



July 31, 2025

Transmitted via Email

Nishita Singh
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RE: Alternative Monitoring Plan - 40 Code of Federal Regulations (CFR) Part 63, National Emission Standards for Hazardous Air Pollutants (NESHAPS)-Subpart YYYYY-Stationary Combustion Turbines – Eighteen (18) Stationary Combustion Turbines without Oxidation Catalyst-Cheniere Energy-Corpus Christi Liquefaction-Gregory, Texas

Dear Ms. Singh:

This letter is in response to the Alternative Monitoring Plan (AMP) request to the U.S. Environmental Protection Agency (EPA) Region 6, dated February 9, 2023, to petition for operating limitations that will be monitored to demonstrate compliance with the formaldehyde emission limitations for stationary turbines that are not equipped with an oxidation catalyst. Corpus Christi Liquefaction (CCL) provided additional information on February 3, 2023; February 28, 2025; and June 6, 2025, in support of the original AMP request. Based on the EPA's review of the information provided, and as discussed in this response, we are approving your request.

CCL, a subsidiary of Cheniere Energy, LLC, owns and operates the liquefied natural gas terminal located in Gregory, Texas, including eighteen (18) General Electric (GE) LM2500+G4 Dry Low Emissions (DLE) natural gas stationary combustion turbines that are subject to 40 CFR 63, Subpart YYYYY. The 18 turbines are not equipped with an oxidation catalyst; therefore, per 40 CFR §63.6120(e) CCL is required to submit an Operational Parameter Monitoring petition to EPA for approval¹. A summary of the EPA's analysis of CCL Operational Parameter Monitoring Petition is included in the Enclosure. This response has been coordinated with EPA's Office of Air Quality Planning and Standards (OAQPS). A copy of the AMP and EPA's response will be sent to TCEQ to attach to the facility's air permit for

¹ Although the Texas Commission on Environmental Quality (TCEQ) is delegated authority for NESHAP YYYYY, EPA headquarters has determined that the Agency should approve operating parameter petitions to ensure consistency across all states and EPA Regions.

federal enforceability. If representations made in the request or supporting information change, if the rule changes, or if process unit operations change, this determination may become void, and a new determination will be necessary. Please address questions or concerns about this determination to Cassandra Lowder of my staff at lowder.cassandra@epa.gov or at (214) 665-8545.

Sincerely,

STEVEN
THOMPSON

Digitally signed by
STEVEN THOMPSON
Date: 2025.07.31 12:42:14
-05'00'

Steve Thompson
Manager
Air Enforcement Branch

Enclosure

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Enclosure

CCL operates 18 turbines with Dry Low Emission (DLE) technology. Since these turbines are not equipped with an oxidation catalyst, CCL has submitted a petition to approve operating parameters to monitor. The petition was submitted under 40 Code of Federal Regulations (“C.F.R.”) § 63.6120(e) for justifying the required information under 40 C.F.R. § 63.6120(g)(1) through (7).

EPA Analysis

The petition stated that it addresses the required information described for 40 C.F.R. § 63.6120(g)(1) through (7). After reviewing the petition, EPA determined that the facility is monitoring additional operating parameters; therefore, the petition requires CCL to instead provide information under 40 C.F.R. § 63.6120(f)(1) through (5). EPA makes the following determinations under 40 C.F.R. 63, Subpart YYYY regarding the lean premixed gas-fired combustion turbines with DLE technology which are operating without an oxidation catalyst, and outlines the following emission and operating limitations based on representations made in CCL’s petition².

EPA received the following documents from CCL during the review process to ensure it was complete:

- CCL 40 C.F.R. 63, Subpart YYYY Petition
- Initial Stack Test
- Monitoring Parameters – DLE Package Operations, Revision 3 (Document Code SOK2312851)²
- YYYY Alarm Notification & Response Process²

63.6120(f)(1) Identification of the specific parameters CCL proposes to use as additional operating limitations.

CCL’s petition proposes monitoring the Lean Premix (LPM) operation to meet the requirements for ensuring compliance with the formaldehyde emission standards in 40 CFR 63, Subpart YYYY. Baker Hughes is the original equipment manufacturer (OEM) for the 18 GE LM2500+G4 DLE stationary turbines and uses the term DLE synonymously with LPM. The turbine DLE system stages a specific air-to-fuel ratio into a turbine’s three burner rings (labelled A, B, C) that have a specific configuration. The air-to-fuel ratio is automatically adjusted, and a suitable burner configuration mode is selected to ensure proper operation of the DLE system, combustion efficiency, and acoustic vibrations. The DLE system and manufacturer-defined parameters are explained further in the OEM document titled, “Monitoring Parameters – DLE Package Operations,” Revision 3 (Document Code SOK2312851).

63.6120(f)(2) A discussion of the relationship between the monitored parameters and hazardous air pollutant (HAP) emissions, identifying how HAP emission rates change with changes in the operating parameters, and how limitations on these operating parameters will serve to limit HAP emissions of formaldehyde.

² Turbine specific operating parameters and other representations in the company’s petition and supporting information were claimed as Confidential Business Information and as such are not directly incorporated into EPA’s response.

CCL states that DLE technology emits low emissions of nitrogen oxides (NO_x) and products of incomplete combustion, including formaldehyde. A gas turbine which operates with lean premix does not guarantee that emissions will be below the formaldehyde standard of 91 parts per billion by volume, dry basis (ppbvd) at 15 percent (%) oxygen (O₂). However, CCL conducted initial emissions testing from July 12, 2022, through July 26, 2022, which showed compliance with the NESHAP YYYY formaldehyde emission limit. Additionally, CCL has also demonstrated compliance with subsequent annual performance testing for the formaldehyde standard in 2023 and 2024. The results from the initial and subsequent formaldehyde testing are summarized in Table 1.

Table 1: Initial & Annual Formaldehyde Performance Test Results

Unit Name	Unit ID	Initial Test Date	Test Results (ppbvd at 15% O ₂)	2023 Test Results (ppbvd at 15% O ₂)	2024 Test Results (ppbvd at 15% O ₂)
Refrigeration Turbine 1	TRB1	7/21/2022	22	18	38
Refrigeration Turbine 2	TRB2	7/22/2022	19	17	39
Refrigeration Turbine 3	TRB3	7/25/2022	24	44	38
Refrigeration Turbine 4	TRB4	7/26/2022	42	77	39
Refrigeration Turbine 5	TRB5	7/22/2022	33	61	38
Refrigeration Turbine 6	TRB6	7/21/2022	19	42	38
Refrigeration Turbine 7	TRB7	7/15/2022	39	17	39
Refrigeration Turbine 8	TRB8	7/14/2022	73	73	38
Refrigeration Turbine 9	TRB9	7/18/2022	23	58	39
Refrigeration Turbine 10	TRB10	7/13/2022	49	51	39
Refrigeration Turbine 11	TRB11	7/19/2022	31	23	39
Refrigeration Turbine 12	TRB12	7/12/2022	54	17	38
Refrigeration Turbine 13	TRB13	7/18/2022	35	71	40
Refrigeration Turbine 14	TRB14	7/15/2022	29	60	40
Refrigeration Turbine 15	TRB15	7/19/2022	20	66	40
Refrigeration Turbine 16	TRB16	7/14/2022	32	56	40
Refrigeration Turbine 17	TRB17	7/20/2022	19	20	39
Refrigeration Turbine 18	TRB18	7/13/2022	50	16	39

63.6120(f)(3) A discussion of how you will establish the upper and/or lower values for these parameters which will establish the limits on these parameters in the operating limitations.

- a. During the initial commissioning of the turbines, and as needed thereafter, the DLE system of each turbine will be manually adjusted by OEM called “mapping.” The mapping procedure is a detailed, lengthy process requiring accurate measurement of gas turbine engine operating parameters and corresponding NO_x and carbon monoxide (CO) emission rates, as well as combustion dynamics monitored through acoustic vibrations. Operating parameters and resultant emission rates are measured and recorded across all operating conditions and combustion modes. These operating parameters are used to define the upper and lower operational boundaries that meet the prescribed emission limits and acoustic vibration targets. These operational boundaries are then converted into a final combustion “map” or control scheme and programmed into each gas

turbine's digital controller. Each engine is then only able to operate within the combustion map of operational boundaries programmed into its respective digital controller. More detailed information can be located in Revision 3 (Document Code SOK2312851) of the document titled, *"Monitoring Parameters – DLE Package Operations;"* and outlined in the procedures entitled, *"YYYY Alarm Notification and Response Process."*

- b. Only qualified OEM personnel are able to modify or change the control logic. Specialized classroom and field training is required by the OEM to become qualified to properly map a particular gas turbine engine model.
- c. CCL proposes to monitor specific parameters that were provided in the Revision 3 (Document Code SOK2312851) "Monitoring Parameters – DLE Package Operations" document. CCL performance testing has demonstrated that all 18 turbines at the CCL facility are below the 91 ppbvd at 15 % O₂ formaldehyde limit while operating in DLE mode. Since the algorithms utilized by the process logic controller (PLC) to maintain DLE operation of the turbines are extremely complex and require a myriad of measured and calculated inputs, it is impractical to monitor formaldehyde emissions performance parametrically through any subset of parameters. As discussed in Section 1 of the referenced OEM document, ideal operation of the turbine in any given mode is multivariate and not subject to any simple upper and/or lower value for a given operating condition. Even if certain parameters were identified for manual monitoring, the PLC, with the benefit of computer processing, would detect, analyze, and react to any anomalous data quicker than any human operator could.

While the DLE control philosophy ensures low CO, NO_x, and HAP emissions during normal operation, the transitory operation of the turbine during startup and shutdown may result in a different emission profile of these pollutants. In accordance with CCL's Texas air permit number 105710/PSDTX1306M1, periods of startup and shutdown are limited to one hour.

63.6120(f)(4) A discussion identifying the methods CCL will use to measure and the instruments CCL will use to monitor the proposed parameters, as well as the relative accuracy and precision of these methods and instruments.

- a. CCL will use the turbines' inherent PLC system to continuously monitor the specific parameters of the Revision 3 referenced OEM document utilizing indicators. If the PLC detects an exceedance of the operational parameters or improper combustion, then the PLC will make automatic adjustments to return the affected turbines back to optimal DLE operations. In the event the PLC cannot return a turbine back within its operational limits or proper combustion then it will automatically shut down the affected turbine. Additionally, each of the monitored parameters has an alarm installed with an established set point.
- b. CCL cannot make any adjustments or conduct mapping to the PLC - only OEM technicians can do so. CCL and OEM will respond to an alarm notification as outlined in the procedures titled, *"YYYY Alarm Notification and Response Process."*

- c. CCLs has a list of specific monitored parameters, and the alarm set points in the Revision 3 referenced OEM document. CCL also provided for EPA review the copies of indicators and manufacturer specifications outlined in Revision 5 (Document Code SOM6769252) of the document titled, *"Instrument Data Sheets."*

63.6120(f)(5) A discussion identifying the frequency and methods for recalibrating the instruments CCL will use for monitoring the selected parameters.

CCL will have the OEM install, calibrate, and maintain the 18 turbines at the frequency indicated in Revision 3 (Document Code SOK2312851) of the document titled, *"Monitoring Parameters – DLE Package Operations."*