GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Richard E. Dunn, Director

Air Protection Branch
4244 International Parkway
Suite 120
Atlanta, Georgia 30354
404-363-7000

NARRATIVE

TO: Jeng-Hon Su

FROM: Eddie Gomez

DATE: November 16, 2022

Facility Name:	Hanwha Q Cells USA, Inc.
AIRS No.:	313-00165
Location:	Dalton, GA (Whitfield County)
Application #:	28606
Date of Application:	September 21, 2022

Background Information

Hanwha Q Cells USA, Inc. (hereinafter "facility") is a synthetic minor facility located at 300 Nexus Drive, Dalton, Georgia 30721 (Whitfield County). Whitfield County is in attainment for all criteria pollutants. The facility manufactures 3.1 GW photovoltaic modules through five parallel assembly lines (PR01 and PR02).

Solar cells are brought on-site and assembled into modules. The cells are then cleaved, and connections formed between the cells during tabbing with the aid of a flux material. The cells are laid out and the connections completed through a smoldering process. The assembly process utilizes an induction soldering method; therefore, a separate solder material is not used in the process. An Ethyl Vinyl Acetate (EVA) film and back-sheet is laminated with the solar cells. There are several quality control checks throughout the process. The edges of the modules are trimmed as needed after lamination, and the junction box is soldered to the assembled module using induction soldering. The module is framed using silicone in aluminum frames, and potting silicone is applied to protect the junction box components from corrosion. The silicone from the framing and potting processes undergoes a curing process at near ambient temperature. The solar cell modules are then sorted and packaged prior to being shipped off-site.

Emissions are expected to be generated during the tabbing, lamination, framing, and potting processes. Emissions may also be generated during the junction box soldering phase, as some silicone is applied during this process step. Dust may be generated during the junction box soldering phase as some silicone is applied during this process step. Dust may be generated during the cleaving and trimming process steps, but the dust is expected to consist of larger particles that fall to the floor and are not emitted. Most process steps are not expected to generate emissions, including laying out the cells, various quality assurance testing, and curing. Curing is not expected to generate emissions as the process occurs near room temperature, and emissions would be expected to occur during lamination, framing, or potting. The only combustion sources at the facility are the rooftop natural gas space heating units (ID Nos. SH01 and SH02).

The primary pollutants emitted from the facility are volatile organic compounds (VOC) and hazardous air pollutants (HAP) from the assembly process.

Purpose of Application

On November 1, 2022 the facility submitted Application No. 28606 for the construction and operation of two additional module assembly lines (ID No. PR03). The new equipment arrangement will include two parallel assembly lines (ID No. PR03) which are to operate the same way the current systems function. The two new assembly lines will add 1.4GW capacity to the facility. The facility also proposed to install 36 small natural gas fired rooftop heating units (ID No. SH03).

Updated Equipment List

Table 1: Equipment List

Emission Units				Associated Control Devices	
Production Line Code	**Source Code**	**Description**	**Installation Date**	**Source Code**	**Description**
PR01	T01	Tabbing Process	2018	none	n/a
	L01	Lamination Process			
	S01	Junction Box Soldering Process			
	F01	Framing Process			
	P01	Potting Process			
	T02	Tabbing Process			
	L02	Lamination Process			
	S02	Junction Box Soldering Process			
	F02	Framing Process			
	P02	Potting Process			
	T03	Tabbing Process			
	L03	Lamination Process			
	S03	Junction Box Soldering Process			
	F03	Framing Process			
	P03	Potting Process			
PR02*	T04	Tabbing Process	2022	none	n/a
	L04	Lamination Process			
	S04	Junction Box Soldering Process			
	F04	Framing Process			
	P04	Potting Process			
	T05	Tabbing Process			
	L05	Lamination Process			
	S05	Junction Box Soldering Process			
	F05	Framing Process			
	P05	Potting Process			

Table 1: Equipment List					
Emission Units				**Associated Control Devices**	
Production Line Code	**Source Code**	**Description**	**Installation Date**	**Source Code**	**Description**
PR03*	**T06**	**Tabbing Process**	**2022**	**none**	**n/a**
	L06	**Lamination Process**			
	S06	**Junction Box Soldering Process**			
	F06	**Framing Process**			
	P06	**Potting Process**			
	T07	**Tabbing Process**			
	L07	**Lamination Process**			
	S07	**Junction Box Soldering Process**			
	F07	**Framing Process**			
	P07	**Potting Process**			

* Proposed within current application

Fuel Burning Equipment

Source Code	Input Heat Capacity (MMBtu/hr.)	Description	Installation Date	Construction Date
SH01	17.9	36 natural gas fired roof top heating units	2018	2018
SH02	17.9	36 natural gas fired roof top heating units	2022	2022
SH03*	**17.9**	**36 natural gas fired roof top heating units**	**2022**	**2022**
EG01	0.6	Emergency fire pump	2018	2018

* Proposed within current application

Emissions Summary

Facility-Wide Emissions
(in tons per year)

Table 2: Facility-Wide Emissions						
Pollutant	**Potential Emissions**			**Actual Emissions**		
	Before Mod.	**After Mod.**	**Emissions Change**	**Before Mod.**	**After Mod.**	**Emissions Change**
$PM/PM_{10}/PM_{2.5}$	1.7	2.6	0.8	1.7	2.6	0.8
NOx	17.2	24.9	7.7	17.2	24.9	7.7
SO_2	0.2	0.3	0.1	0.2	0.3	0.1
CO	13.4	19.9	6.5	13.4	19.9	6.5

Table 2: Facility-Wide Emissions						
Pollutant	Potential Emissions			Actual Emissions		
	Before Mod.	After Mod.	Emissions Change	Before Mod.	After Mod.	Emissions Change
VOC	<100	<100	0	<100	<100	0
Max. Individual HAP	<10	<10	0	<10	<10	0
Total HAP	<25	<25	0	<25	<25	0
Total GHG (if applicable)	18,400	27,600	9,190	18,400	27,600	9,190

Regulatory Applicability

Federal Rules:

The modification proposed by the facility is not subject to any New Source Performance Standards (NSPS) in 40 CFR 60 or any National Emission Standards of Hazardous Air Pollutants (NESHAP) in 40 CFR 63.

The facility's potential to emit (PTE) levels will remain below 25 tpy for combined HAP, and 10 tpy for individual HAP. Thus, the facility will remain as an area source of HAP emissions. Therefore, the NESHAP applicability will not change due to the proposed modification.

Note that the facility clarified that all roof top units are indirectly heated. The exhaust gas is not ducted inside the building; it is used to heat up air going inside the building. All rooftop units therefore meet the definition of "process heaters" in 40 CFR 60 Subpart Dc and 40 CFR 63 Subpart JJJJJJ. Because process heaters are not steam generating units nor boilers, they are not subject the said NSPS and NESHAP.

Georgia State Rules:

Georgia Rules for Air Quality Control (GRAQC) 391-3-1-.02(2)(b) – Visible Emissions

The new equipment is subject to GA Rule (b). The nature of solar module manufacturing operations are unlikely to generate high opacity emissions; therefore, compliance with the GA Rule (b) visible emission limit is expected.

Georgia Rules for Air Quality Control (GRAQC) 391-3-1-.02(2)(d) – Fuel-Burning Equipment

Since the primary purpose of all rooftop units is production of thermal energy from the combustion of fuel (natural gas) with heat furnished indirectly though transfer by fluids and transmission through process walls (combustion exhaust passes as a fluid and transfer heat to air going into the building through piping/vessel walls), rooftop units meet the definition of "fuel-burning equipment" specified in GA Rule 391-3-1-.01(cc). Thus, all rooftop units are subject to GA Rule (d) for the visible emission limits and PM emission standards. Since they all burn natural gas, and natural gas is considered a clean fuel, compliance with the GA Rule (d) limits are expected.

GRAQC 91-3-1-.02(2)(e) – Particulate Emissions from Manufacturing Processes

The new equipment is subject to GA Rule (e). The Division agrees that the nature of operation of the facility will not emit much PM and will therefore comply with the GA Rule (e) PM emission standard.

GRAQ 391-3-1-.02(2)(g) – Sulfur Dioxide

The new roof top heating units (ID No. SH03), existing roof top heating units (ID Nos. SH01 and SH02) and existing fire pump (ID No. EG01) are subject to the fuel sulfur content limit specified in GA Rule (g). Since the roof top heating units (ID Nos. SH01, SH02, and SH03) fire exclusively on natural gas, and natural gas contains minimum amounts of sulfur, compliance with the GA Rule (g) limit is expected for the three units (ID Nos. SH01, SH02, and SH03). Since the fire pump (ID No. EG01) fires exclusively on distillate fuel oils, and distillate fuel oils contain less than 0.5% sulfur, compliance with the 2.5-percent GA Rule (g) fuel sulfur content is also expected. Note that the fire pump is exempted from permitting and is therefore not included in the permit. The GA Rule (g) limit for roof top heating units (ID Nos. SH01, SH02, and SH03) is contained in existing Condition 2.6.

Permit Conditions

The VOC and HAP emission caps specified in existing Conditions 2.1 and 2.2 of SIP Permit No. 3674-313-0165-S-01-0 will remain the same after the proposed modification. The facility will remain a minor source under Title V of the 1990 Clean Air Act Amendments (CAAA). The facility must track all VOC and HAP actual emissions in accordance with Conditions 7.2 through 7.9 for both the 5 existing lines and 2 new lines.

Condition 2.5 with the GA Rule (d) limits were added back to the permit because the facility demonstrated that all rooftop units meet the definition of fuel-burning equipment in GA Rule 391-3-1-.01(cc).

The two new lines will be subject to the GA Rule (b), (e), and (g) standards specified in existing Conditions 2.3, 2.4, and 2.6.

With the submittal of this application, the Division found that the tabbing and lamination process from both the new lines (ID No. PR03) and the existing lines (ID Nos. PR01 and PR02) will form formaldehyde. The Division does not have past test data for formaldehyde formation; therefore, Condition 6.2 requires the facility to conduct a performance test to find the pound formaldehyde per pound product emission rate at the maximum operating capacity of the two new lines (ID No. PR03) as a basis for formaldehyde emission forming rates for all process lines.

After reviewing this application, the Division found that the facility has two sources of HAP emissions: HAP contained in the materials, which is calculated with mass balance, and formaldehyde formed in the tabbing and lamination process, which is calculated using the formaldehyde forming rate determined in accordance with Condition 6.2. Therefore, Condition 7.6 has been modified so that the facility must keep usage records of all HAP containing materials and the amount of products that go through tabbing and lamination of all three lines. Then Conditions 7.7 and 7.9 contain the instruction and formulas for calculating the facility-wide actual HAP emissions that include the two HAP sources discussed above.

Since formaldehyde is also a VOC, similar changes have been made to Conditions 7.2, 7.3, and 7.5 for VOC tracking.

Within 15 days after startup of the two new lines, the facility is required to notify the Division per GA Rule 391-3-1-.02(6)(b)1(i). This is specified in Condition 7.11.

Toxic Impact Assessment

The proposed two additional module assembly lines will emit five Toxic Air Pollutants (TAP), Hexane Hydrogen Fluoride, Tetraethoxysilane, Isopropanol, and Formaldehyde. The facility wide emissions of these compounds are presented in the table below.

Table 3: Facility-wide HAP/TAP PTE and MER Comparison

Chemical Name	CAS No.	Facility-wide Emissions (lb./yr.)	Minimum Emission Rate (MER) (lb./yr.)	Emissions Greater Than MER?
Hexane	110-54-3	830	170,000	No
Isopropanol	67-63-0	195,000	114,000	Yes
Formaldehyde	50-00-0	466	267	Yes
Hydrogen Fluoride	7664-39-3	542	284	Yes
Tetraethoxysilane	78-10-4	3,780	98,500	No

As demonstrated in the table above, the emissions of Hydrogen Fluoride, Isopropanol, and Formaldehyde are at levels which exceed the Minimum Emissions Rate (MER) thresholds. Therefore, modeling was conducted via Screen 3 to make sure the Maximum Ground Level Concentrations (MGLC) of these three TAPs were below the Acceptable Ambient Concentrations (AAC). The results of this assessment are presented in the following table.

Table 4: Screen 3 Results

Chemical Name	Long Term Averaging Period	Long Term MGLC (µg/m^3)	Long Term AAC (µg/m^3)	15-min MGLC (µg/m^3)	15-min AAC (µg/m^3)
Hydrogen Fluoride	24-hr.	0.0878	5.84	1.45	245
Isopropanol	24-hr.	284	2330	936	98000
Formaldehyde	Annual	1.09	1.10	17.9	245

Summary & Recommendations

I recommend that Permit Amendment No. 3674-313-0165-S-01-3 be issued to the facility. A Public Advisory was issued on November 2, 2022 and comments were due by December 2, 2022, no comments were received. A Public Notice was issued on x y, 2022, and comments were due by x y, 2023, no comments were received. The Stationary Source Compliance Program (SSCP) is responsible for inspections and complaints/investigations.