MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

November 28, 2017

PERMIT TO INSTALL
117-17

ISSUED TO
Jaguar Energy, LLC

LOCATED AT
27 East Marlette Road
Waters, Michigan

IN THE COUNTY OF
Otsego

STATE REGISTRATION NUMBER
B6497

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: **October 24, 2017**	
DATE PERMIT TO INSTALL APPROVED: **November 28, 2017**	SIGNATURE:
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

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Common Abbreviations / Acronyms

Common Acronyms		Pollutant / Measurement Abbreviations	
AQD	Air Quality Division	acfm	Actual cubic feet per minute
BACT	Best Available Control Technology	BTU	British Thermal Unit
CAA	Clean Air Act	°C	Degrees Celsius
CAM	Compliance Assurance Monitoring	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	CO_2e	Carbon Dioxide Equivalent
CFR	Code of Federal Regulations	dscf	Dry standard cubic foot
COM	Continuous Opacity Monitoring	dscm	Dry standard cubic meter
Department/ department	Michigan Department of Environmental Quality	°F	Degrees Fahrenheit
		gr	Grains
EU	Emission Unit	HAP	Hazardous Air Pollutant
FG	Flexible Group	Hg	Mercury
GACS	Gallons of Applied Coating Solids	hr	Hour
GC	General Condition	HP	Horsepower
GHGs	Greenhouse Gases	H_2S	Hydrogen Sulfide
HVLP	High Volume Low Pressure*	kW	Kilowatt
ID	Identification	lb	Pound
IRSL	Initial Risk Screening Level	m	Meter
ITSL	Initial Threshold Screening Level	mg	Milligram
LAER	Lowest Achievable Emission Rate	mm	Millimeter
MACT	Maximum Achievable Control Technology	MM	Million
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts
MAP	Malfunction Abatement Plan	NMOC	Non-methane Organic Compounds
MDEQ	Michigan Department of Environmental Quality	NO_x	Oxides of Nitrogen
		ng	Nanogram
MSDS	Material Safety Data Sheet	PM	Particulate Matter
NA	Not Applicable	PM10	Particulate Matter equal to or less than 10 microns in diameter
NAAQS	National Ambient Air Quality Standards		
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonable Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition	SO_2	Sulfur Dioxide
SCR	Selective Catalytic Reduction	TAC	Toxic Air Contaminant
SNCR	Selective Non-Catalytic Reduction	Temp	Temperature
SRN	State Registration Number	THC	Total Hydrocarbons
TEQ	Toxicity Equivalence Quotient	tpy	Tons per year
USEPA/EPA	United States Environmental Protection Agency	µg	Microgram
		µm	Micrometer or Micron
VE	Visible Emissions	VOC	Volatile Organic Compounds
		yr	Year

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**

2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909-7760, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**

3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R 336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**

4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**

5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to R 336.1219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of R 336.1219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environmental Quality. **(R 336.1219)**

6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**

7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**

8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.

9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R 336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R 336.1303. **(R 336.1301)**
    a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
    b) A visible emission limit specified by an applicable federal new source performance standard.
    c) A visible emission limit specified as a condition of this Permit to Install.

12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R 336.1370(2). **(R 336.1370)**

13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R 336.2001 and R 336.2003, under any of the conditions listed in R 336.2001. **(R 336.2001)**

SPECIAL CONDITIONS

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Flexible Group ID
EUSWEETENING	Because there is H_2S present, the natural gas is considered sour gas. The sour gas is put through this sweetening process that uses amine to remove the H_2S. To prevent the H_2S from being released to the atmosphere, the H_2S is sent to the flare and burned. In the burning process, the H_2S converts to sulfur dioxide (SO_2). The resulting SO_2 is released to atmosphere and is less dangerous and has less odor than H_2S.	NA
EUDEHY	The natural gas is put through this glycol dehydration system and the water is removed.	NA
EUTANK	The 18,000 gallon tank is used to store condensate.	NA

The following conditions apply to: EUSWEETENING

DESCRIPTION: Because there is H_2S present, the natural gas is considered sour gas. The sour gas is put through this sweetening process that uses amine to remove the H_2S. To prevent the H_2S from being released to the atmosphere, the H_2S is sent to the flare and burned. In the burning process, the H_2S converts to sulfur dioxide (SO_2). The resulting SO_2 is released to atmosphere and is less dangerous and has less odor than H_2S.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT: Flare

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
1. SO_2	20.32 pounds per hour [a]	24-hour average	EUSWEETENING	VI.4	40 CFR 52.21(c) & (d)
[a] This is equivalent to a mass flow rate of hydrogen sulfide to the flare of 10.81 pounds per hour, based on a 24-hour average.					

II. MATERIAL LIMIT(S)

Material	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA	NA	NA	NA	NA	NA

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. The permittee shall operate a continuously burning pilot flame at the flare. The pilot flame shall burn only sweet natural gas. Sweet gas means any gas that is not a sour gas. Sour gas means any gas containing more than 1 grain of hydrogen sulfide or more than 10 grains of total sulfur per 100 standard cubic foot. **(R 336.1403(2)), R 336.1119(dd), R 336.1119(i))**

2. In the event that the pilot flame is extinguished, shut-in of EUSWEETENING shall commence automatically within one second. Operation of EUSWEETENING shall not be restarted unless the pilot flame is reignited and maintained. **(R 336.1403(5)(f))**

3. The permittee shall not operate EUSWEETENING unless all emergency relief valves are vented to the flare. **(R 336.1403(5)(c))**

4. If the concentration of hydrogen sulfide is more than 100 ppm in any building enclosing the sweetening process, all process inflow streams to the facility shall automatically begin a safe and orderly shutdown. Full operation may be resumed only after successful corrective measures have been applied. **(R 336.1403(5)(e))**

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3)))**

1. On a continuous basis, the permittee shall determine and record the volumetric flow rate of gas entering the plant. **(R 336.1403(5)(a))**

2. Once a month, the permittee shall determine and record the hydrogen sulfide concentration of the gas using colorimetric detector tubes or their equivalent. **(R 336.1403(5)(a))**

3. The permittee shall calculate and record the SO_2 emissions in pounds per hour based upon a 24-hour average using the equation in Appendix A. **(40 CFR 52.21(c) and (d))**

4. The permittee shall continuously monitor the concentrations of H_2S in the building enclosing the sweetening process. The sensors shall be placed as close to process equipment as practicable. The system shall be designed, installed, and maintained to provide a visual alarm when the hydrogen sulfide concentration is more than 50 ppm. **(R 336.1403(5)(d))**

5. The permittee shall perform non-certified visible emissions readings from the flare on a daily basis and record the following information: **(R 336.1910)**
   a. Are visible emissions present;
   b. The duration of the visible emissions;
   c. Any corrective actions taken to resolve the visible emissions.

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVFLARE	8	74	R 336.1403(2)

IX. OTHER REQUIREMENT(S)

NA

The following conditions apply to: EUDEHY

DESCRIPTION: The natural gas is put through this glycol dehydration system and the water is removed.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT: Flare

I. EMISSION LIMITS

NA

II. MATERIAL LIMITS

NA

III. PROCESS/OPERATIONAL RESTRICTIONS

1. The permittee shall not operate EUDEHY unless the glycol dehydrator is vented to the flare. **(R 336.1403(5)(c))**

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. If EUDEHY meets the exemption criteria in 40 CFR 63.764(e)(1)(i) for glycol dehydrators with actual annual average flow rate of natural gas less than 85,000 cubic meters per day, the actual flow rate of natural gas shall be determined using either of the procedures below:
   a. The permittee shall install and operate a monitoring instrument that directly measures natural gas flow rate to the glycol dehydration unit with an accuracy of plus or minus 2 percent or better. The permittee shall convert annual natural gas flow rate to a daily average by dividing the annual flow rate by the number of days per year the glycol dehydration unit processed natural gas. **(40 CFR 63.772(b)(1)(i))**
   b. The permittee shall document, to the AQD District Supervisor's satisfaction, that the actual annual average natural gas flow rate to the glycol dehydration unit is less than 85,000 cubic meters per day. **(40 CFR 63.772(b)(1)(ii))**

As an alternative, if EUDEHY meets the exemption criteria in 40 CFR 63.764(e)(1)(ii) for glycol dehydrators with actual average benzene emissions less than 0.90 megagram per year, the emissions shall be determined either uncontrolled, or with federally enforceable controls in place and using either of the procedures below:

c. The permittee shall determine actual average benzene emissions using the model GRI-GLYCalc™, Version 3.0 or higher, and the procedures presented in the associated GRI-GLYCalc™ Technical Reference Manual. Inputs to the model shall be representative of actual operating conditions of the glycol dehydration unit and may be determined using the procedures documented in the Gas Research Institute (GRI) report entitled "Atmospheric Rich/Lean Method for Determining Glycol Dehydrator Emissions" (GRI–95/0368.1). **(40 CFR 63.772(b)(2)(i))**

d. The permittee shall determine an average mass rate of benzene emissions in kilograms per hour through direct measurement using the methods in 40 CFR 63.772(a)(1)(i) or (ii), or an alternative method according to 40 CFR 63.7(f). Annual emissions in kilograms per year shall be determined by multiplying the mass rate by the number of hours the unit is operated per year. This result shall be converted to megagrams per year. **(40 CFR 63.772(b)(2)(ii))**

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

NA

IX. OTHER REQUIREMENT(S)

1. The permittee shall be in compliance with all applicable requirements of 40 CFR, Part 63, Subpart HH, National Emissions Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities. **(40 CFR, Part 63, Subpart HH)**

The following conditions apply to: EUTANK

DESCRIPTION: 18,000 gallon condensate storage tank.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT: Flare

I. EMISSION LIMIT(S)

NA

II. MATERIAL LIMIT(S)

NA

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. A vapor return system shall be employed in the load out of EUTANK. **(R 336.1403(5)(c))**

2. EUTANK shall be vented to the flare. **(R 336.1403(5)(c))**

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

NA

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

NA

IX. OTHER REQUIREMENT(S)

NA

FLEXIBLE GROUP SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGFACILITY	All process equipment source-wide including equipment covered by other permits, grand-fathered equipment and exempt equipment.	NA

The following conditions apply Source-Wide to: FGFACILITY

I. EMISSION LIMITS

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Testing / Monitoring Method	Underlying Applicable Requirements
1. SO_2	89 tpy	12-month rolling time period as determined at the end of each calendar month.	FGFACILITY	SC VI.2, VI.3, VI.4 and Appendix A	R 336.1205(1)(a) & (3)

II. MATERIAL LIMITS

1. The amount of sour natural gas processed by FGFACILITY shall not exceed 244,861,809 cubic feet per year based on a 12-month rolling time period as determined at the end of each calendar month. **(R 336.1205(1)(a) & (3))**

III. PROCESS/OPERATIONAL RESTRICTIONS

1. The permittee shall not process wells other than those wells specified in the AQD permit process without prior notification to the AQD. **(R 336.1225, R 336.1901)**

2. The permittee shall not operate FGFACILITY unless the preventative maintenance/malfunction abatement plan (PM / MAP), or alternate plan approved by the AQD District Supervisor, is implemented and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum, the plan shall include:
   a. Identification of the equipment and, if applicable, air-cleaning device and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
   b. Description of the items or conditions to be inspected and frequency of the inspections or repairs.
   c. Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
   d. Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
   e. A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

   If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the PM / MAP to be inadequate, the AQD District Supervisor may request modification of the PM/MAP to address those inadequacies. **(R 336.1702(a), R 336.1910, R 336.1911)**

IV. DESIGN/EQUIPMENT PARAMETERS

NA

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor and make them available by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any monitoring/recordkeeping special condition. **(R 336.1205(1)(a) & (3))**

2. On a continuous basis, the permittee shall determine and record the volumetric flow rate of sour gas entering the plant. **(R 336.1205(1)(a) & (3))**

3. Once a month, the permittee shall determine and record the hydrogen sulfide concentration of the sour gas entering the plant using colorimetric detector tubes or their equivalent. **(R 336.1205(1)(a) & (3))**

4. The permittee shall keep, in a satisfactory manner, hourly, monthly and 12-month rolling time period SO_2 emission calculation records for FGFACILITY, as required by SC I.1, and Appendix A. The permittee shall keep all records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205(1)(a) & (3))**

5. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period records of the amount of sour natural gas entering FGFACILITY. The permittee shall keep all records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205(1)(a) & (3))**

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTIONS

NA

IX. OTHER REQUIREMENTS

NA

APPENDIX A

SO_2 EMISSION CALCULATION METHODOLOGY

The permittee shall use the following calculation, in conjunction with monitoring, testing and recordkeeping data to determine the SO_2 emissions in pounds per hour based upon a 24-hour average.

$$SO_2 \text{ emissions}\left(\frac{\text{pound}}{\text{hour}}\right) = C \times V \times \frac{1\,\text{lb}\cdot\text{mol}}{379.4\ \text{ft}^3} \times \frac{34\ \text{lb}\ H_2S}{1\,\text{lb}\cdot\text{mol}\ H_2S} \times \frac{1\,\text{day}}{24\ \text{hr}} \times \frac{1.88\ \text{lb}\ SO_2}{1\,\text{lb}\ H_2S}$$

Where: C = H_2S concentration going to the flare expressed as $\frac{\text{ppm}_v\ H_2S}{10^6\ \text{ppm}_v\ \text{natural gas}}$

V = inlet gas volume expressed as MMSCFD

$$SO_2\ emissions\left(\frac{ton}{yr}\right) = \frac{SO_2\,pound}{hour} \times \frac{8760 hour}{year} \times \frac{ton}{2Kpounds}$$