

State Registration Number
B2644

**RENEWABLE OPERATING PERMIT
STAFF REPORT**

ROP Number
MI-ROP-B2644-2021a

Hemlock Semiconductor Operations LLC

and

Linde Inc.

State Registration Number (SRN): B2644

Located at

12334 Geddes Road, Hemlock, Hemlock, Saginaw County, Michigan 48626

Permit Number: MI-ROP-B2644-2021a

Staff Report Date: May 17, 2021

Amended Date: April 15, 2022

This Staff Report is published in accordance with Sections 5506 and 5511 of Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). Specifically, Rule 214(1) of the administrative rules promulgated under Act 451, requires that the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD), prepare a report that sets forth the factual basis for the terms and conditions of the Renewable Operating Permit (ROP).

TABLE OF CONTENTS

MAY 17, 2021 - STAFF REPORT	3
JUNE 21, 2021 - STAFF REPORT ADDENDUM	10
APRIL 15, 2022 - STAFF REPORT FOR RULE 216(2) MINOR MODIFICATION	11

State Registration Number
B2644

RENEWABLE OPERATING PERMIT
MAY 17, 2021 - STAFF REPORT

ROP Number
MI-ROP-B2644-2021

Purpose

Major stationary sources of air pollutants, and some non-major sources, are required to obtain and operate in compliance with an ROP pursuant to Title V of the federal Clean Air Act; and Michigan’s Administrative Rules for Air Pollution Control promulgated under Section 5506(1) of Act 451. Sources subject to the ROP program are defined by criteria in Rule 211(1). The ROP is intended to simplify and clarify a stationary source’s applicable requirements and compliance with them by consolidating all state and federal air quality requirements into one document.

This Staff Report, as required by Rule 214(1), sets forth the applicable requirements and factual basis for the draft ROP terms and conditions including citations of the underlying applicable requirements, an explanation of any equivalent requirements included in the draft ROP pursuant to Rule 212(5), and any determination made pursuant to Rule 213(6)(a)(ii) regarding requirements that are not applicable to the stationary source.

General Information

Stationary Source Mailing Address:	Hemlock Semiconductor Operations LLC and Linde Inc. 12334 Geddes Road Hemlock, Michigan 48626
Source Registration Number (SRN):	B2644
North American Industry Classification System (NAICS) Code:	327992
Number of Stationary Source Sections:	2
Is Application for a Renewal or Initial Issuance?	Renewal
Application Number:	202000150
Responsible Official:	Section 1: Andrew Ault, Vice President of Manufacturing 989-301-5761 Section 2: Steve Morton, Vice President of Operations 281-203-3250; and Matthew Hess, Facility Manager 320-825-4449 ext 3
AQD Contact:	Gina McCann, Senior Environmental Quality Analyst 989-439-2282
Date Application Received:	October 5, 2020
Date Application Was Administratively Complete:	October 5, 2020
Is Application Shield in Effect?	Yes
Date Public Comment Begins:	May 17, 2021
Deadline for Public Comment:	June 16, 2021

Source Description

Hemlock Semiconductor Corporation (HSC), located at 12334 Geddes Road, Hemlock, Michigan, produces a variety of high purity polycrystalline silicon for semiconductor and photovoltaic manufacturers. Section 1 of the ROP covers the HSC operations in Hemlock, Michigan. Section 2 of the ROP was established for the Linde Inc. operations located at the HSC Hemlock site. Linde Inc. (Linde) produces hydrogen and nitrogen for use at HSC.

The HSC site operates several chemical vapor deposition vessels where chlorosilanes are converted to polycrystalline silicon in a batch process operated under high temperature conditions. The polycrystalline silicon manufacturing process includes raw material storage, polycrystalline silicon production, and silane and chloride recovery. A majority of the process exhaust associated with the production of polycrystalline silicon is recovered for reuse or sale via vent vapor recovery systems. Process exhaust which cannot be recovered is vented to the caustic scrubber associated with each vapor recovery system.

HSC uses nitric acid and hydrofluoric acid for etching and washing of silicon. Caustic scrubbers are used to control emission from the etching and washing activities. Emissions from material handling of hydrofluoric acid are also controlled by a caustic scrubber.

HSC operates three natural gas fired boilers. Two with a heat capacity of 98 MMBTU/hr, each controlled by a low nitrogen oxide burner, and a third with a heat capacity of 152 MMBTU/hr, EUBOILER10. This renewal incorporates EUBOILER10 permitted under Permit to Install (PTI) No. 185-18. EUBOILER10 is a natural gas-fired boiler rated at 152 MMBTU/hr. It is used to generate steam and process heat for the facility. The boiler utilizes low NO_x burners (LNB) and flue gas recirculation (FGR). Several smaller steam and hot water boilers and natural gas fired process heaters throughout the site provide additional process heat for a variety of production activities.

Several other auxiliary emission units exist at the facility which include emergency engines for power interruptions, fire pumps, cold cleaners, painting for maintenance purposes and a gasoline dispensing facility for on-site vehicles.

The HSC facility has hydrochloric acid (HCL) stored on-site. The chlorosilanes used at the HSC facility become hydrochloric acid (HCL) upon contact with air. Only small amounts of HCL are released during normal processing but there is the potential for larger releases due to leaks and upset conditions.

Some maintenance performed on site generates emissions from parts cleaners, sandblasting, and painting.

The Linde plant produces gaseous hydrogen from natural gas feedstock by the steam methane reforming process. A cryogenic air separation plant produces gaseous nitrogen.

The following table lists stationary source emission information as reported to the Michigan Air Emissions Reporting System (MAERS) for the year **2019**.

TOTAL STATIONARY SOURCE EMISSIONS

Pollutant	Tons per Year
Carbon Monoxide (CO)	79.98
Lead (Pb)	0.00034
Nitrogen Oxides (NO _x)	73.99
Particulate Matter (PM)	14.57
Sulfur Dioxide (SO ₂)	0.48
Volatile Organic Compounds (VOCs)	6.36

The following table lists Hazardous Air Pollutant emissions as calculated for the year 2019 by HSC:

Individual Hazardous Air Pollutants (HAPs) **	Tons per Year
Hydrochloric Acid	1.26
Hydrogen Fluoride	0.047
Methanol	0.85
Total Hazardous Air Pollutants (HAPs)	2.16

**As listed pursuant to Section 112(b) of the federal Clean Air Act.

See Parts C and D in the ROP for summary tables of all processes at the stationary source that are subject to process-specific emission limits or standards.

Regulatory Analysis

The following is a general description and history of the source. Any determinations of regulatory non-applicability for this source are explained below in the Non-Applicable Requirement part of the Staff Report and identified in Part E of the ROP.

The stationary source is in Saginaw County, which is currently designated by the United States Environmental Protection Agency (USEPA) as attainment/unclassified for all criteria pollutants.

The stationary source is subject to Title 40 of the Code of Federal Regulations (CFR) Part 70 because the potential to emit of nitrogen oxides and carbon monoxide exceeds 100 tons per year.

The stationary source is a minor source of HAP emissions because the potential to emit of any single HAP regulated by Section 112 of the federal Clean Air Act is less than 10 tons per year and the potential to emit of all HAPs combined are less than 25 tons per year.

No emission units at the stationary source are currently subject to the Prevention of Significant Deterioration regulations of Part 18, Prevention of Significant Deterioration of Air Quality of Act 451, because at the time of New Source Review permitting the potential to emit of each criteria pollutant was less than 250 tons per year.

The Linde methane reformer EUH2PLANT was subject to the Maximum Achievable Control Technology Standards for Chemical Manufacturing Area Sources promulgated in 40 CFR Part 63, Subparts A and VVVVVV. Based on a negative applicability determination by the USEPA, Linde requested to remove the federal applicability of 40 CFR Part 63, Subpart VVVVVV, Chemical Manufacturing Area Sources Rule (CMAS rule), covered in FGMACTVVVVVV. Linde will have potential emissions of the applicable metal HAPS only during maintenance catalyst change-outs, which occur when the facility is shut down. According to the USEPA letter to Air Products and Chemicals, Inc., dated June 24, 2013, during catalyst change out, the chemical manufacturing process unit (CMPU) would be out of service and would not meet the rule requirements for HAP use or generation during production. In the case of the steam-methane-reforming (SMR) facilities, the CMAS rule would not apply during the catalyst change out process since the CMPU would not be in use for hydrogen production at the time of loading and unloading. Based on the above determination, FGMACTVVVVVV was removed from the ROP during this renewal.

A caustic scrubber is considered Best Available Control Technology (BACT) for the processes with potential hydrofluoric or nitric acid emissions. "Good combustion practices" are BACT for VOC at the Linde hydrogen plant/steam methane reformer plant.

This ROP renewal removes EUS30ETCH, PTI No. 83-04, a poly silicon chunk etching process and EUS023Wafer, a FGRULE290 emission unit, was decommissioned in 2018.

EUBOILER8 and EUBOILER 9 are two 98 MMBTU/hr steam boilers that are subject to 40 CFR Part 60, Subparts A and Subpart Dc, Standards of Performance for Small Industrial-Commercial-institutional Steam Generating Units. Both units are equipped with low NOx burners for control of NOx emissions.

PTI No. 185-18 was issued for a 152 MMBTU/hr natural gas-fired boiler (EUBOILER10) and rolled into this ROP renewal.

EUBOILER10 is equipped with low NOx burners and flue gas recirculation and began installation in November 2019. EUBOILER10 is subject to 40 CFR Part 60, Subparts A and Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. In lieu of installing a Continuous Emissions Monitoring system (CEMS) to monitor NOx emissions, the facility has installed a Predictive Emissions Monitoring System (PEMS) to comply with the NOx emission monitoring requirements in Subpart Db. The PEMS will continuously monitor and record the NOx emissions and diluent gas in the form of O₂ from EUBOILER10 to show compliance with an hourly, 30-day rolling average time period and 12-month rolling time period as determined at the end of each calendar month NOx emission limit. To develop the PEMS, data from the plant process control system was collected and correlated with emissions data obtained from a temporary CEMS. Process and emission data was collected through the full operating range, including startup and shutdown. This data was then used to train the PEMS to predict NOx and O₂ emissions based on boiler operating data. During the training period of the PEMS, predicted emission values were compared to CEMS measured emission values to verify that the PEMS operates properly.

EUFPS369P1, EUFPS369P2, EUFPS569P1, and EUFPS569P2 at the stationary source are subject to the Standards of Performance for Stationary Compression Ignition-Internal Combustion Engines promulgated in 40 CFR Part 60, Subparts A and Subpart IIII for compression ignition (CI, i.e. diesel fuel-fired) emergency engines.

EUFPS069P1, EUFPS069P2, EUGENS042, and EUGENS082 at the stationary source are subject to the National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE), located at an area source of HAP emissions, existing emergency, compression ignition (CI) RICE promulgated in 40 CFR Part 63, Subparts A and Subpart ZZZZ. The AQD is not delegated the regulatory authority for this area source MACT.

EUGASAST1 and EUGASAST2 at the stationary source are subject to the National Emissions Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities promulgated in 40 CFR Part 63, Subparts A and CCCCC (Gasoline Dispensing Facilities Area Source MACT). The ROP contains special conditions provided by HSC in their application for applicable requirements from 40 CFR Part 63, Subparts A and CCCCC. The AQD is not delegated the regulatory authority for this area source MACT.

40 CFR Part 63, Subpart CCC, National Emission Standards for Hazardous Air Pollutants for Steel Pickling, HCl Process Facilities and Hydrochloric Acid Regeneration Plants does not apply to HSC at this time. HSC is currently an area source of Hazardous Air Pollutants and Subpart CCC only applies to major sources of HAPs. In addition, acid regeneration is defined as the "collection of equipment and processes configured to reconstitute fresh hydrochloric acid pickling solution from spent pickle liquor using a thermal treatment process." While pickle liquor is not defined in the NESHAP, applicability for the NESHAP indicates steel pickling (ie. carbon steel). HSC does not pickle carbon steel.

The AQD's Rules 287 and 290 were revised on December 20, 2016. FGRULE287(2)(c) and FGRULE290 are flexible group tables created for emission units subject to these rules. Emission units installed before December 20, 2016 can comply with the requirements of Rule 287 and Rule 290 in effect at the time of installation or modification as identified in the tables. However, emission units installed or modified on or after December 20, 2016 must comply with the requirements of the current rules as outlined in the tables.

The monitoring conditions contained in the ROP are necessary to demonstrate compliance with all applicable requirements and are consistent with the "Procedure for Evaluating Periodic Monitoring Submittals."

No emission units have emission limitations or standards that are subject to the federal Compliance Assurance Monitoring rule pursuant to 40 CFR Part 64, because all emission units at the stationary source either do not have a control device or those with a control device do not have potential pre-control emissions over the major source thresholds.

Please refer to Parts B, C, and D in the draft ROP for detailed regulatory citations for the stationary source. Part A contains regulatory citations for general conditions.

Source-Wide Permit to Install (PTI)

Rule 214a requires the issuance of a Source-Wide PTI within the ROP for conditions established pursuant to Rule 201. All terms and conditions that were initially established in a PTI are identified with a footnote designation in the integrated ROP/PTI document.

The following table lists all individual PTIs that were incorporated into previous ROPs. PTIs issued after the effective date of ROP No. MI-ROP-B2644-2015 are identified in Appendix 6 of the ROP.

PTI Number			
324-07	83-04	80-83C	402-74
81-07	91-00	80-83B	132-96
363-06	402-74	103-71A	103-71B

Streamlined/Subsumed Requirements

This ROP does not include any streamlined/subsumed requirements pursuant to Rules 213(2) and 213(6).

Non-applicable Requirements

Part E of the ROP lists requirements that are not applicable to this source as determined by the AQD, if any were proposed in the ROP Application. These determinations are incorporated into the permit shield provision set forth in Part A (General Conditions 26 through 29) of the ROP pursuant to Rule 213(6)(a)(ii).

Processes in Application Not Identified in Draft ROP

The following table lists processes that were included in the ROP Application as exempt devices under Rule 212(4). These processes are not subject to any process-specific emission limits or standards in any applicable requirement.

Exempt Emission Unit ID	Description of Exempt Emission Unit	Rule 212(4) Exemption	Rule 201 Exemption
EUBldgHeat	Miscellaneous natural gas burning equipment to provide heat and hot water for human comfort	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUGASAST1	2,500 gallon gasoline above ground storage tank	R 336.1212(4)(d)	R 336.1284(2)(g)(ii)
EUGASAST2	1,000 gallon gasoline above ground storage tank	R 336.1212(4)(d)	R 336.1284(2)(g)(ii)
EUBUILDINGHT	Miscellaneous building heater	R 336.1212(4)(b)	R 336.1282(b)(i)

Exempt Emission Unit ID	Description of Exempt Emission Unit	Rule 212(4) Exemption	Rule 201 Exemption
EUS15#HOT	S-15 No. 1 Hot Water Boiler 15,000 MBTU/hr Input for front campus building heat	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS15#2HOT	S-15 No. 2 Hot Water Boiler 15,000 MBTU/hr Input for front campus building heat	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS15#3HOT	S-15 No. 3 Hot Water Boiler 15,000 MBTU/hr Input for front campus building heat	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24001STMBLR	S-24 No. 1 Steam Boiler 41,425 MBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24002STMBLR	S-24 No. 2 Steam Boiler 22,300 MBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24003STMBLR	S-24 No. 3 Steam Boiler 22,300 MBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24004STMBLR	S-24 No. 4 Steam Boiler 41,678 MBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24005STMBLR	S-24 No. 5 Steam Boiler 41,678 MBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS24-HOT-H2O	S-24 Hot Water Boiler 3,300 MBTU/hr Input for air handlers & trench heat	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS459-35016	S-459-35016-Process Heater #1 - 5.5 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS459-35017	S-459-35017-Process Heater #2 - 9.2 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS459-35018	S-459-35018-Boiler - 10.5 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS468-35056	South S-468-35056-Process Heater #1 - 14.4 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS468-35057	South S-468-35057-Process Heater #2 - 32 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS468-35096	North S-468-35096-Process Heater #1 - 14.4 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS468-35097	North S-468-35097-Process Heater #2 - 32 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS468-46018	S-468-46018-Boiler - 32 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS568-55056	S-568-55056-Process Heater #1 - 14.4 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS568-55057	S-568-55057-Process Heater #2 - 35.3 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)
EUS568-55418	S-568-55418-Boiler - 32 MMBTU/hr	R 336.1212(4)(c)	R 336.1282(2)(b)(i)

Draft ROP Terms/Conditions Not Agreed to by Applicant

This draft ROP does not contain any terms and/or conditions that the AQD and the applicant did not agree upon pursuant to Rule 214(2).

Compliance Status

The AQD finds that the stationary source is expected to be in compliance with all applicable requirements as of the effective date of this ROP.

Action taken by EGLE, AQD

The AQD proposes to approve this ROP. A final decision on the ROP will not be made until the public and affected states have had an opportunity to comment on the AQD's proposed action and draft permit. In addition, the USEPA is allowed up to 45 days to review the draft ROP and related material. The AQD is not required to accept recommendations that are not based on applicable requirements. The delegated decision maker for the AQD is Chris Hare, Bay City District Supervisor. The final determination for ROP approval/disapproval will be based on the contents of the ROP Application, a judgment that the stationary source will be able to comply with applicable emission limits and other terms and conditions, and resolution of any objections by the USEPA.

State Registration Number
B2644

RENEWABLE OPERATING PERMIT
JUNE 21, 2021 - STAFF REPORT ADDENDUM

ROP Number
MI-ROP-B2644-2021

Purpose

A Staff Report dated May 27, 2021, was developed to set forth the applicable requirements and factual basis for the draft Renewable Operating Permit (ROP) terms and conditions as required by Rule 214(1) of the administrative rules promulgated under Act 451. The purpose of this Staff Report Addendum is to summarize any significant comments received on the draft ROP during the 30-day public comment period as described in Rule 214(3). In addition, this addendum describes any changes to the draft ROP resulting from these pertinent comments.

General Information

Responsible Official:	Section 1: Andrew Ault, Vice President of Manufacturing 989-301-5761 Section 2: Steve Morton, Vice President of Operations 281-203-3250; and Matthew Hess, Facility Manager 320-825-4449 ext 3
AQD Contact:	Gina McCann, Senior Environmental Quality Analyst 989-439-2282

Summary of Pertinent Comments

No pertinent comments were received during the 30-day public comment period.

Changes to the May 27, 2021 Draft ROP

No changes were made to the draft ROP.

State Registration Number
B2644

RENEWABLE OPERATING PERMIT
APRIL 15, 2022 - STAFF REPORT FOR RULE 216(2)
MINOR MODIFICATION

ROP Number
MI-ROP-B2644-2021a

Purpose

On August 10, 2021, the Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD), approved and issued Renewable Operating Permit (ROP) No. MI-ROP-B2644-2021 to Hemlock Semiconductor Operations LLC and Linde Inc. pursuant to Rule 214 of the administrative rules promulgated under Act 451. Once issued, a company is required to submit an application for changes to the ROP as described in Rule 216. The purpose of this Staff Report is to describe the changes that were made to the ROP pursuant to Rule 216(2).

General Information

Responsible Official:	Gerard Manley, Environmental Health, Safety, & Security Manager 989-301-6247
AQD Contact:	Caryn E. Owens, Senior Environmental Engineer 231-878-6688
Application Number:	202200059
Date Application for Minor Modification was Submitted:	March 7, 2022

Regulatory Analysis

The AQD has determined that the change requested by the stationary source meets the qualifications for a Minor Modification pursuant to Rule 216(2).

The changes made in the PTI were not required to go through the public participation process, and the changes made were considered administrative to adjust the lb/MMBTU NOx 30-day rolling time period emission limit.

Description of Changes to the ROP

Minor Modification Number 202200059 was to incorporate PTI No. 185-18A, which is to increase the lb/MMBTU NOx rolling 30-day emission limit for EUBOILER10 in Section 1 of the ROP to the New Source Performance Standard (NSPS) limit of 0.20 lb/MMBTU, since this limit is more desirable for the facility in the summer months. The pound per hour limit remained the same limit as previously permitted.

Compliance Status

The AQD finds that the stationary source is expected to be in compliance with all applicable requirements associated with the emission unit(s) involved with the change as of the date of approval of the Minor Modification to the ROP.

Action Taken by EGLE

The AQD proposes to approve a Minor Modification to ROP No. MI-ROP-B2644-2021, as requested by the stationary source. A final decision on the Minor Modification to the ROP will not be made until any affected states and the United States Environmental Protection Agency (USEPA) has been allowed 45 days to review the proposed changes to the ROP. The delegated decision maker for the AQD is the District Supervisor. The final determination for approval of the Minor Modification will be based on the contents of the permit application, a judgment that the stationary source will be able to comply with applicable emission limits and other requirements, and resolution of any objections by any affected states or the USEPA.