Alternate Method of Control (AMOC) #138
Technical Review Summary

Company	***Gulf Coast Growth Ventures, LLC***	AMOC No. (Project No.)	***138 (302243)***
City	***Gregory***	Customer Reference No.	***CN605632439***
County	***San Patricio***	Regulated Entity No.	***RN109753731***
Project	***Multipoint Ground Flare (MPGF)***	Assoc. NSR Permit Nos.	***146425, PSDTX1518, GHGPSDTX170***
Site Name	***Ethylene Plant***	Assoc Title V Permit No.	***NOT YET ASSIGNED***
RO/DAR Contact	*Mr. William H. Cheek, President* *GCGV, LLC* *Bill.Cheek@exxonmobil.com*	Tech Contact	*Philip E. Nangle* *GCGV Project, Environmental Coordinator* *1735 Hughes Landing Blvd., E.07.S196* *The Woodlands, Texas 77380* *281-630-4287 Mobile 346-259-5759 Office* *Philip.E.Nangle@EXXONMOBIL.COM* *Shawn Simmons* *Shawn.E.Simmons@exxonmobil.com*

Project Overview:
On May 30, 2019 Gulf Coast Growth Ventures (GCGV) submitted a multipoint ground flare (MPGF) test protocol. GCGV is currently applying for the above-referenced permits for a new ethylene plant. One of the controls included as a part of this new plant is a multi-point ground-flare (MPGF) system. The new MPGF is designed to provide safe control of gases vented from normal operations, and startup and shutdown with various stages operating under 40 CFR §60.18 and others which will not meet the tip velocity requirements of those regulations.

Background:
GCGV is a joint venture between ExxonMobil Chemical Company (XOM) and Saudi Basic Industries Corporation (SABIC). The entity proposes to construct a new organic chemicals manufacturing complex ("the GCGV complex") in San Patricio county consisting of: a steam cracking plant ("Ethylene Plant" or "Olefins Plant") for production of ethylene, using ethane as feedstock; a monoethylene glycol (MEG) plant, employing ethylene oxide (EO) as an intermediate; and two linear low density polyethylene (LLDPE) plants. A closed vent system (the "shared vent system") which includes a multi-point ground flare, an elevated flare, a flare gas recovery unit, and two thermal oxidizers in parallel, will be shared by the Ethylene plant and the PE plant.

The permit allows for flaring of high-pressure vents from the MPGF when two or more boilers are in low firing mode and unable to accept gas from the flare gas recovery unit. The permit also allows flaring of high-pressure vents during the shakedown period (defined as the 180-day period following initial start-up of the plant). The MPGF system, including high pressure stages, will also be used during process turnarounds, MSS, and emergency and upset situations.

Regulatory Applicability:
The sources and streams which vent to the MPGF system are potentially subject to Texas SIP regulations which require up to 90% VOC control for applicable sources in San Patricio County as noted in 30 Texas Administrative Code (TAC) Chapter 115, thus needing to obtain an alternate means of control (AMOC) approval from the TCEQ. The sources are also applicable to numerous federal regulations which may have flares as a potential control, thus needing to obtain an alternate approval (AMEL) for any affected source (see Attachment A). At this time, EPA is not processing MPGF AMEL applications and has delegated that review to states which follow their framework as published.

Overview:
The MPGF will provide reliable and safe disposal of hydrocarbon vapor streams that may result from upsets and emergency events or planned maintenance, startup and shutdown (MSS) activities. The system consists of 19 stages each with three (3) pilots and a total of 630 burners. While the MPGF system does not have a spare stage, it is designed to operate with one stage out of service at higher operating pressures. It is the high pressure (HP) stages which are the focus of this review. The details of the design and operations are included in Attachment B. Prior to the full AMOC submittal and evaluation (as required by the permit conditions, and following the framework and guidance provided by EPA for MPGF AMELs), GCGV and Zeeco must perform various performance testing to demonstrate proper flare operation, cross-lighting, flame stability, smokeless operation, and destruction rate effectiveness (DRE).

Review Summary:
For consistency, this AMOC (like all MPGF AMOC requests) is evaluated based on the administrative and technical requirements published by EPA for MPGF AMELs (relevant portions only).

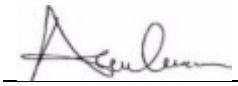
GCGV evaluated all potential operational and emergency scenarios and included four (4) worst-case conditions for testing and demonstration of the MPGF system, including both high- and low-pressure scenarios. Details on the chemical mixtures and justification for the testing scenarios was submitted and a summary is included in Attachment C.

Performance testing is to be conducted on Zeeco MJ-4 style burners. Testing is scheduled for **June 17th, 2019**. The testing will occur by Zeeco at their Combustion and Research Test Facility located in Broken Arrow, Oklahoma. Test runs will be performed under the most challenging conditions for cross-lighting, stability, and smokeless operation performance. The detailed analysis for the test protocol is in Attachments D & E. Additional details on the cross-lighting tests was requested and received on 6/7/19.

Request for Comments:

From	Program Staff	Date	Comments/ Resolutions
NSR	Jeff Grief, Technical Specialist	6/4/19 – 6/7/19	Confirm stability and cross-light testing will meet requirements. *See details Attachments D & E*.
Reg 14	Kelly Ruble, Air Program Mgr	6/4/19 – 6/5/19	No concerns
OCE	Michael Miller, Program Support	6/4/19	No comments Defer to Region
EPA	Brenda Shine, OAQPC	6/4/19	No comments
EPA 6	Cynthia Kaleri, Region 6	6/4/19	No comments

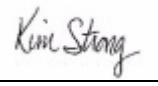
Recommendation: The testing protocol presented by GCGV and Zeeco meets all TCEQ expectations and approval to proceed is recommended.



6/7/19

Anne Inman, PE
Project Reviewer

Date



Kim Strong,
Special Assistant
to Director

6/10/2019

Date

Attachment A: Potential State and Federal Applicability

30 Texas Administrative Code (TAC) Chapter 115

- Subchapter B: General Volatile Organic Compound Sources,
  - Division 2: Vent Gas Control, 115.122;
  - Division 3: Water Separation; and
  - Division 4: Industrial Wastewater

- Subchapter C: Volatile Organic Compound Transfer Operations
  - Division 1: Loading And Unloading Of Volatile Organic Compounds

- Subchapter D: Petroleum Refining, Natural Gas Processing, and Petrochemical Processes.
  - Division 1: Process Unit Turnaround And Vacuum-Producing Systems In Petroleum Refineries
  - Division 3: Fugitive Emission Control In Petroleum Refining, Natural Gas/Gasoline Processing, And Petrochemical Processes In Ozone Nonattainment Areas

- Subchapter F: Miscellaneous Industrial Sources
  - Division 3: Degassing Of Storage Tanks, Transport Vessels And Marine Vessels

- Subchapter H: Highly-Reactive Volatile Organic Compounds
  - Division 1: Vent Gas Control
  - Division 2: Cooling Tower Heat Exchange Systems
  - Division 3: Fugitive Emissions

Standards of Performance for New Stationary Sources (NSPS), 40 Code of Federal Regulations (CFR) Part 60:

- Subpart A, General Provisions.

Subpart Db, Industrial-Commercial-Institutional Steam Generating Units.
Subpart Kb, Volatile Organic Liquid Storage Vessels.
Subpart VVa, Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI).
Subpart DDD, Polymer Manufacturing Industry.
Subpart NNN, SOCMI Distillation Operations.
Subpart RRR, SOCMI Reactor Processes.
Subpart IIII, Stationary Compression Ignition Internal Combustion Engines.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) in 40 CFR Part 61:

- Subpart A, General Provisions.
- Subpart J, Equipment Leaks of Benzene.
- Subpart FF, Benzene Waste Operations.

Maximum Achievable Emission Limits (MACT) for NESHAP Sources in 40 CFR Part 63:

- Subpart A, General Provisions.
- Subpart F, SOCMI.
- Subpart G, SOCMI Process Vents, Storage Vessels, Transfer Operations, and Wastewater.
- Subpart H, Equipment Leaks.
- Subpart UU, Equipment Leaks— Control Level 2 Standards.
- Subpart SS, Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process.
- Subpart WW, Storage Vessels— Control Level 2 Standards.
- Subpart XX, Ethylene Manufacturing Process Units: Heat Exchange Systems and Waste Operations
- Subpart YY, Generic Maximum Achievable Control Technology Standards.
- Subpart EEEE, Organic Liquids Distribution (Non-Gasoline).
- Subpart FFFF, Miscellaneous Organic Chemical Manufacturing.
- Subpart ZZZZ, Stationary Reciprocating Internal Combustion Engines.
- Subpart DDDDD, Industrial, Commercial, and Institutional Boilers and Process Heaters.

Attachment B: Details of Design and Operation

Zeeco intends to challenge the performance of the MPGF burners over a range of fuels, pressures, and flow rates that are representative of expected field conditions. Performance of the burners will be demonstrated by flame stability and destruction and removal efficiency (DRE). The testing will be performed on fuel mixtures and operating pressures to confirm the DRE and stability performance of all gas cases for this project. The test burners will be of the same design as the burners being supplied on this order for the Gulf Coast Growth Ventures (GCGV) Project.

An 800 Btu/scf NHV mixture of Propylene and Nitrogen was chosen as the test fuel to provide the worst-case most challenging DRE conditions when operating at high pressure. The 100% Propylene case was chosen as the test fuel to represent heavy hydrocarbons and provide the most challenging DRE conditions when operating at low pressure.

All burners provided for this project are Zeeco MJ-4 style burners. These burners are drilled with ports of varying size and quantity to achieve the appropriate tip exit area required for the flare. For this project and this test there is one tip areas, 3.38 square inches representing Stage 1-19 burners.

As the gas fires out of the ports on the burner, it will mix with air and burn. Smaller burner exit areas will induce a more aerated jet exiting the burner than a larger exit area would (considering same pressure and gas composition). As a result, stability is more difficult when using smaller jets (smaller tip area) as opposed to larger jets (larger tip area). Lower BTU gases do not require as much aeration as higher BTU gases. Therefore, smaller burner areas and lower BTU gases present more difficulty to fire with stability when compared to higher BTU gases and larger burner areas. Larger burner exit areas will have larger diameter ports (considering same drill patterns) meaning larger core gas streams that are less likely to mix thoroughly with the aspirated air. As a result, complete combustion/destruction is less likely when using larger jets (larger tip area) as opposed to smaller jets (smaller tip area). Higher BTU gases require much more air for combustion as compared to lower BTU gases. Therefore, larger burner areas and higher BTU gases present more difficulty to fire with complete combustion/destruction of the flared gas when compared to lower BTU gases and smaller burner areas.

The following burner will be used to perform the project testing: One (1) MPGF burner representing Stage 1-19 Drilling
The test burner will be mounted on a temporary manifold, and valves will be installed at the base of each riser so that only one tip will operate at a time. A single burner will be used for this DRE testing to avoid the possibility of interaction with an adjacent firing burner inducing more stability i.e. worst-case scenario.

Attachment C: Operational Scenarios

4.1. Test Point #1 High Pressure/Low BTU DRE Test
The test fuel for this test point is the 800 Btu/scf Propylene/N2 mixture. One (1) Stage 1-19 burner will be fired for this test point. The test point will be fired at the staging pressure of the burner (high-pressure). The test point will be held for a minimum of twenty (20) minutes. Extractive sampling will be performed during this test point to determine DRE performance. This test point will be performed three (3) times. This test point is designed to challenge the small area burner at the staging pressure for stability/DRE performance when firing a Low BTU content fuel. The test gas is a diluted mixture of Olefin and Nitrogen, the burner area is the smallest area for the project, and the operating pressure is the highest the burner is expected to experience. The high operating pressure means a high exit velocity which will cause the test fuel to aspirate the most air, possibly over aerating the already dilute test fuel mixture.

4.2. Test Point #2 Low Pressure/Low BTU DRE Test
The test fuel for this test point is the 800 Btu/scf Propylene/N2 mixture. One (1) Stage 1-19 burner will be fired for this test point. The test point will be fired at the de-staging pressure of the burner (low-pressure). The test point will be held for a minimum of twenty (20) minutes. Extractive sampling will be performed during this test point to determine DRE performance. This test point will be performed three (3) times. This test point is designed to challenge the small area burner at the de-staging pressure for stability/DRE performance when firing a Low BTU content fuel. The test gas is a diluted mixture of Olefin and Nitrogen, the burner area is the smallest area for the project, and the operating pressure for this test point is the lowest the burner is expected to experience. The low operating pressure means a low exit velocity which will cause the test fuel to aspirate the least air, possibly not having sufficient air to fully complete the combustion/destruction process.

4.3. Test Point #3 High Pressure/High BTU DRE Test
The test fuel for this test point is 100% Propylene. One (1) Stage 1-19 burner will be fired for this test point. The test point will be fired at the staging pressure of the burner (high-pressure). The test point will be held for a minimum of twenty (20) minutes. Extractive sampling will be performed during this test point to determine DRE performance. This test point will be performed three (3) times. This test point is designed to challenge the small area burner at the staging pressure for stability/DRE performance when firing a High BTU content fuel. The test gas is 100% Olefin content, the burner area is the smallest area for the project, and the operating pressure is the highest the burner is expected to experience. The high operating pressure means a high exit velocity which will cause the test fuel to aspirate the most air, possibly over aerating the test fuel leading to poor combustion and low DRE.

4.4. Test Point #4 Low Pressure/High BTU DRE Test
The test fuel for this test point is 100% Propylene. One (1) Stage 1-19 burner will be fired for this test point. The test point will be fired at the de-staging pressure of the burner (low-pressure). The test point will be held for a minimum of twenty (20) minutes. Extractive sampling will be performed during this test point to determine DRE performance. This test point will be performed three (3) times. This test point is designed to challenge the small area burner at the de-staging pressure for stability/DRE performance when firing a High BTU content fuel. The test gas is 100% Olefin content, the burner area is the smallest area for the project, and the operating pressure for this test point is the lowest the burner is expected to experience. The low operating pressure means a low exit velocity which will cause the test fuel to aspirate the least air, possibly not having sufficient air to fully complete the combustion/destruction process.

Attachment D: Regulatory Requirements and Guidelines

Part 1: 30 TAC Chapter 115, Subchapter J, Division 1: Alternate Means of Control

Rule Citation	Requirement	Review
§115.910	**Availability of Alternate Means of Control**	
§115.910(a)	Any person … may request approval of an AMOC…. AMOC plan shall be approved if it is demonstrated that the plan meets all applicable criteria and procedures of §§115.911 - 115.913, 115.915, and 115.916	*GCGV submitted a complete AMOC Test Protocol application for a MPGF.*
§115.910(b)	An AMOC applicant may apply to the executive director for a waiver of portions of §115.913 … §115.914 and §115.915	*No waivers were requested.*
§115.910(c)	Application for an AMOC plan does not stay enforcement of regulations of this chapter.	*Applies in all cases.*
§115.910(d)	Any violation of an AMOC plan shall be subject to enforcement action as a violation of this chapter.	*Applies in all cases.*
§115.911	**Criteria for Approval of Alternate Means of Control Plans**	
	An AMOC plan shall be approved if it meets each of the following criteria, as applicable	*Applies in all cases.*
§115.911(1)	All facilities covered by the AMOC plan are and remain in the same account number	*All facilities covered under the AMOC are located at the same site.*
§115.911(2)	The AMOC plan must propose annual emission limits …[which] results in net emissions reductions equal to or greater than reductions that would be achieved if each source complied with all applicable requirements	*The permit conditions and limitations are 98-99.5% DRE and is expected to meet or exceed all requirements.*
§115.911(3)	If the AMOC plan involves any source with a proposed annual emission limit which exceeds the baseline … the AMOC plan must provide additional reductions … multiplied by the applicable factor	*Not applicable.*
§115.911(4)	The AMOC application must demonstrate that the sum of the maximum daily potentials to emit … shall not be more than 200 lbs per day greater than … if the emissions were controlled in accordance with this chapter	*Not applicable*
§115.911(5)	The AMOC must be implemented and reductions created after January 1, 1991	*The MPGF will be operated after January 1, 1991.*
§115.911(6)	Reductions in actual emissions accounted for in the AMOC plan must be surplus and remain surplus to reductions required by this chapter and any netting or offsetting requirements	*Applies in all cases.*
§115.911(7)	Mobile sources and indirect sources (Federal Clean Air Act, §110(a)(5)(C)) shall not be included in the AMOC plan	*Not applicable.*
§115.911(8)	For purposes of demonstrating reductions …quantification of emissions must be accomplished using any of the methods as specified by the ED	*The calculation methods are the same as used in the permit review.*
§115.911(9)	The AMOC plan must establish emission limits and/or control requirements for all sources in the plan which render the proposed annual emission limits enforceable	*The plan will include operating requirements and limitations once the full application is reviewed.*
§115.911(10)	The AMOC plan must include all necessary and appropriate provisions for monitoring, testing, reporting, and recordkeeping as specified by the executive director. The frequency of AMOC required monitoring, testing, reporting, and recordkeeping shall be sufficient to reasonably ensure compliance with applicable emission limits and/or control requirements. The monitoring, testing, reporting, and recordkeeping shall be at least as reliable, readily retrievable, and retained for a comparable period of time as the underlying requirements of this chapter	*The plan will include monitoring, testing, reporting, and recordkeeping sufficient to reasonably ensure compliance with applicable emission limits and/or control requirements.*

§115.912 (a)-(f)	**Calculations for Determining Alternate Means of Control Reductions**	*Not applicable*
§115.913	**Procedures for Alternate Means of Control Plan Submittal**	
§115.913(a)	All persons requesting an AMOC plan …shall submit a proposed AMOC plan and demonstration to the executive director; copies …to the appropriate regional office… any local air pollution control program with jurisdiction …and copies to the EPA regional office	*Copy of the AMOC application sent to TCEQ Region 14 and EPA Region 6.*
§115.913(b)(1)	The plan shall include AMOC applicant name with mailing address, site name with physical address, account number, contact person including address and telephone number	*All of this information was included and is listed in this technical analysis.*
§115.913(b)(2)	The plan shall include an identification and a description of the sources involved in the AMOC plan including any applicable air permit numbers, plot plans, detailed flow diagrams, EPNs, and FINs; an identification of the provisions of this chapter that are applicable; and an identification of promulgated provisions of this chapter that will be applicable to such sources; and a description of normal operating conditions	
§115.913(b)(3)	The plan shall include quantification of the AMOC plan sources' actual emissions	*The MPGF operations are covered by the Permit MAERT and are not changing.*
§115.913(b)(4)	The plan shall include quantification of annual emission limits and daily maximum potential emissions from all sources affected by the AMOC showing the difference between projected emissions from the affected source(s) without the AMOC plan and projected emissions resulting under the proposed AMOC	
§115.913(b)(5)	The plan shall include specification of emission limitation(s) and control requirement(s) to be applicable to each source affected by the proposed AMOC plan	
§115.913(b)(6)	The plan shall include a description of the compliance methodologies, including monitoring, testing, reporting, and recordkeeping measures, that will be used to enforce the emission limitation(s) and/or control requirement(s) applicable to each source affected by the AMOC plan	*To be reviewed after Testing Report complete.*
§115.913(b)(7)	The plan shall include a sample of reporting and recordkeeping forms to be utilized	*This information included in the application.*
§115.913(b)(8)	The plan shall include a demonstration that the AMOC plan satisfies each applicable requirement of §115.911	
§115.913(b)(9)	The plan shall include a list containing the name, address, and telephone number of any air pollution control program with jurisdiction over the account affected by the AMOC	
§115.913(b)(10)	The plan shall include any other relevant information necessary to evaluate the merits and/or enforceability of the AMOC plan, as may be requested by the ED	*See below.*
§115.913(c)	All representations with regard to the AMOC plan, as well as any provisions attached to the AMOC plan, become conditions upon which the subsequent AMOC plan is issued. It shall be unlawful for any person to vary from such representation or provision if the change will cause a change in the method of control of emissions, the character of the emissions, or will result in an increase in the discharge of the various emissions. It shall also be unlawful for any AMOC holder to vary from the emission limits, control requirements, monitoring, testing, reporting, or recordkeeping requirements of an approved AMOC plan	*Applies in all cases.*
§115.913(d)	Applications to amend or revise an AMOC plan shall be submitted subject to the requirements of this chapter	*Applies in all cases.*
§115.914	Upon a preliminary determination to approve or deny the proposed alternative means of control (AMOC) plan, the executive director shall, in writing, so notify the submitter of the plan, any local air pollution control program with jurisdiction over the account affected by the AMOC plan, and the EPA regional office	*To be determined at a later date.*

§115.915 (a) – (c)	**Public Notice Format**	*To be determined at a later date.*
§115.916	**Review of Approved Alternate Means of Control Plans and Termination of Alternate Means of Control Plans**	
§115.916(a)	For the purposes of this division (relating to Alternate Means of Control), "compliance date" shall mean the date by which a source must comply with new or modified sections of this chapter.	*Applies in all cases.*
§115.916(b)	Unless revised to reflect new regulatory requirements, an alternative means of control (AMOC) plan becomes void on the compliance date specified for a new or modified section of this chapter affecting a source subject to an AMOC plan.	*Applies in all cases.*
§115.916(c)	The holder of an AMOC plan shall comply with the requirements of this chapter if the AMOC plan voided	*Applies in all cases.*
§115.916(d)	Upon final approval of an AMOC plan, the owner or operator of the facilities affected by such plan shall keep a copy of the plan on the site affected by the plan and shall make the plan available upon request to representatives of the executive director, EPA, or any local program	*Applies in all cases.*
§115.916(e)	Upon request, each holder of an AMOC plan shall submit to the executive director a demonstration that the plan continues to meet all applicable criteria of this division	*Applies in all cases.*
§115.916(f)	An AMOC holder is responsible for obtaining a new AMOC plan prior to the compliance date of any new or modified regulation of this chapter that affects a source subject to an AMOC plan	*Applies in all cases.*
	The plan shall include any other relevant information necessary to evaluate the merits and/or enforceability of the AMOC plan, as may be requested by the ED	
§115.122(a)(1)(B) §115.126(1)(B)	*As part of the PE Unit, an interconnected set of control devices (i.e., a vent collection system), which includes a Multi-Point Ground Flare (MPGF) System, will handle the waste gases. The MPGF System is a state-of-the art flare technology that achieves higher destruction and removal efficiency (DRE) through different operational and design principles than a traditional elevated flare.*	
Other Reg's	*There are other requirements in 30 TAC Chapter 115 SC B and 30 TAC Chapter 115 SC D that apply to controlled waste gas streams at the new PE Unit but that are not on the high pressure header connected to the MPGF. The requirements of the specific citations above are to meet requirements in 40 CFR §60.18, including maintaining the minimum heating value of the waste gas above the specification in 40 CFR §60.18(c)(3) and to restrict the exit velocity of the flare to below the specification in 40 CFR §60.18(c)(4) as the MPGF is a non-assisted flare.*	

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Attachment E: Outline of Technical Requirements for MPGF

Requirements based on EPA final Framework Outline as published in the Federal Register 2016-04-21 FR Vol. 81, No. 77, pgs 23480-88) https://www.gpo.gov/fdsys/pkg/FR-2016-04-21/pdf/2016-08911.pdf.
Updates on MPGF AMEL reviews proposal published 4/25/18 have no effect on the Test Protocol Reviews.

Ref #	Requirements	Description / Application
	Applicant provide copies of all of the following to EPA & TCEQ	*Copy of the AMOC application sent to TCEQ Region 14 and EPA Region 6.*
(1)	**Project Scope and Background**	
(1)(a)	Size and scope of plant,	*A description of the plant operations, MSS and upsets for the use of the flare system was included.*
	products produced,	*Ethylene & polyethylene.*
	location of facility, and	*Gregory, San Patricio County.*
	the MPGF proximity, if less than 2 miles, to the local community and schools.	*The proposed plant is located in an industrial area.*
(1)(a)(b)	Details of overall emissions control scheme (e.g., low pressure control scenario and high pressure control scenario),	*Normal production unit emissions are not sent to MPGF. All stages will have 3 pilots per each of the flare stages. The systems will additively open subsequent stages depending on the pressure on the main flare header. The MPGF will be surrounded by a radiation fences to ensure minimization of heat and light pollution. Four different scenarios with associated flow, composition, and pressure were presented as worst-case.*
	MPGF capacity and operation (including number of rows (stages),	
	number of burners and pilots per stage and staging curve), and	
	how the MPGF will be used (e.g., controls routine flows, only controls flows during periods of startup, shutdown, maintenance, emergencies).	
(1)(c)	Details of typical and/or anticipated flare waste gas compositions and profiles to be routed to the MPGF for control.	
(1)(d)	MPGF burner design type, geometry, and size.	*Included in the Confidential submittal*
(1)(e)	Anticipated date of startup.	***PERFORMANCE TESTING SCHEDULED 6/17/19.***
(2)	**Regulatory Applicability**	
(2)(a)	Detailed list or table of applicable NESHAP, MACT, and/or NSPS	*Included above*
	applicable standards that allow use of flares	
(3)	**Destruction Efficiency/Combustion Efficiency Performance Demonstration**	
(3)(a)	Sources must provide a performance demonstration to the agency that the MPGF pressure-assisted burner being proposed for use will achieve a level of control at least equivalent to the most stringent level of control required by the underlying standards (e.g., 98% destruction efficiency or better). Facilities can:	*Performance testing will be conducted on an MPGF burner by Zeeco at their Combustion and Research Test Facility located in Broken Arrow, Oklahoma. Two chemical mixture of propylene and nitrogen/propylene mix have been shown to be the most difficult to burn smokelessly.*
	do a performance test that includes a minimum of three test runs under the most challenging conditions (e.g., highest operating pressure and/or sonic velocity conditions) using passive Fourier transform infrared spectroscopy (PFTIR) testing,	
	extractive sampling,	
	or rely on an engineering assessment.	
	Sources must test [or otherwise justify] using fuel representative of the type of waste gas the MPGF will typically burn or substitute a waste gas such as an olefin gas or olefinic gas mixture that will challenge the MPGF to achieve a high destruction efficiency smokelessly.	*The engineering assessment included conservative comparisons for representative waste gas mixtures, resulting in 4 composition and flow characteristic scenarios. There are several reasons why propylene is a conservative test species for stability, cross-light and DRE testing compared to ethylene. Propylene has a) slower flame speed, b) a narrower flammability range, c) higher heating value (needing more diluent to achieve same NHV target) and d) a higher auto-ignition temperature. All these properties make propylene more difficult to fully combust compared to ethylene and therefore is considered a more challenging species for performance testing.*
Ref #	**Requirements**	***Description / Application***
(3)(a)(i)	If a performance test is conducted on the burners, a test report must be submitted to the agency which includes at a minimum:	*The test sets of Burners for DRE include the burner size used. All required procedures and documentation shall occur during the testing.*
	A description of the testing,	
	a protocol describing the test methodology used,	
	associated test method quality assurance/quality control (QA/QC)	

	parameters	
	raw field and laboratory data sheets,	
	summary data report sheets,	
	calibration standards,	
	calibration curves,	
	completed visible emissions observation forms,	
	a calculation of the average destruction efficiency,	
	combustion efficiency over the course of each test,	
	the date, time and duration of the test,	
	the waste gas composition and NHVcz and/or LFLcz	
	the flowrate and velocity of the waste gas,	
	the MPGF burner tip pressure,	
	waste gas temperature,	
	meteorological conditions (e.g., ambient temperature, and barometric pressure, wind speed and direction, relative humidity), and	
	whether there were any observed flare flameouts.	
(3)(a)(ii)	If an engineering assessment is done, sources must provide to the agency a demonstration that a proper level of destruction/combustion efficiency was obtained through prior performance testing for a similar equivalent burner type design. To support an equivalent burner assessment of destruction/combustion efficiency, sources must discuss and provide information related to	*No previous performance tests and represented conditions relied upon for any of the justifications used.*
	design principles of burner type,	*Detailed specifics on the burners was provided as trade secret and proprietary.*
	burner size,	
	burner geometry,	
	air-fuel mixing, and	
	the combustion principles associated with this burner that will assure smokeless operation under a variety of operating conditions.	
	Similarly, sources must also provide details outlining why all of these factors, in concert with the waste gas that was tested in the supporting reference materials, support the conclusion that the MPGF burners being proposed for use by the source will achieve at least an equivalent level of destruction efficiency in the applicable regulations.	*GCGV will demonstrate that the MPGF is at least as equivalent as a standard flare at 98% DRE.*
(4)	**MPGF Stability Testing**	
(4)(a)	The operation of a MPGF with a stable, lit flame is of paramount importance to continuously ensuring good flare performance; therefore, any source wishing to demonstrate equivalency for purposes of using these types of installations must conduct a stability performance test. Since flare tip design and waste gas composition have significant impact on the range of stable operation, sources should use a representative waste gas the MPGF will typically burn or a waste gas, such as an olefin or olefinic mixture, that will challenge the MPGF to perform at a high level with a stable flame as well as challenge to achieve smokeless operation.	*Stability testing will be conducted on the MPGF burners 6/17/19.*

Ref #	Requirements	*Description / Application*
(4)(b)	Sources should first design and carry out a performance test to determine the point of flare flame instability and flameout for the MPGF burner and waste gas composition chosen to be tested. Successful, initial demonstration of stability is achieved when there is a stable, lit flame for a minimum of five minutes at consistent flow and waste gas composition.	*The test report will detail cross-lighting, stability, and smokeless operation performance. The supporting documentation will justify the equivalency of the specified burners in representing worst case operations and design.*
	It is recommended, although not required, that sources determine the point of instability at sonic flow conditions or at the highest operating pressure anticipated.	
	Any data which demonstrates instability and complete loss of flame prior to the five minute period must be reported along the initial stable flame demonstration.	*This information will be included in the raw data of the test report.*
	Along with destruction efficiency and combustion efficiency, the data elements laid out in 3(a)(i) should also be reported.	
(4)(c)	Using the results from (b) above as a starting point, sources must perform a minimum of three replicate tests at both minimum and maximum operating conditions on at least one MPGF burner at or above the NHVcz or at or below the LFLcz	*The supporting documentation will show three test runs for all represented worst case operations and design.*
	If more than one burner is tested, the spacing between the burners must be representative of the projected installation.	
	Each test must be a minimum of 5-minutes in duration with constant flow and composition for the three runs at minimum conditions,	*Each test will be a minimum of 5-minutes in duration with constant flow and composition for 3 runs at minimum conditions and 3 runs at maximum conditions.*
	Each test must be a minimum of 5-minutes in duration with constant flow and composition for the three runs at the maximum conditions.	
	The data and data elements mentioned in 4(b) must also be reported.	*The data collected will be reported.*
(5)	**MPGF Cross-light Testing**	
(5)(a)	Sources must design and carryout a performance test to successfully demonstrate that cross-lighting of the MPGF burners will occur	*Confirmed cross-light testing protocol meets framework expectations. Additional information requested a*nd received *6/7/19. Testing previously occurred on this burner configuration under worst-case fuel conditions on 4/2219 – 4/26/19 and met all previous AMOC/AMEL protocol expectations. A detailed summary of the protocol and test results were submitted.*
	over the range of operating which the burners will be used.	
	Sources may use the NHVcz and/or LFLcz	
	Perform a minimum of three replicate runs at each of the operating conditions.	
	Sources must cross-light a minimum of three burners and	
	the spacing between the burners and location of the pilot flame must be representative of the projected installation.	
	A description of the testing	
	A protocol describing the test methodology used	
	Associated test method QA/QC parameters,	
	The waste gas composition and	
	NHVcz and/or LFLcz of the gas tested,	
	The velocity (or Mach speed ratio) of the waste gas tested,	
	The MPGF burner tip pressure.	
	The time, length, and duration of the test	
	successful cross-light observed over all of the burners and	
	the length of time it took for the burners to cross-light,	
	maintaining a stable flame after a successful cross-light	
	the duration [successful cross lighting] was observed	
	records of any smoking events during the cross-light,	
	waste gas temperature, and	
	meteorological conditions (e.g., ambient temperature, barometric pressure, wind speed and direction, and relative humidity),	
	whether there were any observed flare flameouts.	

Ref #	Requirements	*Description / Application*
(6)	Flaring Reduction Considerations	*GCGV proposes to use the MPGF during non-routine operations, such as upsets or planned MSS. The "staged" control system will route waste gas streams meeting the minimum operating requirements of the MPGF to the MPGF. The MPGF is designed to handle these streams, as well as optimize, and control the combustion to achieve a high destruction efficiency. Startup, Shutdown and Malfunction procedures are developed to minimize flaring emissions and recover as much process material as possible. The response plan for malfunctions includes taking steps to stabilize the situation, minimize emissions, and correct or repair the root cause of the event in a safe, efficient and timely manner as soon as practicable. Equipment maintenance procedures are also developed to ensure continuous reliable operation of the unit resulting in fewer upset flaring conditions and optimal equipment operations in rare instances when events occur.*
(6)(a)	Sources must make a demonstration, considering MPGF use, on whether additional flare reduction measures, including flare gas recovery, should be used and implemented	
(7)	MPGF Monitoring and Operating Conditions	*When waste gas is being combusted in the MPGF, all continuous monitoring systems shall be in continuous operation except for system breakdowns, repairs, calibration checks, periodic maintenance and zero and span adjustments to monitor and record data to demonstrate on-going compliance with the limitations proposed in this AMOC request to achieve the permitted DRE.*
(7)(a)	Based on the results of the criteria mentioned above in this section, sources must make recommendations to the agency on the type of monitoring and operating conditions necessary for the MPGF to demonstrate equivalent reductions in emissions as compared to flares complying with the requirements at 40 CFR 60.18 and 40 CFR 63.11, taking into consideration a control scheme designed to handle highly variable flows and waste gas compositions.	