O/lb (10.71 g H₂O/kg) of dry air. Emission levels may vary subject to instrumentation, measurement, ambient conditions, fuel quality, and engine variation. Engine may require adjustment on-site to meet emission values, which may affect engine performance and heat output. NO_x, CO, THC, and NMHC emission levels are listed as a not to exceed limit, all other emission levels are estimated. CO₂ emissions based on EPA Federal Register/Vol. 74, No. 209/Friday, October 30, 2009 Rules and Regulations 56398, 56399 (3) Tier 3 Calculation Methodology, Equation C-5.
6. Air flow is based on undried air with a tolerance of $\pm 7\%$.
7. Exhaust temperature given at engine exhaust outlet flange with a tolerance of $\pm 50^{\circ}\text{F}$ (28°C).
8. Exhaust gas mass flow value is based on a "wet basis" with a tolerance of $\pm 7\%$.
9. Inlet air restrictions based on full rated engine load. Exhaust backpressure based on 138 PSI BMEP and 1200 RPM. Refer to the engine specification section of Waukesha's standard technical data for more information.
10. Cooling circuit capacity, lube oil capacity, and engine dry weight values are typical.
11. Fuel must conform to Waukesha's "Gaseous Fuel Specification" S7884-7 or most current version. Fuel may require treatment to meet current fuel specification.
12. Heat exchanger sizing values given as the maximum heat rejection of the circuit, with applied tolerances and an additional 5% reserve factor.
13. Fuel volume flow calculation in english units is based on 100% relative humidity of the fuel gas at standard conditions of 60°F and 14.696 psia (29.92 inches of mercury; 101.325 kPa).
14. Fuel volume flow calculation in metric units is based on 100% relative humidity of the fuel gas at a combustion temperature of 25°C and metering conditions of 0°C and 101.325 kPa (14.696 psia; 29.92 inches of mercury). This is expressed as [25, V(0;101.325)].
15. Engine sound data taken with the microphone at 1 m (3.3 ft) from the side of the engine at the approximate front-to-back centerline. Microphone height was at intake manifold level. Engine sound pressure data may be different at front, back and opposite side locations. Exhaust sound data taken with microphone 1 meter (3.3 ft) away and 1 meter (3.3 ft) to the side of the exhaust outlet.
16. Due to variation between test conditions and final site conditions, such as exhaust configuration and background sound level, sound pressure levels under site conditions may be different than those tabulated above.
17. Cooling system design flow is based on minimum allowable cooling system flow. Cooling system maximum external restriction is defined as the allowable restriction at the minimum cooling system flow.
18. Continuous Power Rating: The highest load and speed that can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance at indicated ambient reference conditions and fuel. It is permissible to operate the engine at the indicated overload power, for two hours in every 24 hour period.
19. emPact emission compliance available for entire range of operable fuels; however, fuel system and/or O₂ set point may need to be adjusted in order to maintain compliance.
20. In cold ambient temperatures, heating of the engine jacket water, lube oil and combustion air may be required. See Waukesha Technical Data.
21. Available Turndown Speed Range refers to the constant torque speed range available. Reduced power may be available at speeds outside of this range. Contact application engineering.

SPECIAL REQUIREMENTS

Equipment Specification

Proposal Information	Proposal Number: RJM-22-004862	Date: 8/1/2022
	Project Reference: Dominion/Wexpro Wy 7042	

Engine Information	Engine Make: Waukesha	Speed: Rated
	Engine Model: VHP-L7042SGI S4	Power Output: 1,480 bhp
	Rated Speed: 1200 RPM	Exhaust Flow Rate: 10,148 lb/hr
	Fuel Description: Natural Gas	Exhaust Temperature: 1,162 ° F
	Hours Of Operation: 8760 Hours per year	O ₂ : 0.38%
	Load: 100%	H ₂ O: 15%

Emission Data (100% Load)	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	<i>g/bhp-hr</i>	<i>tons/yr</i>	<i>ppmvd @ 15% O₂</i>	<i>ppmvd</i>	<i>g/kW-hr</i>	<i>lb/MW-hr</i>	<i>g/bhp-hr</i>	<i>tons/yr</i>	<i>ppmvd @ 15% O₂</i>	<i>ppmvd</i>	<i>g/kW-hr</i>	<i>lb/MW-hr</i>	
NO _x	14.3	204.36	981	3,412	19.177	42.28	0.5	7.15	34	119	0.671	1.48	96.5%
CO	11.46	163.78	1,291	4,491	15.368	33.88	0.5	7.15	56	196	0.671	1.48	95.6%
NMNEHC	0.13	1.8	25	86	0.169	0.37	0.06	0.9	12	43	0.084	0.19	50%
CH ₂ O	0.05	0.71	5	18	0.067	0.15	0.02	0.36	3	9	0.034	0.07	50%

System Specifications	<u>Catalyst (Replacement Catalyst)</u>
	Element Model Number: MECB-TW-RO-3350-0000-350
	Number of Catalyst Layers: 2
	Number of Catalyst Per Layer: 1
	Catalyst Back Pressure: 4.0 inWC (Clean)
	Design Exhaust Flow Rate: 10,148 lbhr
	Design Exhaust Temperature: 1,162f
	Dimensions: Ø 33.5 in
	Exhaust Temperature Limits*: 750f – 1250f (catalyst inlet); 1350f (catalyst outlet)
	System Pressure Loss: 4.0 inWC (Clean)

* General catalyst temperature operating range. Performance is based on the Design Exhaust Temperature.