FILE NOTE
NOV 27

Travis - YEC

- Review
- Integrated resources plan update (every 5 years)
- Capacity gap
    - The # of MW that they supply the system
    - If they were to loose aishihik they would need enuf energy to supply the rest of the grid – if you have that type of emergency (losing that type of generation)
    - N-1 (type of emergency) – nominal minus 1 (loosing the plant)
- If they have an N-1 they observed given their load forecast that they have a bit of a gap
- So until they bring on permanent additional capacity (hydro, wind, thermal or battery which are all in planning table)
- In the interim – they have a gap
- Plan to address
    - Install some diesel engines
    - Just sit there
    - Mobile
    - Semi trailers that sit there with engine
    - Parked beside
    - Only operated when emergency
- If in an emergency these would need to be turned on
- Best and fastest situation is to have diesel engine's ready to go
- Emergency
    - Over 1MW each (2MW each = 18kW each –> rated for 2 MW)
    - The capacity gap is 8 MW now, but next year could grow an additional 2MW
    - This year plug in 4x2MW units
    - Don't want to have roational black outs – would continue to be able to supply power
    - Would require a authorozation to operate these?
    - Need an emergency
    - Have ordered units, will be delivered this winter
    - In case of emerg would be connected to grid and then operated
- If they have to operate them need an operation
- Because they are over 1MW they would require an amendment
- Provision for emergency
- Unfortunately it is happening quickly
- Identified in early year
- Had to go through options analysis, within last week or two have been able to narrow down to technically feasible solution
- Diesel engines
    - **This is an activity under the YESAA List regs … this is an expansion to an electric fossil fuel fired electrical generation**
    - **Amendment to permit**
    - **We have an essential service, temporary, extremely low likelihood that it would ever operate (unless grid wide emergency)**
    - **In order to be ready for this do we need re-assessment**
- All mobiles are under 1MW (200, 500MW) – but not big enough
- Permit speaks to grid scale generation facilities at the communities

- Us as regulator
    - **Is DD necessary in order us to authorize this temporary emergency back up**
- Will come in if we want to he will come in
- Will they need an assessment, or can the gov't operate this temporary emergency only to the permit with out a DD
- Temporary authorization without an assessment, if an assessment is required.
- Units are Tier 2 (contemporary CAT diesel engines)
- Pre-tier is manufactured before 1987 (?) … Tier Zero
- From human health perspective

Part 4.2(b)

Energy and Telecommunications

	Column 1	Column 2
Item	Activity	Specific Exception
1	Construction, installation, operation, modification, decommissioning or abandonment of, or other activity in relation to, a power line or a telecommunications line	
2	Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, **(a)** a hydroelectric generating station; **(b)** a fossil fuel-fired electrical generating station; **(c)** a wind-powered electrical generating station; **(d)** a wood-fired electrical generating station; or **(e)** a wood-fuelled heating facility for the commercial sale of heat	Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, a wind-powered electrical generating station if its production capacity is, and in the case of a modification remains, 50 kW or less

Determination of Significant Change

No significant change

49.1 (1) A new assessment of a project or existing project is not required when an authorization is renewed or amended unless, in the opinion of a decision body for the project,

- look at scope to see number of MW

November 22, 2017

- Got above call from travis
- Discussed with sarah and bengt. Suggested 49.1 be used to amend permit
- Requested more info from Travis

November 23, 2017

- Met with Sarah, John re: determination of significant change; all agreed that we have no concerns based on info that Travis provided. Will conduct consultation with FN, and take that into consideration prior to amending permit.
- Spoke with Andrew Wilson who advised that there were no guidelines on length of consultation with FN.
- Travis:
    - transformers are in place to make the connection, just waiting for ____ to arrive.
    - Michael Brandt who has had informal discussion, no flags raised (informally), KD supported
    - Planning on reaching out with TKC
- Sent email to travis seeking completed application for amendment

Nov 28

- Received application for amendment
- Circulated internally for comment (John, Jenn)
- Preparation of Letter of Determination to KDFN, TKC,
- Email notification to O&G, Fire Marshal, EMO, City of Whitehorse (deadline noon Dec 8)
- Sent s.49(1) letters to FN

Notes:

- 2011-0241: Yukon Energy Air Emissions Permit Renewal Whitehorse
- 2013-0115: Whse Diesel Natural Gas Conversion Project

FILE NOTE:
April 24, 2018
Janine Kostelnik

YEC requested to amend their AER permit to increase emergency contingency generation from 10-12MW at the Whse plant.

Following is a review of related YESAA assessments to determine whether this request exceeds what was identified in the original scope, and would therefore require an assessment prior to amending.

2011-0241 Assessment:
- renewal of permit
- 25.2MW of nameplate diesel was assessed

2013-0115 Assessment:
- YEC retired 9.1MW (3.92 + 5.15) diesel and added two natural gas units (4.4MW each)

2017 Determination of significant change (s.49.1):
- 8.8 MW of natural gas (with a 3rd proposed to be brought on summer 2018– amendment yet to be submitted – would raise this to 13.2)
- Emergency backup: "…authorized to operate up to five emergency back-up generators, exclusively on diesel fuel … in the event of an N-1 event". Travis says max capacity of the generators is 2MW, but our permit is not for capacity it is for number of generators. Travis confirmed they are unable to get generators larger than 2MW.

Travis has confirmed that the total rated capacity of existing diesel generators currently on site is 12.7MW, and that with the five back-up generators, it's another 10MW (nameplate). Totaling 22.7MW. Bring on a sixth backup and that will take the total to 24.7MW, which is under the initial 25.2 output that was scoped in.

Travis confirmed that their 2011 assessment estimates were based on nameplate capacity. As this will be the deciding factor on whether or not an assessment is required.

Dates	Diesel Assessed	Diesel Retired	Diesel N-1 (Tier2)	Diesel Rated	DIESEL Nameplate	LNG
2011	25.2MW nameplate					
2013		9.1 MW nameplate				8.8
2017			10 MW nameplate			
2018				12.7 MW		
TOTAL					26.1	8.8
Proposed April 2018			2 MW nameplate			
Proposed Summer 2018						4.4
Total Diesel (Whse + 4x N1)						
Propopsed Total Deisel (Whse + 5xN1)						

Options:

Scenario 1 (nameplate capacity): exceeds 25.2 scoped in threshold:
25.2 – 9.1 + 10 = 26.1 total

Scenario 2 (rated capacity): is within threshold
12.7 + 10 = 22.7 total

Recommendation:

- Scenario 2 is actual output (ie. rated), so assessment is not required. Amend permit to change from 4 to 5 generators under N1 conditions. Total rated capacity of 25MW.

NB:

- 3rd LNG unit coming on board this summer
- Nameplate capacity is max capacity
- As units age, ratings go down (function of unit over time with wear and tear)
- Rated capacity: engineers/mechanics look at unit and it's ability to generate electricity in safe/efficient way; they test it; advise that it only be run it up to a certain MW; internal procedures; they give a max a min and a recommended operating output
- WD6 is rated at 3MW but energineers suggest 2.3-2.7

PART 4

Energy and Telecommunications

	Column 1	Column 2
Item	Activity	Specific Exception
1	Construction, installation, operation, modification, decommissioning or abandonment of, or other activity in relation to, a power line or a telecommunications line	
2	Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, **(a)** a hydroelectric generating station; **(b)** a fossil fuel-fired electrical generating station; **(c)** a wind-powered electrical generating station; **(d)** a wood-fired electrical generating station; or **(e)** a wood-fuelled heating facility for the commercial sale of heat	Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, a wind-powered electrical generating station if its production capacity is, and in the case of a modification remains, 50 kW or less

October 2018

- Request to amend to add another diesel generator, totalling 6 diesel N-1 generators and 3 LNG units
- Advised in email dated Oct 2 to include impact on these systems when going through YESAA for thermal plant, as clarity will be required to differentiate between nameplate and rated capacity

Yukon Energy Corporation
P.O. Box 5920
Whitehorse
Yukon Y1A 6S7
Ph: (867) 393-5300
Fax: (867) 393-5322

August 27, 2018

File: 2515.03.01

Janine Kostelnik, Environmental Protection Analyst
Department of Environment, Standards & Approvals Section
Yukon Government
Box 2703
Whitehorse, Yukon Y1A 2C6

(Via email)

Dear Ms. Kostelnik,

RE: AIR EMISSIONS PERMIT NO. 60-010 – APPLICATION FOR PERMIT AMENDMENT TO AUTHORORIZE OPERATION OF EMERGENCY DIESEL GENERATORS AND ADDITION OF THE THIRD NATURAL GAS GENERATOR - WHITEHORSE RAPIDS GENERATING STATION

Please find an application and supporting documentation regarding the above referenced permit amendment request.

Please contact me by telephone at 867.393.5350 or by email: travis.ritchie@yec.yk.ca if you have any questions, comments, or concerns with this submission.

Thank you for your time and consideration in this matter.

Yours Sincerely,

Travis Ritchie, P.Biol.

Manager – Environment, Assessment, & Licensing

Attachment:
Air Emissions Permit Application and Supporting Attachments A-E

Yukon Environment

APPLICATION FOR RENEWAL, AMENDMENT OR CANCELLATION OF *ENVIRONMENT ACT* PERMITS

Please complete the following and ensure that all information is legibly printed or typed:

Permittee: Yukon Energy Corporation
(Business or individual name)

Permit type: Air Emissions Permit
(e.g. pesticide, special waste, air emissions, solid waste, land treatment facility, relocation, ODS/OH)

Permit number: 60-010
(e.g. 4201-XX-XXX)

Please check (✓) appropriate box:

Renewal

☐ I have fully reviewed my permit and the information on my current permit is correct and complete and my business is operating as described therein.

Amendment

☑ I have fully reviewed my permit and the following changes or additions have occurred and should be taken into account when renewing my permit (attach additional information if necessary):

Ownership: Yukon Energy Corporation (no change)
Mailing Address: Box 5920
Whitehorse Yukon Y1A 6S7
Site Location(s): Whitehorse Rapids Generating Station (No. 2 Miles Canyon Road, Whitehorse)

Telephone #: 867.393.5350 Fax #:
Email: travis.ritchie@yec.yk.ca
Products/Activities: Temp. use of up to 12MW mobile diesel generators and addition of 3rd Nat. Gas Genset
Transport special wastes: yes: ☐ no: ☑
Other: See attached supporting documents.
Note: additional information may be required depending on the nature of the change.

Cancellation

☐ I am no longer undertaking the activities authorized by the above permit. I understand that I will be contacted by enforcement officials to confirm that a permit is no longer required, at the following coordinates:

Mailing Address:
Site Location(s):
Telephone #: Fax #:
Email:
Permitted Activities:

I, Travis Ritchie *[print name clearly]*, certify that I am an authorized representative of Yukon Energy Corporation *[business name]*, and hereby make application for the renewal, amendment or cancellation of the above-noted permit, as indicated, and certify that the information provided on this form is correct.

Signature of applicant	August 27, 2018 Date	6 (Attachements A-F) # of attachments

This information is being collected under the authority of s.90 of the *Environment Act*. For further information contact the Environmental Programs Branch at (867) 667-5683.

Print Form Clear Form

AIR EMISSIONS PERMIT (NO. 60-010)
AMENDMENT APPLICATION
SUPPORTING DOCUMENT

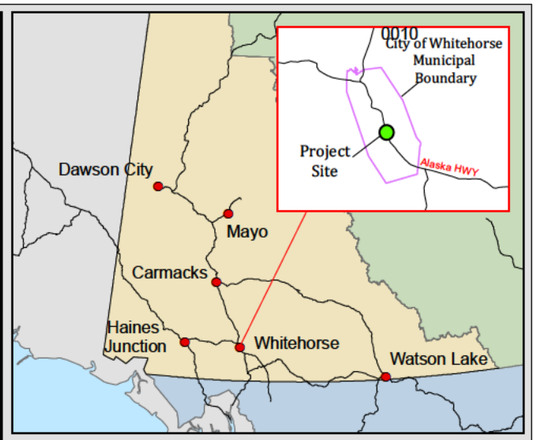
ATTACHMENT A

FIGURE 1

INSTALLATION SITE LAYOUT

August 27, 2018

YUKON ENERGY



Legend

- 2MW Portable Generators
- 4 Unit SS Breakers
- 50kVa Station Service
- Fuek Tank
- Switching Structure
- Transformer
- Project Site Boundary
- Project Footprint

Data Source -Main Map:
City of Whitehorse 2006 digital image
Coordinate System: NAD83 UTM Zone 8

Data Source -Overview Map:
NTDB 2009, 1:1,000,000 Place Names
Canadian Administrative boundaries, Geobase 2013
Coordinate System: Yukon Albers

*For illustrative purposes only. All data are limited by the date the map was printed. All spatial data subject to change.

N W E S

Metres
0 25 50 75 100 125 150

1:2,500

YUKON ENERGY

Air Emissions Permit Amendment - Whitehorse

Site Overview

Drawn by: M. Power (EDI)
Reviewed by: Yukon Energy
Date Produced: 8/27/2018

Figure 1

Document Path: S:\Data\Project_Data\2018_Projects\18Y0079_YEC_Misc\GIS_TravisRitchie\Fig1_ProjectStudyAreaMP_20180827.mxd

AIR EMISSIONS PERMIT (NO. 60-010)
AMENDMENT APPLICATION
SUPPORTING DOCUMENT

ATTACHMENT B

EPA APPROVED TIER 2
3516C CATERPILLAR ENGINE
GENERATOR SPECIFICATIONS

August 27, 2018

YUKON
ENERGY

Image shown may not reflect actual package

STANDBY 2000 kW
PRIME 1825 kW
POWER MODULE
50/60 Hz

Frequency	Voltage	Standby kW (kVA)	Prime kW (kVA)
60	480/277V	2000 (2500)	1825 (2281)
50	400V	1440 (1800)	1310 (1638)

FEATURES

EPA TIER 2 and CARB certified for non-road mobile applications. Factory designed, certified prototype tested with torsional analysis. Production tested and delivered in a package that is ready to be connected to your fuel and power lines. Supported 100% by your Caterpillar® dealer with warranty on parts and labor. Extended warranty available in some areas. The generator set is designed and manufactured in an ISO 9001:2000 compliant facility. Generator set and components meet or exceed the following specifications: AS1359, AS2789, ABGSM TM3, BS4999, DIN6271, DIN6280, EGSA101P, JEM1359, IEC 34/1, ISO3046/1, ISO8528, NEMA MG1-22

CATERPILLAR SR4B GENERATOR

Single bearing, wye-connected, static regulated, brushless permanent magnet excited generator designed to match the performance and output characteristics of the Caterpillar diesel engine driving it.

RELIABLE, FUEL EFFICIENT DIESEL ENGINE

The compact, four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy. The fuel system operates on a variety of fuels.

CATERPILLAR COOLING SYSTEM

Sized compatible to rating with energy efficient fan and core.

CATERPILLAR SWITCHGEAR

Provides single unit and/or multi-unit/utility paralleling components. Standby, load sense/load demand, import, export, and base load modes. Comes standard with Basler Utility Multi-function Relay IPS-100.

EXCLUSIVE CATERPILLAR DIGITAL VOLTAGE REGULATOR (CDVR)

Three-phase sensing and adjustable Volts-per-Hertz regulation give precise control, excellent block loading, and constant voltage in the normal operating range.

ENVIRONMENTALLY FRIENDLY

110% spill containment of onboard engine fluids.

SOUND ATTENUATED CONTAINER

For ease of transportation and protection. Meets 75 dB(A) at 50 ft or below per SAE J1074 measurement procedure at 110% prime load.

FACTORY INSTALLED STANDARD EQUIPMENT

SYSTEM	STANDARD EQUIPMENT
Engine	EPA approved Tier 2 3516C Caterpillar engine Heavy duty air cleaner with service indicator 60-Amp charging alternator Fuel filters – primary and duplex secondary with integral water separator and change-over valve Lubricating oil system with spin-on, full flow oil filters and water cooled oil cooler Oil drain lines routed to engine rail Jacket water heater Fuel cooler and priming pump Electronic ADEM™ A3 controls 24V electric starting motors with battery rack and cables
Generator	SR-4B brushless, permanent magnet excited, three-phase with Caterpillar digital voltage regulator (CDVR), space heater, 6-lead design, Class H insulation operating at Class F temperature for extended life, winding temperature detectors and anti-condensation space heaters (120/240V 1.2 kW)
Containerized Module	40' ISO high cube container, CSC certified 3-axle, 40' ISO container chassis Seven (7) sound attenuated air intake louvers and 4 lockable personnel doors with panic release Side bus bar access door, external access load connection bus bars Shore power connection via distribution block connections for jacket water heater, battery charger, space heaters, and generator condensate heaters Standard lighting 3 AC/4 DC, one (1) single duplex service receptacle, 2 external break-glass emergency stop push buttons 1,250 gal fuel tank, UL listed, double wall, 9 hr runtime @ prime rating Sound attenuated 75 dB(A) @ 50 ft Spill containment 110% of all engine fluids Four (4) oversized maintenance-free batteries, battery rack and 20-Amp battery charger Hospital grade, internally insulated, rectangular exhaust silencer with vertical discharge Vibration isolators, corrosion resistant hardware and hinges External drain access to standard fluids Fire extinguishers (Qty 2) Standard Cat rental decals and painted standard Cat power module white Interior walls and ceilings insulated with 100 mm of acoustic paneling Floor of container insulated with acoustic glass and covered with galvanized steel
Cooling	Standard cooling provides 43° C ambient capability (60 Hz) at prime +10% rating Vertically mounted, separate ATAAC and JW cores with vertical air discharge
Generator Paralleling Control	Custom switchgear control with EMCP 3.3 genset mounted controller and wall mounted paralleling controls Automatic start/stop with cool down timer Protections: 25, 27/59, 40, 32, 81 O/U Utility multi-function relay protections: 25,27/59, 32, 47, 50/51, 62, 67, 81 O/U UMR is IEEE1547-2003 compliant in most applications Reverse compatibility module provided for interface to legacy power modules Touch screen controls with event log Multi-mode operation (island, multi-island and utility parallel), load sharing (multi-unit only) Import & export control (utility parallel only), manual and automatic paralleling capability Touch screen display (status and alarms) Metering display: voltage, current, frequency, power factor, kW, WHM, kVAR, and synchroscope
Quality	Standard genset and package factory tested UL, NEMA, ISO and IEEE standards O&M manuals

SPECIFICATIONS

CAT SR4B GENERATOR

Frame Size 825
Pitch 0.6667
No. of poles 4
Excitation ..... Static regulated brushless PM excited
Constructions ..... Single bearing, close coupled
Insulation ..... Class H
Enclosure ..... Drip proof IP22
Alignment ..... Pilot shaft
Overspeed capability – % of rated ..... 125% of rated
Voltage regulator ..... 3 phase sensing with Volts-per-Hertz
Voltage regulation ..... Less than ± ½% voltage gain
Adjustable to compensate for engine speed droop and line loss
Wave form deviation ..... Less than 5% deviation
Telephone Influence Factor (TIF) ..... Less than 50
Harmonic Distortion (THD) ..... Less than 5%

CAT 3516C DIESEL ENGINE

3516C, 4-Stroke diesel
Bore – mm (in) 170 (6.7)
Stroke – mm (in) 190 (7.5)
Displacement – L (cu in) 69 (4,210)
Compression ratio 15:1
Aspiration ..... ATAAC
Fuel system ..... EUI
Governor type ..... Caterpillar ADEM™ A3 Control System

TECHNICAL DATA

Materials and specifications are subject to change without notice.

Generator Set Technical Data		50 Hz		60 Hz	
	Units	Prime	Standby	Prime	Standby
Performance Specification		DM8754		DM8264	
Power Rating	kW (kVA)	1310 (1637)	1440 (1800)	1825 (2281)	2000 (2500)
Lubricating System					
Oil pan capacity	L (gal)	401.3 (106)		401.3 (106)	
Fuel System					
Fuel Consumption					
100% load	L (gal)	350.1 (92.5)	372.9 (98.5)	483.2 (127.6)	525.7 (138.9)
75% load	L (gal)	281.9 (74.5)	302.8 (80)	380 (100.4)	408.2 (107.8)
50% load	L (gal)	205.5 (54.3)	350.1 (92.4)	270.5 (71.5)	294.2 (77.7)
Fuel tank capacity	L (gal)	4731 (1,250)		4731 (1,250)	
Running time @ 75% rating	Hours	16.7	15.6	12.5	11.5
Cooling System					
Radiator coolant capacity including engine	L (gal)	630 (166)		630 (166)	
Air Requirements					
Combustion air flow	m³/min (cfm)	114.8 (4052)	118.1 (4173)	174.7 (6169)	180.3 (6367)
Maximum air cleaner restriction	kPa (in H_2O)	6.2 (24.9)		6.2 (24.9)	
Generator cooling air	m³/min (cfm)	140 (5,933)		168 (4,995)	
Exhaust System					
Exhaust flow at rated kW	m³/min (cfm)	311.3 (10,993)	320.8 (11,335)	404 (14,260)	428.6 (15,137)
Exhaust stack temperature at rated kW – dry exhaust	°C (°F)	502.1 (935.8)	513.1 (955.6)	387 (728)	405 (762)
Noise Rating (with enclosure)					
@ 7 meters (23 feet)	dB(A)	77	78	78	79
@15 meters (50 feet)	dB(A)	73	74	74	75

Model	Length mm (in)	Width mm (in)	Height mm (in)	Weight	
				With Lube Oil and Coolant kg (lb)	With Fuel, Lube Oil and Coolant kg (lb)
XQ2000 w/o Chassis	12 192 (480)	2438 (96)	2896 (114)	34 019 (75,000)	38 102 (84,000)
XQ2000 w/Chassis	12 192 (480)	2438 (96)	4267 (168)	38 102 (84,000)	42 184 (93,000)

RATING DEFINITIONS

Standby – Applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The generator on the generator set is peak prime rated (as defined in ISO8528-3) at 30° C (86° F).

Prime – Applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and the generator set can supply 10% overload power for 1 hour in 12 hours.

STANDARD FEATURES

GENERATOR SET EMCP 3.3 LOCAL CONTROL PANEL

- Generator mounted EMCP 3.3 provides power metering, protective relaying and engine and generator control and monitoring.
- Provides MODBUS datalink to paralleling control for monitoring of engine parameters.
- Convenient service access for Caterpillar service tools (not included).
- Integration with the CDVR provides enhanced system monitoring.
- Ability to view and reset diagnostics of all controls networked on J1939 datalink.
- Network modules via the control panel removes the need for a separate service tool for troubleshooting.
- Real-time clock allows for date and time stamping of diagnostics and events.

EMCP 3.3 ENGINE OPERATOR INTERFACE

- Graphical display with positive image, transflective LCD, adjustable white backlight/ contrast.
- Two LED status indicators (1 red, 1 amber).
- Three engine control keys and status indicators (Run/Auto/Stop).
- Lamp test key.
- Alarm acknowledgement key.
- Display navigation keys.
- Two shortcut keys: Engine Operating Parameters and Generator Operating Parameters.
- Fuel level monitoring and control.

CIRCUIT BREAKER

- 3000A fixed type, 3 poles, genset mounted, electrically operated, insulated case circuit breaker.
- Solid state trip unit for overload (time overcurrent) and fault (instantaneous) overcurrent protection.
- Includes DC shunt trip coil activated on any monitored engine or electrical fault, 100 KA-interrupting capacity at 480 VAC.

VOLTAGE REGULATION AND POWER FACTOR CONTROL CIRCUITRY

- Generator mounted automatic voltage regulator, microprocessor based.
- Manual raise/lower voltage adjust capability and VAR/power factor control circuitry for maintaining constant generator power factor while paralleled with the utility.
- Includes RFI suppression, exciter limiter and exciter diode monitoring.
- Voltage and power factor adjustments are performed on the setting screen of the HMI touch screen.

FUEL TANK

- UL Listed 1250 gallon double walled.
- Fuel transfer system

CURRENT TRANSFORMERS

- CT's rated 3000:5 with secondaries wired to shorting terminal strips.

POTENTIAL TRANSFORMERS

- 4:1 ratio with primary and secondary fuse protection.

BUS BARS

- Three phase, plus full rated neutral, bus bars are tin-plated copper with NEMA standard hole pattern for connection of customer load cables and generator cables.
- Bus bars are sized for full load capacity of the generator set at 0.8 power factor.
- Includes ground bus, tin-plated copper, for connection to the generator frame ground and field ground cable.

AC DISTRIBUTION

- Provides 240 VAC for all module accessories.
- Includes controls to de-energize jacket water heaters and generator space heater when the engine is running.

SHORE POWER TWO (2)

- One (1) shore power connection distribution block for jacket water heaters.
- One (1) for generator space, battery charger, and fuel pump.

INTERNAL LIGHTING

- Four (4) internal DC lights with one (1) timer and two switches installed at each side of the container door.
- Three (3) internal AC lights.
- One (1) single duplex service receptacle.

BATTERY CHARGER AND BATTERIES

- 24 VDC/20A battery charger with float/equalize modes and charging ammeter.
- Maintenance free batteries.

EMERGENCY STOP PUSHBUTTON

- Two external ESPs located near each access door.

MODES OF OPERATION

Caterpillar utility paralleling controls are intended for automatic or manual paralleling with a utility power source as a load management system, with provisions for standby operation feeding an isolated load network. Load management operation involves microprocessor-based automatic loading controls with soft loading, base load, Import/Export control and soft unloading. For Standby operation, the generator operates as an isochronous machine isolated from the utility supply. The controls allow for automatic operation, initiated locally or remotely by the customer's SCADA system. Detailed modes of operation are listed below:

SINGLE UNIT ISLAND AND MULTI-UNIT ISLAND OPERATION

1. Utility Standby Mode (Normal)
   a. The utility is providing power for the plant loads.
   b. The Power Module Generator breaker is open.
   c. The pm is in automatic standby mode to respond to a utility failure.
2. Emergency Mode (Emergency)
   a. Utility Failure
      1) The customer protective relaying senses a utility abnormal condition.
      2) A run request is sent to the Power Module Generator plant.
      3) The first Power Module Generator reach rated to voltage and frequency is closed to the bus.
      4) In Multi-Unit Island Mode, the remaining Power Module Generators are paralleled to the bus as they reach rated voltage and frequency. This function is performed via the ModBus Plus data link connected between the Power Modules.
      5) Plant load is transferred to the Power Modules, which share load equally via ModBus Plus data link.
      6) The system is now in Emergency Mode.

GENERATOR DEMAND PRIORITY CONTROL

The System Controls include a Generator Demand Priority Control function to automatically match the on-line Power Module Generator capacity to the loads in order to avoid unnecessary operation of all the Power Module Generators when the plant loads are low.

The following controls are provided for each Power Module Generator:

a. User-settable Generator Priority Selector
b. Status indicator for the Generator Priority selected
c. Status indicator for Power Module Generator on-line or off-line
d. Generator Demand Priority Control Switch (On/Off)
e. User-settable Generator Remove Level (% as a function of single generator capacity)
f. User-settable Generator Remove Time Delay
g. User-settable Generator Add Level (% as a function of single generator capacity)
h. User-settable Generator Add Time Delay

Upon entrance into Emergency Mode, all generators will be started and paralleled to the bus. After the Remove Time Delay, Power Module Generators will be removed from the bus as a function of the generator percentage loading. Generators will be removed from the bus in descending priority order.

Should the generator percentage loading increase to the user-selected Generator Add Level after the user-selected Generator Add Time Delay, the next priority generator will be started, synchronized and paralleled to the bus. Should the Power Module Generator plant ever reach 100% loading, the next priority generator will be started and added to the bus, bypassing the Generator Add Time Delay.

MODES OF OPERATION (continued)

SINGLE UNIT IMPORT, EXPORT OR BASE LOAD OPERATION

During periods of peak demand the system may be placed in operation using the operator interface panel on the front of the switchgear.

1. Entry – Local
   a. The operator places the System Control Switch into Load Management.
   b. The operator selects Import, Export or Base Load Operation.
   c. The Load Management Setpoint is the amount of power Imported, Exported or Base-Loaded. A 4-12-20mA signal is provided by the customer and is linearly proportional to the utility load, with 12mA equaling 0 kW. The 4-12-20mA utility load signal is wired to one and only one Power Module. If the Power Module selected for Load Management is not available, the 4-12-20mA signal will be routed to a different Power Module.
   d. The operator sets the Load Management Setpoint and Power Factor Setpoint.
   e. A Run request signal is received by the Single Unit Power Module.
   f. The Power Module Generator is started and will run for a predetermined warm-up time before it is synchronized and paralleled to the utility.
   g. When the generator is on the bus, it is soft-ramp-loaded until the generator output reaches the Load Management Setpoint.
   h. The generator output is dynamically adjusted to maintain the Load Management Setpoint.
   i. Should the utility fail during Load Management Operation, the Protective Relay will cause the Paralleling Circuit Breaker 52G to open and be locked out until the Lockout Relay is manually reset by an operator on site. The generator is allowed to run for the duration of the cooldown time.
2. Exit – Local
   a. The Run Request signal is removed from the power module.
   b. The generator is soft-ramp-unloaded until the plant load is fully supported by the utility.
   c. The Paralleling Circuit Breaker 52G is opened.
   d. The generator is allowed to run for the duration of the cooldown time.

STANDARD PARALLELING CONTROL

GENERATOR PARALLELING CONTROLS

The switchgear includes:

- Single unit island mode.
- Multiple unit island mode.
  - Includes Load Sense/Load Demand control.
  - Load sharing capability is provided via network communication.
- Single unit utility parallel mode.
  Selectable for Import/Export control.
  If import or export control is selected a 4-12-20mA signal is required (provided by others) scalable to the utility contribution.
- 6 inch black and white HMI touch screen.
- Reverse compatibility module provided for interface to legacy designed Power Module Switchgear. Includes PLC, load share and voltage droop.

Incoming Utility Breaker Status Circuit – Circuit to accept customers contact from remote utility disconnect device. Customer to provide a normally open form 'a' contact to indicate when the local load network is connected to the utility grid.

Utility Transfer Trip Circuit – Circuit accepts input (normally open dry contact) from customer's system protective relay(s) or other controlling device. Operation of contacts causes tripping of the generator circuit breaker via the generator (software) 86 lock-out function and places the engine in cooldown mode. Circuit is disabled when operating in single unit or multiple unit island.

GENERATOR PARALLELING CONTROLS OPERATOR INTERFACE

Graphical mimic one line diagram that shows generator with its respective circuit breaker in a one-line representation of the system. The graphics utilize black and white indicators and bar graphs while actively displaying the following information:

- Utility CB Open/Closed. Input contacts provided by others.
- Utility kW 4-12-20mA signal required and provided by customer that is scalable to the utility contribution.
- Generator CB Open/Closed/Tripped.
- Generator Volts/Amps/kW/Frequency.
- Engine Stopped/Running/Cooldown/Pre-Alarm/Shutdown.
- Engine ECS Position Stop/Auto/Run.
- Utility Output kW.
- System Summary Alarm.

Event logging is also included with up to 500 stored events.

GENERATOR METERING AND PROTECTION

Generator metering that will graphically display 3Ø Voltage, 3Ø Current, Frequency, Power Factor, kW, kVAR and a Synchroscope Display of EMCP 3.3 faults, CDVR or ADEM 3 will be provided via Modbus RTU interface to EMCP 3.3.

Generator/Intertie Protective Relaying including:

- Device 27/59 – Under/Over Voltage.
- Device 81O/U – Under/Over Frequency.
- Device 40 – Loss of Excitation.
- Device 32 – Reverse Power.
- Device 25 – Synchronizing Check.
- Device 15 – Auto Synchronizer.
- Device 65 – Governor Load Sharing, Soft Loading Control.
- Device 90 – VAR/PF and Cross Current Compensation Controller.

PROGRAMMING AND DIAGNOSTICS

Includes field programmable set points for engine control and monitoring variables and self-diagnosis of the EMCP 3.3 system component and wiring failures.

ENGINE CONTROL SWITCH

Keypad selectable, four (4) positions – Off, Auto, Man, Cool:

- Off for engine shutdown and resetting faults.
- Auto for local or remote automatic operation when initiated by switch operation or contact closure.
- Man for local starting and manual paralleling.
- Cool for normal engine shutdown with timed cool-down cycle.

CIRCUIT BREAKER CONTROL SWITCH

Heavy duty, three- (3) position spring return to center with momentary trip and close position and slip contacts for automatic closing. Includes circuit breaker position indicating lamps.

EMERGENCY STOP PUSHBUTTON

- Mushroom head, twist to reset, causes engine shutdown and tripping of the generator circuit breaker. Prevents engine starting when depressed.

STANDARD PARALLELING CONTROL (continued)

ELECTRONIC LOAD SHARING GOVERNOR

- Includes speed adjustment, and auto load share capability when in parallel with legacy power modules.

ALARM MODULE

- Dedicates annunciator screens for warning and shutdown faults. Includes external mounted horn and acknowledge push-button.

AUTOMATIC/MANUAL PARALLELING

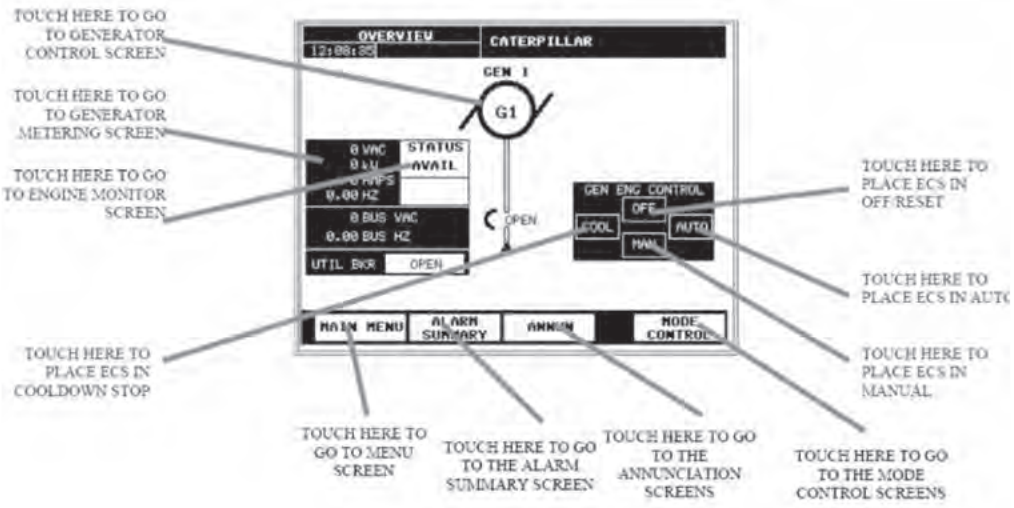
- Automatically synchronizes and parallels the generator with another power source.
- Includes provisions for manual permissive paralleling.

HUMAN MACHINE INTERFACE (HMI) HIGHLIGHTS

- Engine/Generator function is performed thru the 6" HMI touch screen interface.

Overview Screen (Typical)

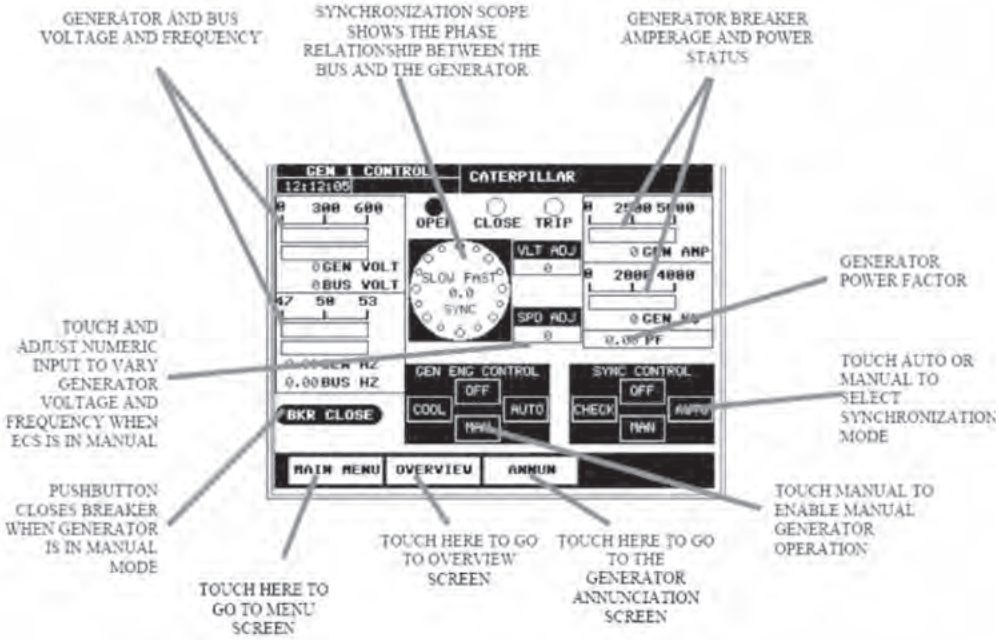
Shows the generator status, generator metering data, bus metering data, ECS position, and generator/utility breaker status.



STANDARD PARALLELING CONTROL (continued)

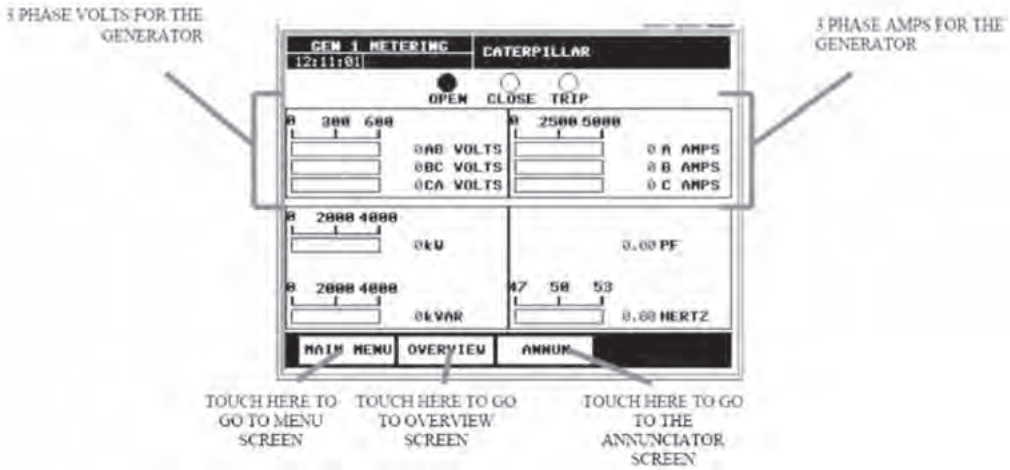
Generator Control Screen (Typical)

It allows the operator to observe the automatic synchronization and transfer of the load to and from the generator. Engine control allows the operator to run the engine in manual, or switch to automatic modes. Voltage and frequency offset adjustment allows the operator to control generator frequency and voltage.



Generator Metering Screen (Typical)

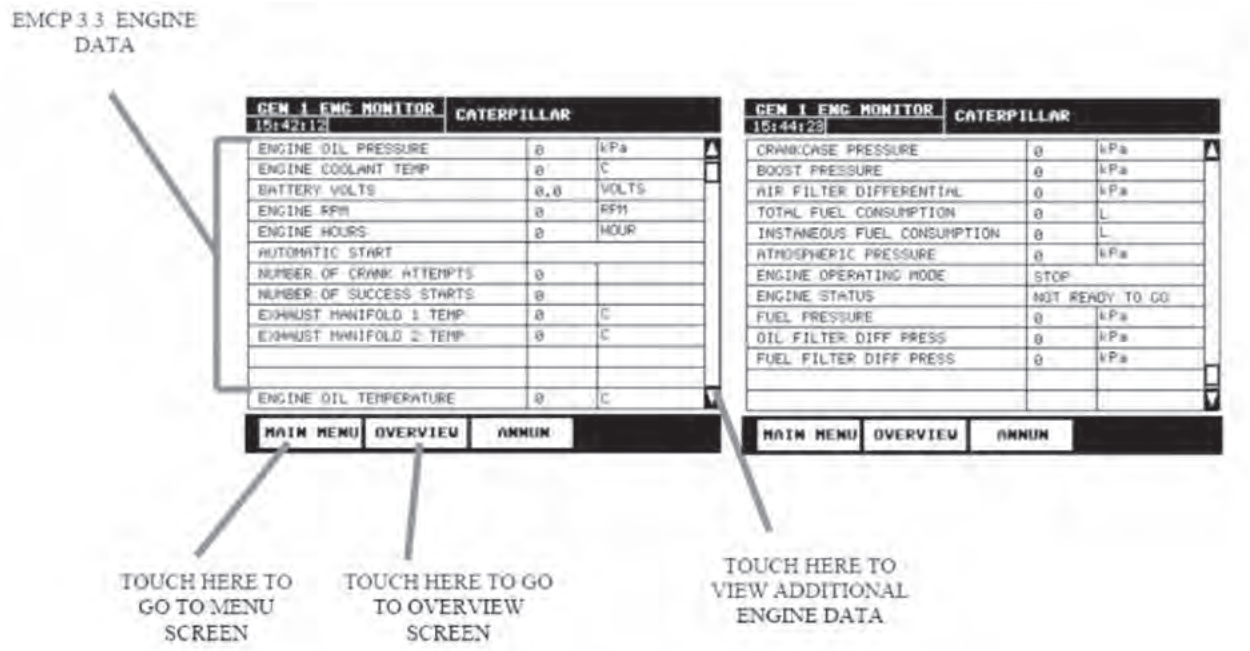
Allows the operator to view three phases of voltage and amperage for the bus and the generator.



STANDARD PARALLELING CONTROL (continued)

Engine Monitoring Screen (Typical)

Engine status is obtained directly from the EMCP 3. Engine starts and total hours can be used by the operator to determine when regular preventive maintenance is required. Other metering includes engine battery and oil filter health.



AIR EMISSIONS PERMIT (NO. 60-010)
AMENDMENT APPLICATION
SUPPORTING DOCUMENT

ATTACHMENT C

TECHNICAL SPECIFICATION

GE JENBACHER JMC 624 GS-NL

NATURAL GAS GENERATOR

August 27, 2018

YUKON ENERGY

28/2017

Technical Description

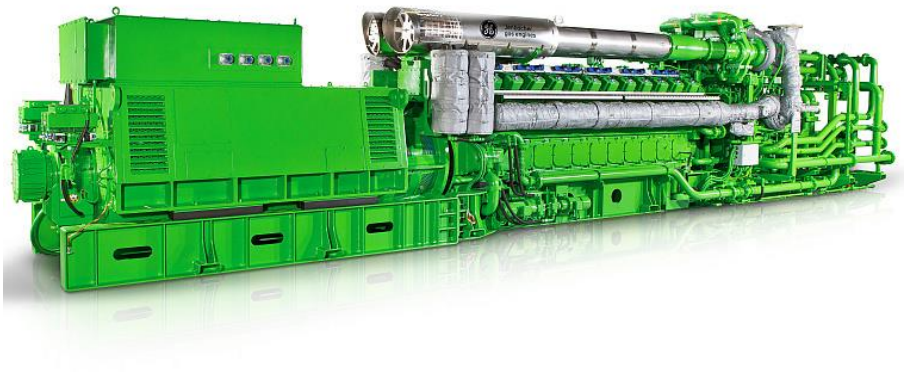
Cogeneration Unit-Container

JMC 624 GS-N.L

Yukon Energy

JMC 624 H01, 4160V

The ratings in the specification are valid for full load operation at a site installation of 670 m and an air intake temperature of T1 < 29 C.. At T1 > 29 C, an output derating of 1.25%/C will occur.



Electrical output	4376 kWe
Thermal output	2397 kW

Emission **values**

NOx < 500 mg/Nm³ (5% O2)

0.01 Technical Data (container)

			100%	75%	50%
Energy input	[2]	kW	9,442	7,229	5,016
Gas volume	*)	Nm³/h	994	761	528
Mechanical output	[1]	kW	4,491	3,368	2,246
Electrical output	[4]	kW el.	4,376	3,268	2,158
Recoverable thermal output					
~ Intercooler 1st stage	[9]	kW	1,292	806	370
~ Lube oil (with gearbox)		kW	445	413	363
~ Jacket water		kW	660	569	468
~ Exhaust gas cooled to 344 °C		kW	~	~	~
Total recoverable thermal output	[5]	kW	2,397	1,788	1,201
Total output generated		kW total	6,773	5,056	3,359
Heat to be dissipated					
~ Intercooler 2nd stage		kW	321	218	142
~ Lube oil (with gearbox)		kW	~	~	~
~ Surface heat	ca. [7]	kW	235	~	~
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2.16	2.21	2.33
Spec. fuel consumption of engine	[2]	kWh/kWh	2.10	2.15	2.23
Lube oil consumption	ca. [3]	kg/h	0.90	~	~
Electrical efficiency			46.3%	45.2%	43.0%
Thermal efficiency			25.4%	24.7%	23.9%
Total efficiency	[6]		71.7%	69.9%	67.0%
Hot water circuit:					
Forward temperature		°C	92.0	86.4	81.0
Return temperature		°C	70.0	70.0	70.0
Hot water flow rate		m³/h	109.5	109.5	109.5
Fuel gas LHV		kWh/Nm³	9.5		

*) 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; ...). In the specifications in addition to the general tolerance of ±8 % on the thermal output a further reserve of +5 % is recommended for the dimensioning of the cooling requirements.

Main dimensions and weights (container)(with gearbox)

Length	mm	17,000
Width	mm	2 x 3000
Height	mm	8,400

Engine - Container (with gearbox)

Weight filled	kg	110,000

Infra - Container

Weight filled	kg	18,000

Ventilation - Container

Weight filled	kg	15,000

Connections

Hot water inlet and outlet [A/B]	DN/PN	100/10
Exhaust gas outlet [C]	DN/PN	600/10
Fuel gas connection (container) [D]	mm	100/16
Fresh oil connection	G	28x2"
Waste oil connection	G	28x2"
Cable outlet	mm	800x400
Condensate drain	mm	18

Output / fuel consumption

ISO standard fuel stop power ICFN	kW	4,491
Mean effe. press. at stand. power and nom. speed	bar	24.00
Fuel gas type		Natural gas
Based on methane number | Min. methane number	MZ d)	94 | 83
Compression ratio	Epsilon	12.5
Min. fuel gas pressure for the pre chamber	bar	5.43
Min./Max. fuel gas pressure at inlet to gas train	bar	6 - 8 c)
Allowed Fluctuation of fuel gas pressure	%	± 10
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	48
Spec. fuel consumption of engine	kWh/kWh	2.10
Specific lube oil consumption	g/kWh	0.20
Max. Oil temperature	°C	80
Jacket-water temperature max.	°C	95
Filling capacity lube oil (refill)	lit	~ 1000

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

0.02 Technical data of engine

Manufacturer		GE Jenbacher
Engine type		J 624 GS-H01
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		24
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	149.70
Nominal speed	rpm	1,500
Mean piston speed	m/s	11.00
Length	mm	9,533
Width	mm	2,111
Height	mm	2,564
Weight dry	kg	17,100
Weight filled	kg	18,100
Moment of inertia	kgm²	92.70
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

Thermal energy balance

Energy input	kW	9,442
Intercooler	kW	1,613
Lube oil (with gearbox)	kW	445
Jacket water	kW	660
Exhaust gas cooled to 180 °C	kW	1,174
Exhaust gas cooled to 100 °C	kW	1,731
Surface heat	kW	118

Exhaust gas data

Exhaust gas temperature at (100% / 75% / 50%) load	[8]	°C	344 / 383 / 431
Exhaust gas mass flow rate, wet		kg/h	23,334 / 17,206 / 11,399
Exhaust gas mass flow rate, dry		kg/h	21,864 / 16,080 / 10,619
Exhaust gas volume, wet		Nm³/h	18,464 / 13,626 / 9,038
Exhaust gas volume, dry		Nm³/h	16,635 / 12,226 / 8,066
Max.admissible exhaust back pressure after y-pipe		mbar	50

Combustion air data

Combustion air mass flow rate	kg/h	22,679 / 16,705 / 11,052
Combustion air volume	Nm³/h	17,550 / 12,926 / 8,552
Max. admissible pressure drop at air-intake filter	mbar	10

Sound pressure level

Aggregate a)		dB(A) re 20µPa	103
31,5	Hz	dB	90
63	Hz	dB	97
125	Hz	dB	103
250	Hz	dB	101
500	Hz	dB	96
1000	Hz	dB	95
2000	Hz	dB	94
4000	Hz	dB	96
8000	Hz	dB	97
Exhaust gas b)		dB(A) re 20µPa	123
31,5	Hz	dB	109
63	Hz	dB	111
125	Hz	dB	121
250	Hz	dB	116
500	Hz	dB	117
1000	Hz	dB	113
2000	Hz	dB	113
4000	Hz	dB	120
8000	Hz	dB	103

Sound power level

Aggregate	dB(A) re 1pW	126
Measurement surface	m²	194
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, precision class 3.
b) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.
The spectra are valid for aggregates up to bmep=24 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	kg	3,100

0.03 Technical data of generator

Manufacturer		AVK e)
Type		DIG 142 g/4 e)
Type rating	kVA	5,850
Driving power	kW	4,473
Ratings at p.f. = 1,0	kW	4,376
Ratings at p.f. = 0.8	kW	4,356
Rated output at p.f. = 0.8	kVA	5,445
Rated reactive power at p.f. = 0.8	kVar	3,267
Rated current at p.f. = 0.8	A	756
Frequency	Hz	60
Voltage	kV	4.16
Speed	rpm	1,800
Permissible overspeed	rpm	2,250
Power factor (lagging - leading)		0,8 - 1,0
Efficiency at p.f. = 1,0		97.8%
Efficiency at p.f. = 0.8		97.4%
Moment of inertia	kgm^2	208.00
Mass	kg	11,950
Radio interference level to EN 55011 Class A (EN 61000-6-4)		N
Ik" Initial symmetrical short-circuit current	kA	6.23
Is Peak current	kA	15.85
Insulation class		F
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40

Reactance and time constants (saturated)

xd direct axis synchronous reactance	p.u.	1.85
xd' direct axis transient reactance	p.u.	0.17
xd" direct axis sub transient reactance	p.u.	0.12
x2 negative sequence reactance	p.u.	0.12
Td" sub transient reactance time constant	ms	20
Ta Time constant direct-current	ms	120
Tdo' open circuit field time constant	s	4.00

e) GE 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.

0.04 Technical data of heat recovery

General data - Hot water circuit

Total recoverable thermal output	kW	2,397
Return temperature	°C	70.0
Forward temperature	°C	92.0
Hot water flow rate	m³/h	109.5
Nominal pressure of hot water	PN	10
min. operating pressure	bar	3.5
max. operating pressure	bar	9.0
Pressure drop hot water circuit	bar	1.70
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

General data - Cooling water circuit

Heat to be dissipated	kW	321
Return temperature	°C	48
Cooling water flow rate	m³/h	50
Nominal pressure of cooling water	PN	10
min. operating pressure	bar	0.5
max. operating pressure	bar	5.0
Loss of nominal pressure of cooling water	bar	~
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

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

connection variant H2-i

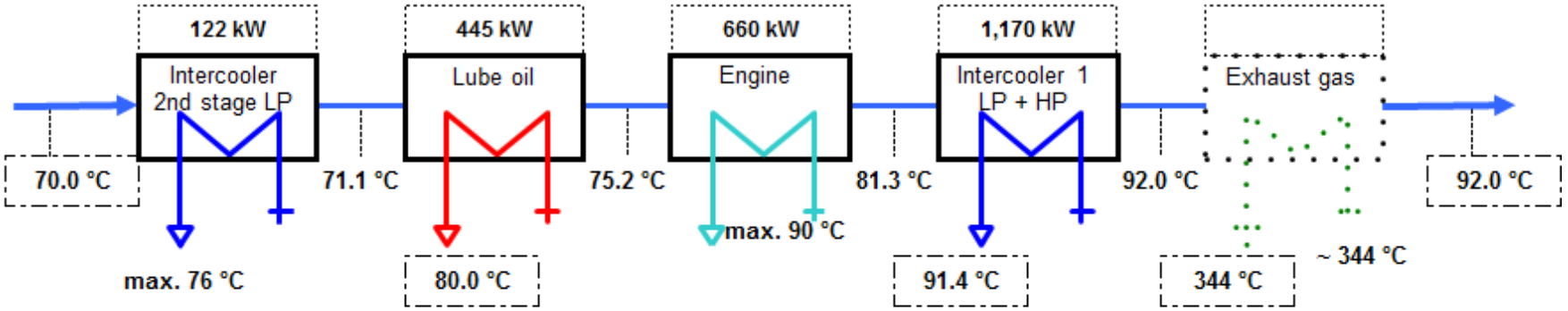
Hot water circuit (calculated with Glykol 50%)

Yukon Energy **J 624 GS-H01**

Recoverable thermal output = 2,397 kW

(±8 % tolerance +5 % reserve for cooling requirements)

Hot water flow rate = 109.5 m³/h

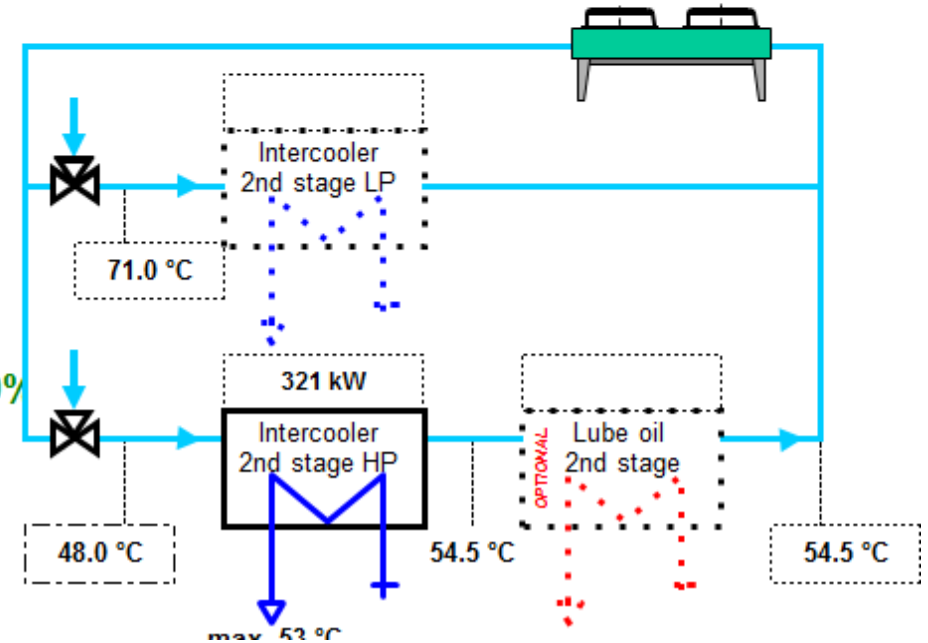


Low temperature circuit (calculated with Glykol 50%

Heat to be dissipated = 321 kW

(±8 % tolerance +5 % reserve for cooling requirements)

Cooling water flow rate = 50.0 m³/h



0.10 Technical parameters

The following “Technical Instruction (TI) of GE JENBACHER” form an integral part of the contract and must be strictly observed:

TI 1100-0110 – Boundary Conditions for GE Jenbacher Gas Engines
TI 1100-0111 – General Conditions – Operation and Maintenance
TI 1100-0112 – Installation of GE 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 GE 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 operations, an output reduction may be applicable per 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 (gauge).

(1) At nominal speed and standard reference conditions ICFN per DIN-ISO 3046 and DIN 6271, respectively
(2) As detailed in DIN-ISO 3046 and DIN 6271, respectively, with a tolerance of + 4% per engine and no greater than +3.5% as an average over 5 engines.
Efficiency performance is based on a new unit (immediately upon commissioning). The effects of degradation during normal operation can be mitigated through regular service and maintenance work.
(3) Average value between oil change intervals as per the maintenance schedule, without oil change amount
(4) At p. f. = 1.0 as detailed in VDE 0530 REM / IEC 34.1 with relative tolerances, all direct driven pumps are included
(5) Total output with a tolerance of +/- 8 %
(6) As detailed in above parameters (1) through (5)
(7) Only valid for engine and generator; module and peripheral equipment not considered (at p. f. = 0.8), (guiding value)
(8) Exhaust temperature with a tolerance of +/- 8 %
(9) Intercooler heat on:
*** standard conditions (Vxx)** - If the turbocharger design is done for air intake temperature > 30°C (86°F) w/o de-rating, the intercooler heat of the 1st stage need to be increased by 2%/K starting from 25°C (77°F). Deviations between 25 – 30°C (77 – 86°F) will be covered with the standard tolerance.
*** Hot Country application (Vxxx)** - If the turbocharger design is done for air intake temperature > 40°C (104°F) w/o de-rating, the intercooler heat of the 1st stage need to be increased by 2%/K starting from 35°C (95°F). Deviations between 35 – 40°C (95 – 104°F) will be covered with the standard tolerance.

Definition of output

- ISO-ICFN continuous rated power:
  The 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: 1000 mbar (14.5 psig) or 100m (328ft) above sea level
  Air temperature: 25°C (77°F) or 298 K
  Relative humidity: 30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)
  Pressure: 1013.25 mbar (14.7 psig)
  Temperature: 0°C (32°F) or 273 K

Output adjustment for turbo charged engines

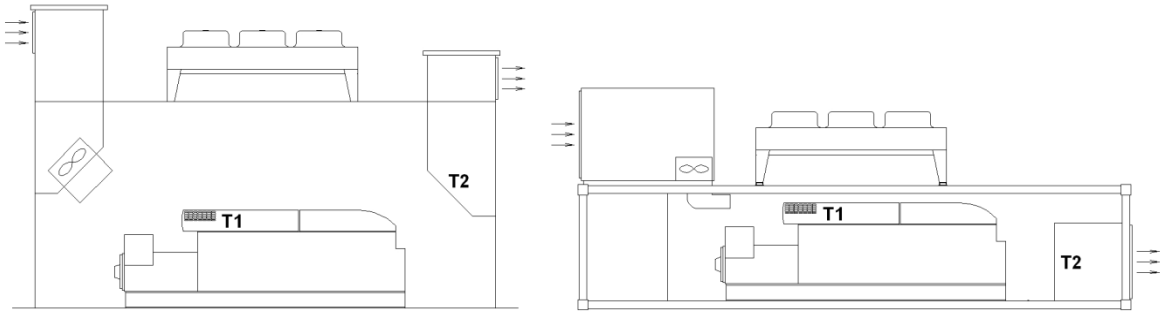
The ratings in this specification are valid for an installation at an altitude 670 m and an air intake temperature T1 < 29C. At T1 > 29C, an output derating of 1.25%/C will occur.

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.

Parameters for the operation of GE Jenbacher gas engines

Maximum room temperature: **50°C (122°F)** (T2) -> engine stop



If the actual methane number is lower than the specified, the knock control responds. First the ignition timing is changed at full rated power. Secondly the rated power is reduced. These functions are carried out by the engine management.

Operation of Voltage and frequency outside of stated limits for the generator as per IEC 60034-1 Zone A will result in a power de-rate up to and including tripping of the equipment.

The generator set fulfills ISO 8528-9 limits for mechanical vibrations.

If possible, railway trucks must not be used for transport (**TI 1000-0046**).

Parameters for the operation of control unit and the electrical equipment

- Relative humidity: 50%
- Maximum temperature: 40°C (104°F).
- **Altitude: < 2000 m (6560ft) above the sea level.**

The gas quantity indicated under technical data refers to standard conditions with the given calorific value. Actual volume flow (under operating conditions) must be considered for dimensioning of any the gas compressor and associated fuel system component. These elements will also be affected by:

- Actual gas temperature (reference **TI 1000-0300** for temperature limits)
- Gas humidity (reference **TI 1000-0300** for temperature limits)
- Gas Pressure (page 5 of this specification)

1.00 Scope of supply - module

Design:
The module is built as a compact package. Engine and generator are connected through a coupling and are mounted to the base frame. To provide the best possible isolation from the transmission of vibrations the engine is mounted to the frame by means of anti-vibrational mounts. The remaining vibrations are eliminated by mounting the module on isolating pads (e.g. Sylomer). This, in principle, allows the module to be placed directly on any floor capable of carrying the static load. No special foundation is required. Prevention of sound conducted through solids has to be provided locally.

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 GE 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, dynamically 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 GE JENBACHER-lean burn engines with optimized fuel consumption and emissions; water cooled, made of special casting, individually replaceable; Valve seats, valve guides and spark plug sleeves individually replaceable; exhaust and inlet valves 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
Motorized carburetor for automatic adjustment according to fuel gas characteristic. Exhaust driven turbocharger, mixture manifold with bellows, water-cooled intercooler, throttle valve and distribution to cylinders.

Ignition system
Most advanced, fully electronic high performance ignition system, external ignition control.
MORIS: 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
1 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
3 Engine mounted electric starter motor

1.01.02 Additional equipment for the engine (spares for commissioning)

The initial set of equipment with the essential spare parts for operation after commissioning is included in the scope of supply.

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.

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 5/6 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, 10P10 15VA, xx/5A, 1FS5, 15VA

Electrical data and features:

- Standards: IEC 60034, EN 60034, VDE 0530, ISO 8528-3, ISO 8528-9, CSA C22.2
- 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
- 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 per IEC 60034

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 GEJ 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 set point follow up over CAN communication. (Option)
- 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 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 none volatile memory.
- Set point 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 U_{nom}. + 1000 V) and the rotor windings (min. 1500 V)

1.03 Module Accessories

Base frame
Split Base Frame fabricated with welded structural steel. First frame to mount the engine, jacket water heat exchangers, pumps and engine auxiliaries, the second to mount the gearbox and generator.

Coupling #1
Engine to Gearbox coupling is provided. The coupling isolates the major sub-harmonics of engine alternating torque from gear box.

Coupling #2
Gearbox to Generator Coupling is provided. This coupling is designed with a torque limiter to couple gear box with alternator.

Coupling housings
Provided for both Couplings

Anti-vibration mounts
2 sets of isolation, one is arranged between engine block assembly and base frame. The second is via insulating pads (SYLOMER) for placement between base frame and foundation, delivered loose.

Gear box:
A Single-stage spur gear with overhead shaft and closed loop lube oil system, completely mounted on the gearbox/generator base frame. The lube oil heat exchanger is integrated with the warm/cooling water circuit. The gear transmission ratio is 1:1.2. Oil volume is approximately 52 gals (196 liters).

Exhaust gas connection
A flanged connection is provided that collects the exhaust gas turbocharger output flows, includes flexible pipe connections (compensators) to compensate for heat expansions and vibrations.

Combustion air filter
A Dry type air filter with replaceable filter cartridges is fitted. The assembly includes flexible connections to the fuel mixer/carburetor and service indicator.

Interface panel (M1 cabinet)
Totally enclosed sheet steel cubicle with hinged doors, pre-wired to terminals, ready to operate. All Cable entry will be via bottom mounted cable gland plates.

Painting: RAL 7035

Protection: External NEMA 3 (IP 54), Internal IP 20 (protection against direct contact with live parts)

Cabinet design is according to IEC 439-1 (EN 60 439-1/1990) and DIN VDE 0660 part 500, respectively. Ambient temperature 41 - 104 °F (5 - 40 °C), Relative humidity 70%

Dimensions:

- Height: 51 in - 82 in (1300 mm-2100 mm)
- Width: 40 in - 47 in (1000 mm -1200 mm)
- Depth: 16 in - 24 in (400 mm-600 mm)

Control Power Source: The starter batteries and the cabinet mounted battery chargers will provide the power source for this enclosure.

Interface Panel contents and control functions:

- The cabinet houses the unit Battery Charger and primary 24VDC Control Power Distribution (breakers, fuses, and terminals) from the unit Batteries
- Distributed PLC Input and Output cards, located in the cabinet, gather all Engine, Gearbox and Generator Control I/O. These cards transmit data via data bus interface to the central engine control of the module control panel located in the A1 cabinet. Data bus is via CAN and B&R Proprietary Data Highway (Data Cables provided by GE)
- Speed monitoring relays for protection are provided.
- Gas Train I/O Collection, including interface relays and terminals for gas train shutoff valves.
- Transducer for generator functions, such as excitation voltage.
- Door Mounted Emergency Stop Switch with associated Emergency Stop Loop interface relays.
- Miscellaneous control relays, contacts, fuses, etc. for additional control valves, and auxiliaries.
- Interface Terminal Strips

Skid Mounted 3 Phase Devices are Powered by 3 x **600**/**346** V, **60** Hz, 50 A

AC Power for engine mounted auxiliaries (heater, pumps, etc.) are routed through a separate J-box mounted on the side M1 cabinet (Box E1). This is done to maintain signal segregation (AC from control)

NOTE: Generator Current Transformer wiring is connected directly to the Generator and does NOT pass through the M1 cabinet.

Exhaust gas scavenging blower

An exhaust gas scavenging blower is used to scavenge the remaining exhaust gas out of the exhaust gas pipe work, to prevent the appearance of deflagrations.

Function:

Before each start scavenging by blower is done for app. 1 minute (except at black out – start)

Supervisions:

- Scavenging air fan failure
- Scavenging air flap failure

Consisting of:

- Fan
- Exhaust gas flap
- Temperature switch
- Compensator and pipe work

1.03.01 Engine jacket water system

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) 300 l
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 **600**/**347** V pump
Consisting of:
- 1 piece oil pump 1500 W, **600**/**347** V
- 1 piece oil pump 1500 W, 24 V
- All necessary vents
- Necessary pipework

1.04 Heat recovery (Yukon Design)

The heat exchangers are mounted to the engine and/or to the module base frame, complete with interconnecting pipe work.
The connection design of the heat exchangers is determined on a project specific basis. The connection design, temperatures and flow rates are shown on page 11 of this document. Interfaces to the customer circuit are shown through a decoupling plate and frame heat exchanger.

The exhaust gas heat exchanger is not included in the GE Jenbacher scope of supply.

The insulation of heat exchangers and pipe work is not included in GE Jenbacher scope of supply and should be provided locally if needed.

1.05.01 Gas train < 500mbar (CSA Approved)

Pre-assembled, CSA 149.1 compliant (GEJ Option A), installed in Container gas pipework to the module.

Consisting of:

- **Main gas train:**
  - Shut off valve
  - Gas filter, filter fineness <3µm
  - Adapter with dismount to the pre-chamber gas train
  - 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, 0-100mbar (0-1,45 psi)
  - Solenoid valves
  - Leakage detector
  - Gas pressure regulator
  - Gas pressure switches (min., max.)
  - TEC JET (has to be implemented horizontal)
  - Gas flow meter (option)
  - p/t compensation (option)

The gas train complies with DIN - DVGW regulations.
Maximum distance from TEC JET outlet to gas entry on engine, including flexible connections, is 1m (39,37in).

- **Pre-chamber gas train:**
  - Ball valve
  - Gas filter, filter fineness <3µm
  - Solenoid valves
  - Pressure regulator
  - Calming distance with reducer
  - Pressure gauge with push button valve, 1-5bar (0-72,5psi)

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: 2200 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.

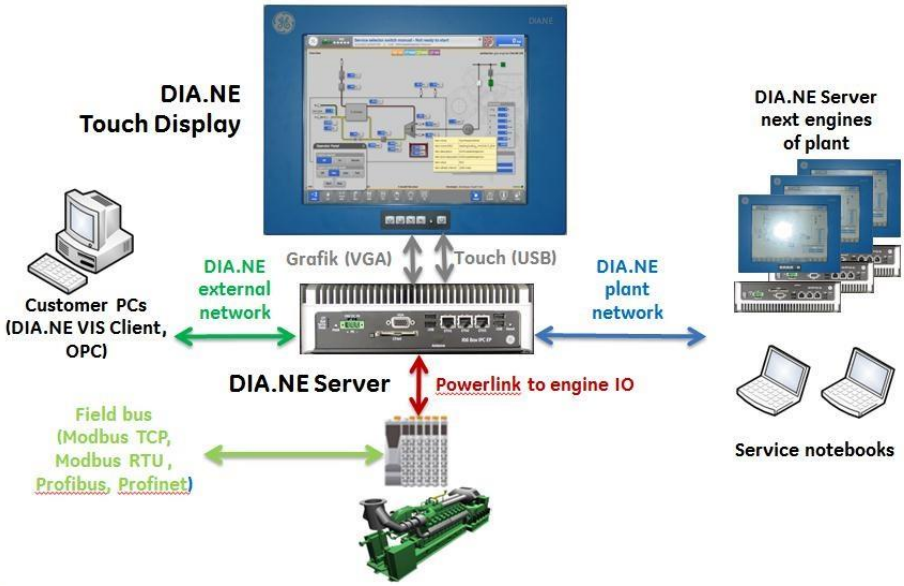
Control supply voltage from starter and control panel batteries: 24V DC

Auxiliaries power supply: (from provider of the auxiliary supply)
3 x **600**/**347** V, **60** Hz

Consisting of:
Motor - Management - System DIA.NE

Setup:

- a) Touch display visualization
- b) Central engine and unit control



Touch Display Screen:

15“ Industrial color graphic display with resistive touch.

Interfaces:

- 24V voltage supply
- VGA display connection
- USB interface for resistive touch

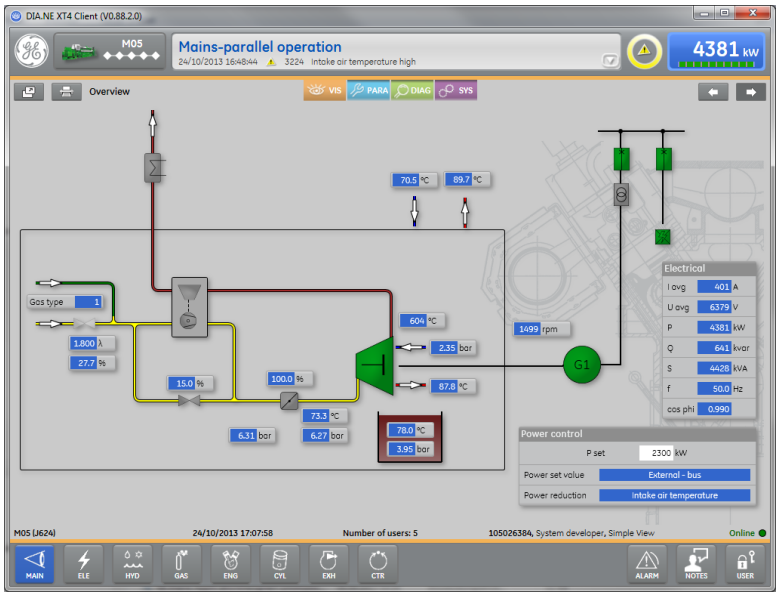
Protection class of DIA.NE XT panel front: IP 65
Dimensions: W x H x D = approx. 410x310x80mm

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

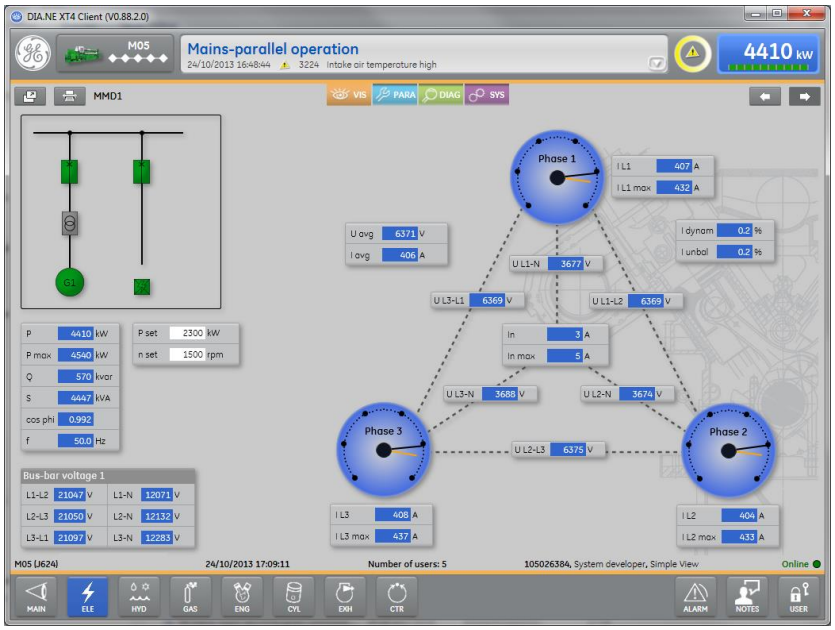
Operation is via the screen buttons on the touch screen
Numeric entries (set point values, parameters…) are entered on the touch numeric pad or via a scroll bar.
Determination of the operation mode and the method of synchronization via a permanently displayed button panel on the touch screen.

Main screens (examples):

Main: Display of the overview, auxiliaries status, engine start and operating data.

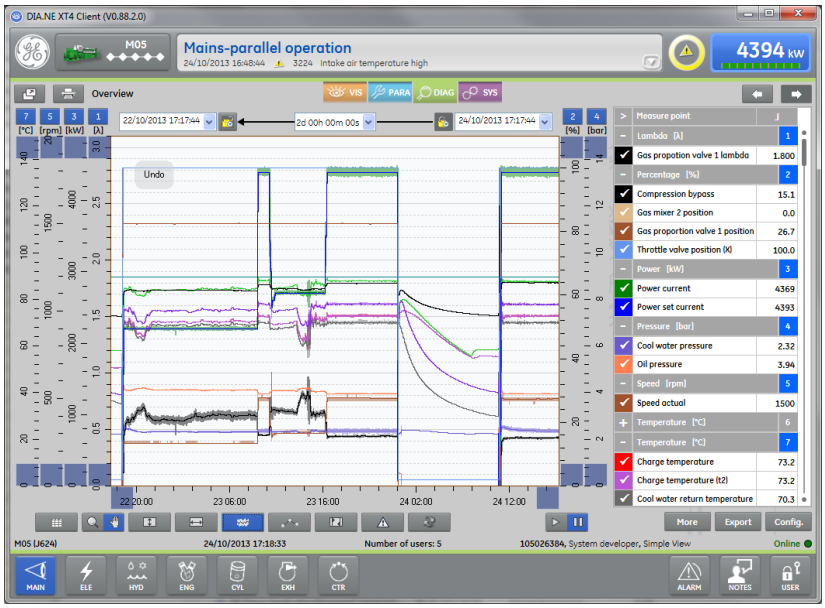


ELE: Display of the generator connection with electrical measurement values and synchronization status



OPTION: Generator winding and bearing temperature

Trending
Trend with 100ms resolution



Measurement values:

- 510 data points are stored
- Measurement interval = 100ms
- Raw data availability with 100ms resolution: 24 hours + max. 5.000.000 changes in value at shut down (60 mins per shut down)
- Compression level 1: min, max, and average values with 1000ms resolution: 3 days
- Compression level 2: min, max, and average values with 30s resolution: 32 days
- Compression level 3: min, max, and average values with 10min resolution: 10 years

Messages:
10.000.000 message events

Actions (operator control actions):
1.000.000 Actions

System messages:
100.000 system messages

Central engine and module control:

An industrial PC- based modular industrial control system for module and engine sequencing control (start preparation, start, stop, aftercooling and control of auxiliaries) 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.
- USB interface for software updates

Connection to the local building management system according to the GE Jenbacher option list (OPTION)

- MODBUS-RTU Slave
- MODBUS-TCP Slave,
- PROFIBUS-DP Slave (160 words),
- PROFIBUS-DP Slave (190 words),
- ProfiNet
- OPC

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:

Shut down functions e.g.:

- Low lube oil pressure
- Low lube oil level
- High lube oil level
- High lube oil temperature
- Low jacket water pressure
- High jacket water pressure
- High jacket water temperature
- Overspeed
- Emergency stop/safety loop
- Gas train failure
- Start failure
- Stop failure
- Engine start blocked
- Engine operation blocked
- Misfiring
- High mixture temperature

- Measuring signal failure
- Overload/output signal failure
- Generator overload/short circuit
- Generator over/undervoltage
- Generator over/underfrequency
- Generator asymmetric voltage
- Generator unbalanced load
- Generator reverse power
- High generator winding temperature
- Synchronizing failure
- Cylinder selective Knocking failure

Warning functions e.g.:

- Cooling water temperature min.
- Cooling water pressure min.
- Generator winding temperature max.

Remote signals:
(volt free contacts)
1NO = 1 normally open
1NC = 1 normally closed
1COC = 1 change over contact

• 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

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

Mains voltage 3 x 4160 V or 3x 110V/v3 other measurement voltages available on request
Bus bar voltage 3 x 4160 V or 3x 110V/v3 – other measurement voltages available on request
Generator voltage 3 x 4160 V or 3x 110V/v3 – other measurement voltages available on request

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

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

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

1.11.00 Motor control panel – Container design (Yukon Design)

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

Dimensions (Located in Container Control Room):

- Height: 71 inch (1800 mm)
- Width: 39 inch (990 mm)
- Depth: 16 inch (405 mm)

Equipment:
Equipped with IEC type starters for each motor
With safety disconnect switches for every load
With step down transformer 600/120V, 10kVA for container consumers

2 Jacket Heaters	9.0 kW/each
2 Jacket Water Pumps	7.5 kW/each
1 Jacket Water Circ Pump	0.4 kW
2 L.O Circ Pump	4.0 kW/each
1 Generator L.O. Pumps	1.1 kW/each
1 LT Circuit Pump	7.5 kW
1 LT Radiator	21.6 kW
1 HT Circuit Pump	18.5 kW
1 HT Radiator	45.8 kW
4 Ventilation Fans	4 kW/each
1 Fresh Oil Pump	0.75 kW/each
1 Waste Oil Pump	0.75 kW/each

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:
Individual error messages, operational messages, measured values for generator power, oil pressure, oil temperature, cooling water pressure, cooling water temperature, cylinder and collective exhaust gas temperatures.

GE 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 connection with Ethernet.

Applications:

1.) DIA.NE XT4 HMI
DIA.NE XT4 HMI is the human-machine-interface of DIA.NE XT4 engine control and visualization system for GE 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 XP, Windows 7, Windows 8, Windows 10)

Function
Functions of the visualization system at the engine control panel can be used remotely. These are among others control and 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 and data backup.DIA.NE XT4 is available in several languages.

Option - Remote demand/blocking

If the service selectors switch at the module control panel is in pos."Automatic" and the demand-selector switch in pos."Remote", it is possible to enable (demanded) or disable (demand off) the module with a control button at the DIA.NE XT4 HMI
Note:
With this option, it makes no sense to have an additional clients demand (via hardware or data bus) or a self-guided operation (via GE Jenbacher master control, grid import /export etc.).

Option - Remote - reset (see TA-No. 1100-0111 chapter 1.7 an d1.9)

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 GE 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 (ETH3) 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 XP, 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 GE Jenbacher remote monitoring and diagnostic (RM&D) service

	Offering Feature	Connect	Protect
Asset Management	Online data transfer	✓	✓
	Big Data cloud storage	✓	✓
	Engine status visibility	✓	✓
	Control alarms visibility	✓	✓
	Basic data trends	✓	✓
	Remote access to DIA.NE HMI	-	✓
	Unlimited data trending	-	✓
	Advanced diagnostics	-	✓
Fleet Management	Fleet status on world map	-	✓
	Fleet summaries and reporting	-	✓
Mobility	SMS/Email notifications	-	✓
	Smartphone app	✓	✓

Web application with following features:

- Visualization of the current state of the engine (available, in operation, fault)
- View of various readings of the Gen-set

- Visualization of counts as a trend graph (if plant available online, or by manually entering of the counter readings)
- Trend graph of the performance value (low resolution; only if system available online)

myPlant™ Connect is free of charge for registered customers
myPlant™ Protect is free of charge within the warranty period (limited to 1 year) and is also included as part of any contractual service agreement (CSA).

Scope of supply

- Access to myPlant™
- Connection between plant server and myPlant™ system

Customer requirements

- Permanent Internet line (wired or mobile, (see option 4))
- See technical instruction TA 2300-0008
- Outbound data connectivity (from plant server to Internet) ONLY – INBOUND connections must NOT be allowed!

CAUTION!
It is in the responsibility of the customer to prevent direct access from the Internet to the plant server using technical equipment like firewalls.
GE Jenbacher does not provide such security devices and services as part of this option!

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

Scope of delivery

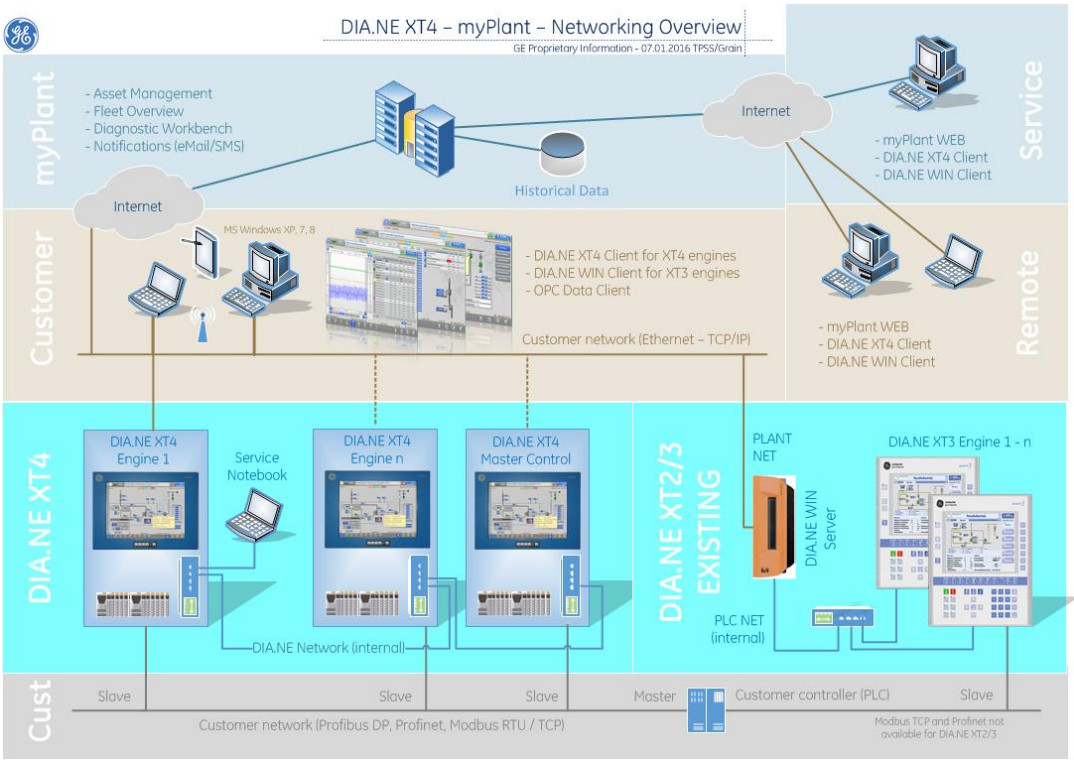
- Mobile Internet router with antenna to connect to the DIA.NE Server XT4

Customer requirements

- SIM card for 3G / 4G

4.) Network overview

For information only!



1.11.14 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 (GEJ 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 on the DIA.NE screen

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

1.11.16 Generator Earth Fault Protection (nondirectional)

Digital protection relay, integrated into the module control panel.
Acting on the generator circuit breaker and on the generator de-excitation
Alarm message on the DIA.NE screen

Dependent on the generator grounding method one of the following protection functions is applied:

1) ANSI function code 50N/G
   Detection of the earth fault current e.g. by means of a window-type current transformer
   (Current transformer by client, secondary 1A, optionally: 5A).
2) ANSI function code 59N/G
   Detection of the residual voltage e.g. by means of the voltage measured across the broken-delta secondary windings of grounded voltage transformers (voltage transformers by client)

1.20.03 Starting system

Starter battery:
6 piece 12 V Pb battery, 200 Ah (according to DIN 72311), complete with cover plate, terminals and acid tester.

Battery voltage monitoring:
Monitoring by an under voltage relay.

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 - 550 V, 47 - 63 Hz**
  - max. power consumption — 2120 W
  - Nominal D.C. voltage — 24 V(+/-1%)
  - Voltage setting range — 24V to 28,8V (adjustable)
  - Nominal current (max.) — 2 x 40 A
  - Dimensions — 240 x 125 x 125 mm
  - Degree of protection — IP20 to IEC 529
  - Operating temperature — 0 °C - 60 °C
  - Protection class — 1
  - Humidity class — 3K3, no condensation.
  - Natural air convection
  - Standards — EN60950,EN50178
    UL/cUL (UL508/CSA 22.2)

Signalling:

Green Led:	Output voltage > 20,5V
Yellow Led:	Overload, Output Voltage < 20,5V
Red Led:	shutdown

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 56°C (133 °F) and 60°C (140°F), to allow for immediate loading after engine start.

1.20.08 Flexible connections

Following flexible connections per module are included in the GE 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**	**150/16**	Stainless steel
2 Intercooler in-/outlet	**DN/PN**	**100/16**	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.

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

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

Standard painting:	Panel:	RAL 7035
	Pedestal:	RAL 7020

2.02 Grid monitoring device

Standard without static Grid Code - 60Hz alternator

Function:
For immediate disconnection of the generator from the grid in case of grid failures.

Consisting of:
- High/low voltage monitoring
- High/low frequency monitoring
- Specially adjustable independent time for voltage and frequency monitoring
- Vector jump monitoring or df/dt monitoring for immediate disconnection of the generator from the grid for example at short interruptions

- Indication of all reference dimensions for normal operation and at the case of disturbance over LCD and LED
- Adjusting authority through password protection against adjusting of strangers

Scope of supply:
Digital grid protection relay with storage of defect data, indication of reference dimensions as well as monitoring by itself.

Grid protection values:

Parameter	Parameter limit	Max time delay[s]	**Comments**
59-61Hz			Do work normal
f<[ANSI 81U]	59Hz	0,5	Load reduction with 10%/HZ below 59Hz!
f<<[ANSI 81U]	58.5Hz	0,1	
f>[ANSI 81O]	61,5Hz	0,1	Load reduction with 30%/HZ above 61Hz!
U<[ANSI 27]	90%	1	Load reduction with 1%P /%U below 95%
U<<[ANSI 27]	80%	0,2	Load reduction with 1%P /%U below 95%
U>[ANSI 59]	110%	30	Load reduction with 1%P /%U above 105%
U>>[ANSI 59]	115%	0,2	Load reduction with 1% P/%U above 105%
Df/dt [ANSI 81R] **Or** **Vector shift** [ANSI 78]	2Hz/s, 5 Periods Or 8° -3pol		Cos phi range: 0,8ind (overexcited) - 1

2.08 High voltage – Junction Box inside Generator Power Cubicle

Cubicle serves as termination point for customer 5 kV power cables. Entry details per unit General Arrangement.

Essential components installed in the high voltage panel:
- 1 surge arrestor
- 3-pole design, 25kA

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
  2 Smoke detector(s)

3.01 Lube oil system

Consisting of:
- **250** l fresh oil tank
- Combined electric driven fresh oil and waste oil pump
- Level switches
- Shut-off devices
- Complete pipework 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:
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 (100 mm (4 inch) rock wool covered with 0,75 mm (0,03 inch) galvanized steel sheet) is required to keep the sound pressure level of the container (65 dB(A) in 10 m (32 ft)).

3.10.02 Cooling system – Dual Circuit High Temp/Low Temp Engine Cooling Control (Module Container Design)

A dual circuit radiator mounted on the container roof will be provided that will dissipate the heat from both the engine hot water circuit and engine intercooler circuit.

Sound pressure level 65 dB(A) at 10 m (32 ft)
(as measuring area level according to ISO 3744 bzw. EN 13487)

High Temperature Hot Water Loop Heat Dissipation Circuit Consisting of:
- Radiator
- Pump
- Short-circuit thermostat
- Safety valve
- Expansion tank
- Thermal Output Temperature Control Valve
- Low Flow, High Pressure, High Temperature Trip
- De-coupling Heat Exchanger for customer thermal collection

Low Temperature Intercooler Water Loop Heat Dissipation Circuit Consisting of:
- Radiator
- Pump
- Short-circuit thermostat
- Safety valve
- Expansion tank
- Pressure Switch

The radiator is designed for an ambient temperature of 35°C (95°F).

3.20 Container Type BR6 (Yukon Design)

Special JMC 624 Container design same as the previous built for the Yukon Project.
(Reference Gföllner Drawings C00BLGT0193AA000)

3.70 Control Strategy

1.) Governor droop mode:

Engines will run together with the Diesel engines and the hydro power plant (40-80 MW) in droop mode. Customer will provide the signal for the frequency set point (raise/lower). In the event of a shutdown of the Diesel engines and the hydro power plant, the engines will continue to operate in island operation (in Isochronous Load Share mode or Droop mode) if the actual loads of the consumers are matching with the engine output. To have an uninterrupted operation the customer´s load management has to control the consumers according to the Technical instructions: **TI 2108-0031 and TI 2108-0026**

Interfaces from customer:

- Pre-selection “Governor droop mode”
- Demand of engine(s)
- 0(4)-20 mA signal for frequency adjustment (Raise/lower between 59Hz and 61Hz)

2.) Isochronous Load share Mode

Engines will operate in isochronous mode via a load sharing line. If the diesel engines are equipped with a load sharing line the engines can run in parallel with the Diesel engines.

Active load sharing (kW):

Engine speed regulator with adjustable quadrature droop kit and similar speed response time!
Operation is possible with droop or load sharing line.
GE Jenbacher must receive at terminals for active power load sharing following signal:
4-20 mA (16mA = 100% PN) from the customer.

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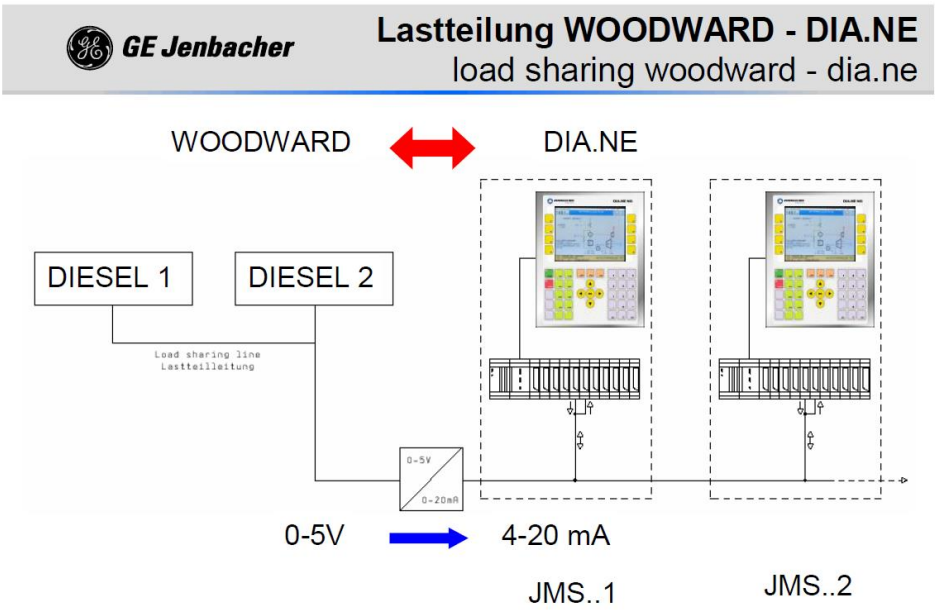


GEJ alternator AVR has U/f function, if customer alternator AVR doesn´t have same characteristic **that feature has to be disabled!**

Signals according interface list from GEJ have to be exchanged between the customer engine and the GE Jenbacher gas engine to ensure safe operation conditions:

Observe also the general requirements for island operation according : TA 2108-0031 (general information about island operation)

Interfaces from customer:
- Pre-selection “Isochronous Load share Mode”
- Demand of engine(s)
- 0(4)-20 mA signal for frequency adjustment (Raise/lower between 59Hz and 61 Hz)

3.) Load Mode – Load set point control

Load Control of the Generator set will be either via a 4-20mA input representing a unit KW load set point or a KW load set point entered on the Diane XT3 screen. Upon breaker closure, the unit will ramp to the set point. Load set point between 50-100% of the nominal engine output. In the event of a shutdown of the Diesel engines and the hydro power plant the engines will shut down and can be demanded for Island operation(“black out Start”) – see description 1 and 2

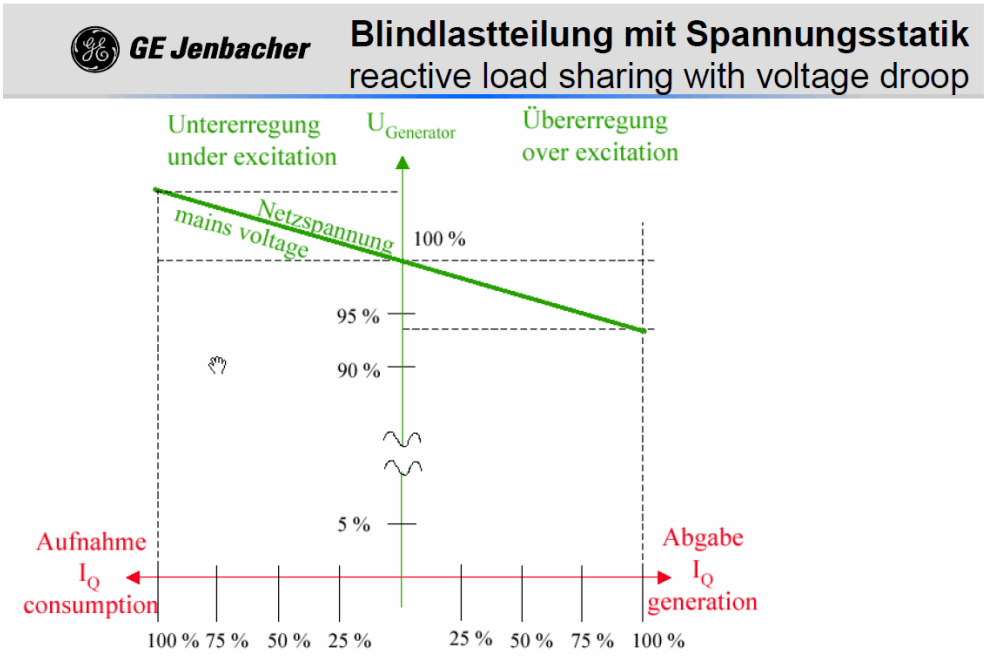
Interfaces from customer:
- Pre-selection “Load Mode- kW Set point”
- Demand of engine(s)
- 0(4)-20 mA signal (Set point kW Control (50-100% load)

Requirement for island parallel operation with the customer engines:

The customer engines have to fulfill some preconditions:

Medium voltage alternator winding system: >1kV
GEJ Generator with 5/6 pitch main stator winding.
Star point is not grounded – delivery and control of a necessary
grounding system according customer SLD is scope of supply from customer!

Reactive load sharing (kvar):
Generator with “voltage droop“ for reactive load sharing - „adjustable quadrature droop kit“.
Reactive power balance is performed through static adjustment of the generators.
In multiple module installations, the voltage adjustment of each generator must be identical.



GEJ alternator AVR has U/f function, if customer alternator AVR doesn´t have same characteristic that feature has to be disabled!

Signals according interface list and detailed design discussions from GEJ have to be exchanged between the customer engine and the GE Jenbacher gas engine to ensure safe operation conditions.

Observe also the general requirements for island operation according: TA 2108-0031 (general information about island operation)

Black out operation

1 , Black out after Mains Failure during Module Shutdown: (Version 1-52M open- internal supply)

- Potential free contact "Mains Failure" is issued to the customer
  - Display "MAINS FAILURE" (screen P_11.1)
- Potential free contact GEJ to Customer:„Command: SHEDD LOAD“
- **Grid CB 52M is open!**
- The customer needs to switch off all loads at the transformer low voltage side
  Potential free contact Customer to GEJ:„STATUS: LOAD SHEDDING IS DONE“
- The available engine will be demanded,
- Potential free contact GEJ to Customer:„ Command: SHEDD LOAD“ will be cancelled.
- Load can now be added according TI.
  - Status display "ISLAND OPERATION"

- After restoration of the mains voltage and after 5 minutes stabilizing time, the synchronizing of the mains CB will commence.;
- Potential free contact GEJ to Customer:„ Command: BLOCK MAINS CB " is cancelled
  - Status display "MAINS-PARALLEL OPERATION" on module control cabinet

2 , Black Out after Mains Failure during Module Shutdown: (Version 2-52M closed – extended island operation)

- Potential free contact "Mains Failure" is issued to the customer
  - Display "MAINS FAILURE" (screen P_11.1)
- Potential free contact GEJ to Customer:„Command: SHEDD LOAD"
- Potential free contact Customer è "ALL CB are interlocked and Busbar is dead"
- **Grid CB 52M is closed!**
- The customer needs to switch off all loads at the transformer low voltage side
  Potential free contact Customer to GEJ:„STATUS: LOAD SHEDDING IS DONE"
- The available engine will be demanded,
- Close of the 52 M breaker upon release from the customer

(***NOTE:*** *When operational GEJ generator sets are closed via 52M onto a de-energized "dead" utility, customer shall consider the potential short circuit currents that could be drawn by de-energized transformers during magnetization. As a rule of thumb, addition of transformers with a KVA rating twice that of the connected generation should be avoided so as to prevent excessive voltage dip*)

- Potential free contact GEJ to Customer:„ Command: SHEDD LOAD" will be cancelled. –>Duration around 10 sec.
- Load can now be added according above TI.
  - Status display "ISLAND OPERATION"

Operation in droop mode!

- If other generators are connected now the required mode of operation must be selected by external signal (preselected operation mode)

3.71 Vibration Switch

A structural Vibration Switch will be installed on the package base frame to detect excessive vibrations. A signal we will sent to the control panel to indicate an alarm condition.

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 GE Jenbacher scope of supply.

4.03 Assembly and installation
Assembly and installation of all GE Jenbacher -components is not included in GE 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 GE Jenbacher start-up and commissioning checklist is 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 GE Jenbacher scope of supply.

4.07 Emission measurement (exhaust gas analyser)
Emission measurement by GE 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).

5.03 Documentation

Preliminary documentation 60 days after receipt of a technically and commercially clarified order:

- Module drawing 1)
- Technical diagram 1)
- Drawing of control panel 3)
- List of electrical interfaces 2)
- Technical specification of control system 2)
- Technical drawing auxiliaries (if included in GE Jenbacher-limit of delivery) 1)

At delivery:

- Wiring diagrams 3)
- Cable list 3)

At start-up and commissioning (or on clients request):

- Operating and maintenance manual 4)
- Spare parts manual 4)
- Operation report log 4)

AIR EMISSIONS PERMIT (NO. 60-010)
AMENDMENT APPLICATION
SUPPORTING DOCUMENT

ATTACHMENT D

EMS

ENVIRONMENTAL WORK PRACTICES

August 27, 2018

YUKON ENERGY

An Environmental Work Practice is a set of positive guidelines or "Do's and Don'ts" on how to control an aspect of the services, activities, or products of Yukon Energy that may have a negative effect on the environment.

DIESEL GENERATOR EMISSIONS

EMS-EWP-002

1.0 Introduction

1.1 Purpose

The purpose of the **Environmental Work Practice** for **Diesel Generator Emissions** is to outline the steps required to use Yukon Energy Diesel generators to produce electricity in a manner that is consistent with Yukon Energy's Environmental Policy.

It is the objective of Yukon Energy to produce electricity with the fewest air emissions and least pollution emitted into the environment, as well as to minimize the impact of such air emissions where they are unavoidable.

1.2 Requirements

- A copy of the Air Emissions Permit, from Environment Yukon, is kept at each site.

1.2.1 Operation and Maintenance

- Except for maintenance purposes (e.g., exercise, run after repair) SCC and Plant Operators must use the generators at each site **in order of highest efficiency** under the circumstances. If this is not possible the operator and SCC must keep a record of why this was done.
- Whenever possible schedule maintenance with surplus hydroelectricity availability so diesel generation is not needed to meet electrical demand.
- Follow manufacturers maintenance presciptions and conduct all necessasary maintenance for generators and environmental emissions controls so the units are as efficient as possible. Monthly run-ups are currently done as scheduled maintenance.
- All particulates collected by emissions control equipment shall be contained such that they are not released to the environment.
- All inspections carried out on the diesel generators shall be documented and retained and will include the name of the person conducting the inspection, the date of the inspection, any observations recorded during the inspection, actions taken as a result of those observations, and the date each action was taken.

2.0 Monitoring, Reporting and Record Keeping

- Keep all records for a minimum of three years and make them available upon request for inspection by an environmental protection officer.
- Records will be kept at Records Management
- The unit operating authority (i.e., SCC) must obtain approval from an Environmetnal Protection Officer with YG prior to:
  - any addition, modification, removal or replacement of any equipment or components related to the release, abatement, control or treatment of air emissions; or
  - any change in the location of the source(s) (i.e., if there is a plan to move a generator).

3.0 Applicable Legislation and Other Requirments

- *Yukon Environment Act*
- *Yukon Air Emissions Regulations*

Yukon Air Emissions Permit No. 60-010

4.0 Other Related Information

Yukon Energy Safe Work Practices
SWP's can be found on the Health and Safety Sharepoint site.

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An Environmental Work Practice is a set of positive guidelines or "Do's and Don'ts" on how to control an aspect of the services, activities, or products of Yukon Energy that may have a negative effect on the environment.

Fuels, Lubricants and Coolants

EMS-EWP-005

1.0 Introduction

1.1 Purpose

The purpose of the **Environmental Work Practice** for **Fuels, Lubricants and Coolants** is to provide the steps required to purchase, store, use, and dispose of fuels, lubricants and coolantsubricants in compliance with applicable laws and otherwise in an environmentally responsible manner.

2.0 Fuels, Lubricants and Coolants

Spills and leaks of oils, coolants, liquids and fuels can harm soil and water and human health if not managed properly. Spills need to be documented, reported, and cleaned up immediately. When hazardous substances such as fuel oil are spilled, the environment and public health can be seriously harmed. Yukon Energy expects the best industry practice as regards storage, handling, and disposal of hazardous materials such as fuels, lubricants and coolants.

2.1 Requirements

- Material Safety Data Sheets (MSDS) will be maintained at the work site for each hazardous material located there. All personnel working with, or potentially exposed to, such materials must have read and be familiar with relevant MSDSs.
- Do not refuel equipment within 30m of a watercourse or waterbody. Exceptions to this requirement include equipment refueled within secondary containment (e.g., water pump contained within spill tray).
- All fuel storage containers should have secondary containment and ideally include integral leak detection and recovery capabilities.
- In addition to absorbent material required to cleanup drips, leaks and minor spills, a fully stocked spill kit shall be available where substances are stored and/or where oil filled equipment will be working.
- Once a spill kit is used, any materials taken out shall be replaced as soon as possible.
- Replacement materials can be obtained through the Kulan Warehouse, or the Procurement Department.
- Warehouse personnel are responsible to ensure adequate supplies of replacement spill response materials are available in stores at all times.
- Lead hands will be responsible for storing spill response supply on hand in their areas of responsibility.

- All service vehicles transporting hazardous materials and all heavy equipment, must maintain suitable spill response equipment with the vehicle/equipment at all times.
- Staff and contractors on site will be familiar with the contents of onsite spill kits and will be trained in the proper use of spill kits.
- Due to the risk of spill and fire, fuels and /or other petroleum or combustible products will not be stored in any large quantity on site (except in designated areas for plant operation). It is suggested that only small fuel containers, such as approved safety containers or tidy tanks properly mounted in trucks will be allowed on site for any extended period of time.
- Spill Contingency Plans will be located near any spill kit. Project managers, lead hands and the foreman shall have a copy of the spill contingency plan available on site at a central location.
- Spill contingency plans will also be located in T&D service vehicles.

Transportation

- All fuels, lubricants, coolants and other hazardous substances must be transported under applicable Transportation of Dangerous Goods Act and Regulation. When transporting any hazardous materials, refer to TDG regulations and the MSDS sheet for the product.
- Contractors hauling hazardous goods for YEC must have Transporation of Dangerous Goods training and certification as well as MSDS sheets for the product in the vehicle.

Waste Handling

WHITEHORSE PLANTS: PUT OILY WASTE INTO RED METAL CONTAINERS.

- Put all contaminated absorbent pads, spent oil filters and contaminated rags into the red oily waste bins in the Whitehorse Hydro and Diesel plants. Oily waste bins will get emptied into a larger dumpster for oily waste outside the WH Diesel plant. Disposal of this material will be facilitated by the Lead hand and Environmental Coordinator.
- Do not line red bins with plastic bags as it could cause a fire.
- Waste oil/fuel/solvents/coolants must be stored in clearly labeled and sealed containers, located upright and out of the elements (i.e., not exposed to precipitation or excessive ultraviolet light), and ideally will be stored in outdoor shelters, or indoors on pallets, with integral leak containment – i.e., spill pallets and spill shelters. Containers must not be stored on pervious surfaces (wood, soil) or otherwise come in contact with moist earth.
- Keep storage sites secure
- Keep containers away from surface waters, catch basins (stormwater), private and public water supply wells

Special Waste Records Collection & Retention

- Leadhands are responsible for storing this material and coordinating with waste collection contractor for regular pick-ups.

- Properly completed and signed records and waste manifests must be completed for all waste disposal events and must be retained and regularly provided to Yukon Energy Records Management for filing.

3.0 Applicable Legislation

- Yukon Environment Act, *Spills Regulations*, Yukon Territorial Government
- The storage of hazardous substances is regulated under the *Yukon's Storage Tank Regulations*
- Oil and Gas Act, *Gas Processing Plant Regulations*, Yukon Territorial Government

4.0 Additional Information

YEC Spill Contingency Plans
Can be found on the EMS SharePoint site under Environmental Documents.

An Environmental Work Practice is a set of positive guidelines or "Do's and Don'ts" on how to control an aspect of the services, activities, or products of Yukon Energy that may have a negative effect on the environment.

SPECIAL WASTES

EMS-EWP-008

1.0 Introduction

1.1 Purpose

The purpose of the **Environmental Work Practice** for **Special Wastes** (commonly known as hazardous wastes) is to provide the steps required to purchase, store, use and dispose of hazardous wastes in an environmentally responsible manner and according to the MSDS sheets for any product.

2.0 Special Wastes

Common examples of special wastes include mercaptan, waste oil, batteries, antifreeze, ozone depleting substances, protective coatings and solvents. In addition, any waste dangerous goods are considered special wastes.

2.1 Requirements

If the contractor or employee works with special waste in any way, they shall be aware of any legal obligations under the *Yukon Special Waste Regulations*.

General

- Maintain records of the types of special wastes in and out of your storage areas, volume, origin and storage location. File with YEC Records Management on a yearly basis.
- Never mix or dilute special wastes.
- Prevent contamination and leaks by ensuring containers are properly sealed, covered and stored within secondary containment.
- Routinely monitor storage equipment and facilities for leaks.
- Routinely ship special wastes to proper disposal facilities to avoid accumulating large volumes of waste at site. Contact Manager of Environment or Environmental Coordinator for more information.
- Store liquid special wastes in a tank if the volume is more than 200 litres or a competent drum or other suitable container for smaller amounts.

- Use external secondary containment for single-walled tanks, for double-walled tanks with capacities more than 50,000 litres, or when storing more than twenty-four 45-gallon drums in one group.
- For 45-gallon drums, use drip pans or similar containers, or use two containers, one placed inside of the other.
- For tanks, use an approved liner or a curbed concrete pad surrounding the tank, and a spill containment device attached to the intake valve. The liner or pad and spill containment device must be made of materials that are compatible with the stored materials.
- The Yukon *Special Waste Regulations* and the *Gas Processing Plant Regulations* state that a person who possesses or controls a special waste at the time of a release (spill), or who causes a release, **must report the incident** to the Yukon Spill Report Line (667-7244) and the Chief Operating Officer of the Oil and Gas Branch (334-3112, if applicable). Containment and clean-up action should begin as soon as possible to protect human health and the environment.

Note that for all but very small quantities of special waste, most placarding, shipping documentation, and transporter certification requirements consistent with the *Transportation of Dangerous Goods Regulations* apply to the transport of special waste.

3.0 Specific Waste Requirements

3.1 Pest Control Products

3.1.1 Requirements

Pest control products include herbicides (e.g., weeds, other undesirable vegetation) and pesticides (e.g., insects, rodents). One must ensure that the certified applicator or his/her assistant performs the work as specified in the permit.

The applicator must have a **Pesticide Service Permit** (see separate Fact Sheet) to apply commercial or restricted pesticides. A **Pesticide Applicator Certificate** is required to purchase any commercial or restricted pesticides.

3.2 Ozone Depleting Substances

A permit must be acquired from Environment Yukon in order to use ozone depleting substances. The form can be found on the Environment Yukon Website or at the link on the Environment Yukon website.

3.2.1 Requirements

- Halon cannot be used in the testing of fire extinguishing systems.
- Keep special wastes in permitted storage containers
- Implement continuous leak detection
- Ozone depleting substances must be captured and recycled during the servicing of all equipment.
- Ozone-depleting substances must be removed from all equipment prior to its disposal. A label stating that the ozone-depleting substance has been removed must be affixed to the unit. The label is affixed by personnel who have received training approved by the Yukon Department of the Environment.

3.3 Mercaptan

Mercaptan has the ability to leach through soil or the sediment at a moderate rate. Accumulates very little in the bodies of living organisms. Highly volatile from water.

3.3.1 Requirements

- Store and handle in accordance with federal and territorial regulations. Grounding and bonding required. Keep separated from incompatible substances.

3.4 Used Batteries and Aerosol Cans

- Batteries contain sulfuric acid and lead. Both of these materials can damage the environment and pose a safety hazard if handled improperly.
- Under the *Yukon Special Waste Regulations*, you must have a Special Waste Permit if you handle more than five kilograms of lead-acid batteries per month.

3.4.1 Requirements

When storing batteries, or preparing them for shipment, follow the steps outlined below to help prevent leaks and spills and to avoid contamination of the storage site:

- Batteries and aerosol cans should be collected and stored in a leak-proof container out of direct sunlight and exposure to precipitation (rain/snow).
- Leadhands shall ensure the proper storage and disposal of such materials. They are also responsible for coordinating the collection and disposal of the material in cooperation with the Environmental Coordinator on an annual or more frequent basis, as required.
- Larger batteries can be placed on wooden pallets. Do not make stacks of batteries more than **three layers thick**. Separate each layer with a sheet of plywood or other suitable material.
- **Layers of pallets** should not be stacked more than **two** high.
- Enclose batteries on the pallet with thick plastic to prevent leaks. All sides must be wrapped to protect

the batteries from the weather and to prevent any acid from being discharged into the environment.

- After wrapping the batteries in plastic, strap the stack of batteries to the pallet to prevent the batteries from shifting.

4.0 Disposal methods

- **Collection by a Permitted Facility**
  There are several facilities in Yukon that have permits in place for treating and/or disposing of special waste.

- Liquid natural gas, natural gas
  In the event of a spill, allow to vapourize and disperse to the atmosphere

- Mercaptan: Contain in leak proof container and dispose at permited special waste handling facility.

5.0 Applicable Legislation

- Environment Act, *Pesticides Regulation,* Yukon Territorial Government
- Environment Act , *Spills Regulations*, Yukon Territorial Government
- Environment Act, *Solid Waste Regulations*, Yukon Territorial Government
- Environment Act, *Special Waste Regulations*, Yukon Territorial Government
- Canadian Environmental Protection Act. *Ozone Depleting Substances Regulations*, Environment Canada
- Oil and Gas Act, *Gas Processing Plant Regulations*, Yukon Territorial Government
- Transportation of Dangerous Goods Act, Government of Canada

6.0 Additional Information

YEC Safe Work Practices (SWP)
SWP's can be found on the Health and Safety Departments SharePoint site.

YEC Spill Contingency Plans
Can be found on the Environmental Management System (EMS) Sharepoint site under the Environment Department.

Yukon
Environment

Permit No: 60-010

AIR EMISSIONS PERMIT

Issued Pursuant to
the *Environment Act* and the *Air Emissions Regulations*

Permittee: Yukon Energy Corporation

Mailing Address: Box 5920, Whitehorse, Yukon, Y1A 6S7

Site Locations: Generating Plants at:
- Dawson
- Faro
- Mayo
- Whitehorse

Authorized Representative: Travis Ritchie
Phone/Fax: (867) 393-5350 / (867) 393-5322
Email: travis.ritchie@yec.yk.ca

Effective Date: Date of Director's signature

This permit has been amended and replaces permit #60-010 issued on December 15, 2017.

Expiry Date: December 31, 2024

Scope of Authorization: In accordance with your application, you are authorized to operate electricity generating equipment at the above site locations (the "site(s)"), as set out in the terms and conditions of this permit.

Dated this 4th day of October, 2018

T. Powell

Director, Environmental Programs Branch
Environment Yukon

PART 1: DEFINITIONS

1. In this permit,

   "Act" means the *Environment Act*, R.S.Y. 2002, c. 76, as updated from time to time;

   "approved plan" means a plan that is submitted by the permittee and approved by an environmental protection analyst under this permit and includes any terms and conditions specified by the environmental protection analyst in the approval;

   "area of influence" refers to that area as determined in the Permittee's air dispersion modelling submitted to the Branch in 2011 for Whitehorse and in 2012 for Dawson City;

   "associated personnel" means all employees, contractors and volunteers involved in the permitted activities;

   "Branch" means the Environmental Programs Branch, Environment Yukon;

   "emission factor" means the mass emission of a pollutant per unit of energy produced in either grams per kilowatt-hour (g/kWh) or kilograms per megawatt-hour (kg/MWh);

   "emission rate" means the average rate in grams per second (g/s) or kilograms/hour (kg/h) at which a pollutant is emitted from a source, determined either:
   i) as estimated based on emission factors derived from published literature regarding sources of similar type and age (estimated emission rates); or
   ii) as derived from measured data obtained from manual stack testing carried out by the permittee (measured emission rates);

   "environmental protection analyst" means an employee of the Branch so designated by the Minister of Environment under the Act;

   "environmental protection officer" means an employee of the Government of Yukon so designated by the Minister of Environment under the Act;

   "N-1 Event" is a situation where a transmission line, generating unit, or any other element within either the Whitehorse-Aishihik-Faro or Mayo-Dawson system fails, and consequently requires emergency back-up to avoid rolling black-outs in any of the communities;

   "Regulations" means the *Air Emissions Regulations*, O.I.C. 1998/207;

   "source" means a fuel-fired electricity generator which has a maximum nameplate capacity equal to or more than 1.0 megavolt-ampere;

   "total annual emissions" means the emissions derived by multiplying emission factors or measured emission rates for each source by the previous three-year average total energy production for that source.

2. Any term not defined in this permit that is defined in the Act or the Regulations has the same meaning as in the Act or the Regulations.

PART 2: GENERAL

1. No condition of this permit limits the applicability of any other law or bylaw.

2. The permittee shall ensure that all activities authorized by this permit occur on property that the permittee has the right to enter upon and use for that purpose.

3. The permittee shall ensure that all associated personnel:
   a) have access to a copy of this permit;
   b) are knowledgeable of the terms and conditions of this permit; and
   c) receive the appropriate training for the purposes of carrying out the requirements of this permit.

4. The permittee shall provide notice in writing to an environmental protection analyst prior to any significant change of circumstances at the site, including without limitation:
   a) discontinuation of any regulated activity at the site;
   b) change of ownership of the site or any of the sources; and
   c) change to the mailing address or phone number of the permittee.

5. The permittee shall obtain approval from an environmental protection analyst prior to:
   a) any addition, modification, removal or replacement of any equipment or components related to the release, abatement, control or treatment of air emissions; or
   b) any change in location of the source(s).

6. Where conflicts exist between this permit, the permit application or any plans, this permit shall prevail.

7. If an inspection reveals that the site or source(s) is in any way not in compliance with this permit, the permittee shall repair the damage or take other actions as required to bring the site or source(s) into compliance.

8. For clarity, all obligations of the permittee under this permit survive the expiry date to the extent that each is not superseded by one or more conditions in a subsequent permit.

PART 3: OPERATION AND MAINTENANCE

1. The permittee is authorized to operate three liquefied natural gas generators; and five generators running exclusively on diesel fuel at the Whitehorse Station, and diesel generators at Mayo, Dawson and Faro stations. The permittee must obtain a permit amendment prior to adding any additional liquefied natural gas generators at the Whitehorse station.

2. In accordance with the manufacturer’s recommendations and best management practices, the permittee shall inspect, maintain and operate the sources, any stand-alone air pollution control equipment, and testing and monitoring equipment as necessary to provide optimum control of air contaminant emissions during all operating periods.

3. Except for maintenance or test purposes, the permittee shall run the sources at each site in order of highest possible efficiency under the circumstances.

4. The permittee shall ensure that the fuel used by the source(s) conforms to the most recent Canadian federal *Sulphur in Diesel Fuel Regulations* for off-road applications.

PART 4: RELEASE OF CONTAMINANTS

1. The visible emissions from any source shall not exceed an opacity of 20% as measured by an environmental protection officer.

2. In the event that the opacity of emissions from any source exceeds the criterion established in Part 4.1 of this permit, the permittee shall take measures to reduce the opacity of the emissions below that criterion as directed by an environmental protection officer.

3. The permittee shall ensure that particulates collected using emission control equipment are contained so that there is no release of contaminants to the atmosphere or into an open body of water.

4. If ambient air quality monitoring data within the area of influence of the Permittee's facility indicates that one or more of Yukon's Ambient Air Quality Standards is being exceeded, and the environmental protection officer is satisfied that the Permittee's facility is the cause or a significant contributor to the prevailing ambient air quality condition, the Permittee shall undertake such mitigation measures as may be specified by the environmental protection officer to improve the ambient air quality condition.

PART 5: MONITORING EMISSIONS

1. If any diesel generator has exceeded 3% of its annual potential to emit in a calendar year, and, in that same calendar year, if the total operating time of all the generators at that site exceeds 3% of their total annual potential to emit, the permittee shall create a emissions management plan to be submitted to the analyst for approval.

2. The permittee shall carry out any commitments in the approved emissions management plan on a schedule that is approved by the analyst.

3. The permittee shall quantify, through monitoring or calculations based on emissions data and published emissions factors, the levels of volatile organic compounds (VOCs) released in normal operations annually from the liquefied natural gas operations at the Whitehorse station.

4. The permittee shall quantify the fugitive emissions of methane (CH_4) from the point of unloading of the liquefied natural gas into the storage tank to and including any emissions from the generator not emanating from the stack at the Whitehorse station.

PART 6: REPORTING

1. The permittee shall submit to an environmental protection analyst a report which identifies:
   a. the total annual operating hours for all sources at all sites;
   b. the estimated total annual emissions of SO_2, $PM_{2.5}$, CO, NO_2, and N_2O from each source at each of the sites, including the calculation used to determine those results;
   c. total annual emissions of volatile organic compounds (VOCs) as required in part 5.3 of this permit; and,
   d. a summary of the fugitive CH_4 monitoring program including methodology, data, and total fugitive emissions as required in part 5.4 of this permit;

   by March 31st of each year of this permit for the previous calendar year.

PART 7: UNAUTHORIZED EMISSIONS

1. The permittee shall contact either an environmental protection officer or the 24-hour Yukon Spill Report Centre (**867-667–7244**) as soon as possible under the circumstances in the event of an unauthorized release or emission, such as fugitive emissions or emissions resulting from burning fuel other than that allowed for under this permit.

PART 8: RECORDS

1. The permittee shall keep all records required under this permit in a format acceptable to an environmental protection officer for a minimum of three years and make them available for inspection by an environmental protection officer upon request.

2. The permittee shall keep the following records:
   a) a copy of each report and approved plans developed under this permit, and any amendments to and approvals (if applicable) of each report and plan;
   b) summaries of all inspections carried out under this permit (including the name of the person conducting the inspection, the date of each inspection, any observations recorded during the inspection, actions taken as a result of those observations, and the date each action was taken);
   c) notes concerning any spills, leaks or unauthorized emissions occurring at the site, including substance involved, estimated quantity, date of observation of the spill or leak, spill reports made and clean-up procedures implemented;
   d) any and all deficiencies remedied in accordance with Part 2.7, and how and when they were remedied; and
   e) notes concerning any instance where the most efficient source was not used in accordance with Part 3.3 and the reason for use of the less efficient source.

PART 9: EMERGENCY BACK-UP DIESEL GENERATORS AT WHITEHORSE STATION

1. The permittee is authorized to operate up to six emergency back-up generators, to a maximum cumulative total of 12 MW (2MW maximum capacity per unit), exclusively on diesel fuel at the Whitehorse Station only in the event that an N-1 event occurs, and

periodically for short periods to confirm operational readiness, up until March 31st, 2022, unless otherwise approved by the Branch.

2. In accordance with the manufacturer's recommendations and best management practices, the permittee shall inspect, maintain and operate the sources, any stand-alone air pollution control equipment, and testing and monitoring equipment as necessary to provide optimum control of air contaminant emissions during all operating periods.

3. Except for maintenance or test purposes, the permittee shall run the sources at each site in order of highest possible efficiency under the circumstances.

4. The permittee shall ensure that the fuel used by the source(s) conforms to the most recent Canadian federal *Sulphur in Diesel Fuel Regulations* for off-road applications.

From: Travis Ritchie
To: Janine.Kostelnik
Subject: RE: AEP 60-010 Amendment Application
Date: September 26, 2018 3:00:55 PM
Attachments: image002.png
image003.png
image004.png
image005.png
image006.png

Hi Janine,
Thanks for your reply.
To you questions:
In its last Resource Plan (2016) Yukon Energy reported that it has a capacity gap in the case of an emergency and that a permanent solution needed to be put in place to address that gap as well as serve growing loads. We have several options on the books, but the most efficient and expedient method is to construct a new thermal plant somewhere in the Whitehorse area. We knew that it was going to take a few years to get that in place and the best near-term solution was to install temporary units on a seasonal basis at the Whitehorse Rapids Generating Station, hence our amendment application late last year. Based on our estimates of load growth and the timing of having an new facility in service, we asked for the provision for 3 winters and up to 10MW (5 x 2MW temp units). In the short term our forecast capacity gap has increased so we are asking for the additional unit to make the 6 x 2MW units. We also determined that the limit at the WRGS substation was 12 MW, not 10MW as initially thought. Regarding the planning for a permanent solution, numerous hurdles in our path have hampered progress along that original schedule and we are not expecting to have a new, permanent, facility ready until 2022 at the earliest. That was the reason I asked this morning if the allowance for the temporary units could be extended to the end of the existing permit term, or to 2022, if the longer term is a challenge to grant.
Regarding the use of the temporary units last winter, the total runtime of all units together was 10 hours (about 2 hours each).
Hope this helps respond to your questions.
Regards,

Travis

From: Janine.Kostelnik@gov.yk.ca [mailto:Janine.Kostelnik@gov.yk.ca]
Sent: September 26, 2018 2:39 PM
To: Travis Ritchie
Subject: RE: AEP 60-010 Amendment Application
Hi Travis,
Just working on it now. Will get draft permit to you tomorrow.

Just to confirm your note here from 10:48 this morning. Am I correct in saying that:

- YEC are going to build a new thermal plant, which will take on the role of emergency backup electricity from the current emergency diesel generators
- The temporary diesels are permitted for March 31, 2020, which was amended into the permit after an initial request to amend the permit - by YEC - to expand the number of emergency diesel back-up generators from 4 to 5.
- The This deadline was identified by YEC as the date when they would no longer need the diesel

back-ups.

My questions to you:

- When are you expecting the thermal plant to come to life?
- Can you provide a summary of use of the emergency diesel back-up generators so far this calendar year?
- Confirm the reasoning why YEC initially requested the 5th generator and the March 31 2020 deadline.

Thank you,

Janine Kostelnik

From: Travis Ritchie [mailto:Travis.Ritchie@yec.yk.ca]
Sent: Wednesday, September 26, 2018 10:48 AM
To: Janine.Kostelnik
Subject: RE: AEP 60-010 Amendment Application

Hi Janine,

One thing we are anticipating to be a challenge is to plan, assess, permit and construct a new permanent thermal plan prior to the March 31st, 2020 date included in the amended permit for the allowance for temporary diesels. Not sure if this clause can simply be extended to the expiry date of the overall permit, but that would be helpful if it was possible.

Thanks for your consideration.

Regards,

T

From: Travis Ritchie
Sent: September 26, 2018 10:40 AM
To: 'Janine.Kostelnik@gov.yk.ca'
Subject: RE: AEP 60-010 Amendment Application

Hi Janine,

Thanks for the update. No sweat.

Will look forward to the permit soon.

Regards,

Travis

From: Janine.Kostelnik@gov.yk.ca [mailto:Janine.Kostelnik@gov.yk.ca]
Sent: September 25, 2018 1:06 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: AEP 60-010 Amendment Application

Hi Travis – as we speak your application is right in front of me! I will get to this tomorrow as I'm out of the office this afternoon. Apologies for the delay

Janine Kostelnik

From: Travis Ritchie [mailto:Travis.Ritchie@yec.yk.ca]

Sent: Tuesday, September 25, 2018 1:01 PM
To: Janine.Kostelnik
Subject: RE: AEP 60-010 Amendment Application

Hi Janine,

Just wanted to check in to see where you were at in your process on this amendment request? Our guys are working to install the units and are curious to know when they can schedule commissioning, which requires unit operation and hence some emissions.

Thanks for your time.

Regards,

Travis

From: Travis Ritchie
Sent: August 27, 2018 4:21 PM
To: 'Janine.Kostelnik@gov.yk.ca' <Janine.Kostelnik@gov.yk.ca>
Subject: AEP 60-010 Amendment Application

Hello Janine,

Please find our application and supporting documentation to amend Air Emissions Permit (No. 60-010) to incorporate the previously assessed natural gas 3rd engine, as well as the provision for an additional 2MW of short term back up diesel capacity we discussed earlier this year.

If you have any questions, comments, or concerns with the application please let me know.

Thank you for your time and consideration.

Regards,

Travis

yukon energy

Travis Ritchie P.Biol., EP

Manager - Environment, Assessment, & Licensing

Telephone: 867-393-5350 | Mobile: 867-333-0300

SustainableElectricityCompany™

From: Jennifer.Dagg
To: Janine.Kostelnik
Subject: RE: YEC Application to Amend permit
Date: May 7, 2018 8:36:12 AM
Attachments: image001.png

Hi Janine,
Thanks for putting all this info together in a short time.
I've now reviewed this document and I agree that no new assessment is required now based on the wording of the assessment trigger. But it's interesting to note that AER is specific to nameplate capacity. For future permits issued under this trigger (for YEC or others) it might be value to be specific about nameplate capacity in the permit (not number of generators).
I would state in communication to Travis that while this change does not trigger an assessment in our interpretation, we've noted the 2011 assessment estimates were based on nameplate capacity, and that the regs are specific to nameplate as well. For the sake of public transparency, it would be good if YEC provided info about the amount of diesel power (both nameplate and rated) as part of the upcoming assessment for the third LNG generator.
Thanks,
Jenn

From: Janine.Kostelnik
Sent: Friday, April 27, 2018 3:07 PM
To: Jennifer.Dagg
Subject: YEC Application to Amend permit
Jenn: here are the options and my recommendations. Let's discuss …
Options:
1. Scenario 1 (nameplate capacity): exceeds 25.2 scoped in threshold:
   25.2 – 9.1 + 10 = 26.1 total
2. Scenario 2 (rated capacity): is within threshold
   12.7 + 10 = 22.7 total

Recommendation:
- Scenario 2 is actual output (ie. rated), so assessment is not required. Amend permit to change from 4 to 5 generators under N1 conditions.

Yukon
Janine Kostelnik
Environmental Protection Analyst
Environment
867-667-5456 | Yukon.ca