

Air Quality Permit

Issued to:	Renewable Energy Corporation- Advanced Silicon Materials LLC Butte Operations 119140 Rick Jones Way P.O. Box 3466 Butte, MT 59702	Permit #2940-05 Administrative Amendment (AA) Request Received: 1/24/06 Department Decision on AA: 3/29/06 Permit Final: 4/14/06 AFS #093-0015
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An air quality permit, with conditions, is hereby granted to Renewable Energy Corporation - Advanced Silicon Materials LLC (REC) pursuant to Sections 75-2-204 and 211, MCA, as amended, and Administrative Rules of Montana (ARM) 17.8.701, *et seq.*, as amended, for the following:

Section I: Permitted Facilities

A. The REC facility consists of a high purity polycrystalline silicon manufacturing plant at 119410 Rick Jones Way near Butte, Montana. The legal description is Section 35, Township 3 North, Range 9 West, Silver Bow County. The plant consists of various boilers and process equipment used in the manufacturing process. A more complete listing of the equipment used at the facility is contained in the permit analysis.

B. Current Permit Action

On January 24, 2006 the Department of Environmental Quality (Department) received a letter from Advanced Silicon Materials LLC (ASiMI) notifying the Department that ownership had been transferred to Renewable Energy Corporation and would change the corporate name to REC. The current permit action changes the corporate name on Permit #2940-04 from ASiMI to REC. Permit #2930-05 replaces Permit #2940-04.

SECTION II: Limitations and Conditions

A. Emission Limitations

1. REC shall operate and maintain all emission control equipment as specified in their application for their Montana Air Quality permits and all supporting documentation (ARM 17.8.749).
2. REC shall not cause or authorize to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, emissions that exhibit an opacity of 20% or greater averaged over six consecutive minutes (ARM 17.8.304).
3. REC shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter (ARM 17.8.308).
4. REC shall treat all unpaved portions of the haul roads, access roads, and the general plant area with water and/or chemical dust suppressant as necessary to maintain compliance with the reasonable precautions limitation in Section II.A.3 (ARM 17.8.749).
5. Incoming Metallurgical Grade Silicon processed at the facility shall be limited to 5952 tons per rolling 12-month time period (ARM 17.8.749).

6. The natural gas consumed at the facility shall be limited to 1,247.77 MMft³ per rolling 12-month time period (ARM 17.8.749).
7. The Hot Oil Heater, H-1201 (EP#107) shall be equipped with low-NO_x burners and flue gas recirculation. The emissions from this heater shall not exceed the following limits (ARM 17.8.752):

NO _x ¹	2.43 lb/hr
CO	4.43 lb/hr
8. The Hot Oil Heater, H-2201 (EP#207) shall be equipped with low-NO_x burners and flue gas recirculation. The emissions from this heater shall not exceed the following limits (ARM 17.8.752):

NO _x ¹	2.43 lb/hr
CO	4.43 lb/hr
9. The emissions from Boiler #1 (EP#113) shall not exceed the following limits (ARM 17.8.752):

NO _x ¹	6.48 lb/hr
CO	8.10 lb/hr
10. Emissions of particulate matter 10 microns or less in diameter (PM-10) from the filter controlling the Metallurgical Grade Silicon Storage Bins (EP#101A&B) shall each be limited to 0.077 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
11. Emissions of PM-10 from the filter controlling the Metallurgical Grade Silicon Feed Hopper (EP#102) shall be limited to 0.021 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
12. Emissions of PM-10 from the filter controlling the Metallurgical Grade Silicon Feed Hopper (EP#202) shall be limited to 0.021 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
13. Emissions of PM-10 from the filter controlling the Metallurgical Grade Silicon Lock Hopper (EP#104) shall be limited to 0.017 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
14. Emissions of PM-10 from the filter controlling the Metallurgical Grade Silicon Lock Hopper (EP#204) shall be limited to 0.017 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
15. Emissions of PM-10 from the filter controlling the Lime Storage System (EP#116) shall be limited to 1.20 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
16. REC shall operate and maintain the Chlorosilane Process Scrubber System (EP#105) to control emissions from the Hydrogenation Section and the Distillation Section of the Silane Area and the Chlorosilane Recovery Area (ARM 17.8.752).
17. Emissions that occur during the annual maintenance shutdown in the Hydrogenation

¹NO_x reported as NO₂
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Section and the Distillation Section of the Silane Area shall either be directed to the Maintenance Scrubber System (EP#127 via ST-1602) or to the Chlorosilane Maintenance Scrubber System (EP#105) (ARM 17.8.752).

18. Emissions of PM-10 from EP#105 shall be limited to 0.033 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
19. REC shall operate and maintain the Silane Scrubber System (EP#106) to control emissions from the Silane Storage Section of the Silane Area (ARM 17.8.752).
20. Emissions of PM-10 from the Silane Scrubber System (EP#106) shall be limited to 2.34 lb/hr (this includes back-half/impinger catch) (ARM 17.8.752).
21. REC shall operate the emergency generators only when commercially supplied electric power is not available or during periods of planned maintenance. REC shall not operate these generators as part of routine operations (ARM 17.8.749).
22. All chlorosilane process equipment pressure safety valves in the Hydrogenation Section and Distillation Section of the Silane Area shall be vented to the Emergency Vent Scrubber (ARM 17.8.749).
23. The annual particulate silica (SiO_2) emissions from the Reactor Hydrogen Vent (EP#111) during Silane Area maintenance operations shall not exceed 25.5 tons during any rolling 12-month time period. The SiO_2 particulate emissions shall be calculated using the monthly polycrystalline silicon production, the silane concentration in the reactor hydrogen recycle stream, and the time that the vent stack was in operation (ARM 17.8.749).
24. REC shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements of 40 CFR Part 60 Subpart Dc for Boiler #1 (ARM 17.8.340 and 40 CFR Part 60 Subpart Dc).

B. Testing Requirements

1. REC shall test Hot Oil Heaters, H-1201 and H-2201, emissions for NO_x and CO within 180 days of issuance of Permit #2940-04 to demonstrate compliance with the NO_x and CO emission limits contained in Section II.A.8 and Section II.A.9.
2. All tests must be completed in compliance with the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106).
3. The Department may require further testing (ARM 17.8.105).

C. Operational Reporting Requirement

1. REC shall supply the Department with annual production information for all emission points, as required by the Department in the annual emission inventory request. The request will include, but is not limited to, all sources of emissions identified in Section I.B of the permit analysis.

Production information shall be gathered on a calendar-year basis and submitted to the Department by the date required in the emission inventory request. Information shall be in units as required by the Department.

In addition, REC shall submit the following information annually to the Department by March 1 of each year. This information is required for the annual emission

inventory, as well as to verify compliance with permit conditions (ARM 17.8.505).

- a. Amount of incoming Metallurgical Grade Silicon processed (ton/yr)
 - b. Annual natural gas consumption from the facility (ft³/yr)
 - c. Venting time of EP#111 (hours)
 - d. Monthly polycrystalline silicon production (kg)
 - e. Silane concentration in the reactor hydrogen recycle stream (concentration used in each monthly calculation)
 - f. Hours of operation for the 2500-kw emergency diesel generator (hour/yr)
 - g. Summary report listing the reasons the 2500-kw emergency generator(s) was operating
 - h. Hours of operation for the 490-hp emergency diesel generator (hour/yr)
 - i. Summary report listing the reasons the 490-hp emergency generator was operating
2. REC shall notify the Department of any construction or improvement project conducted pursuant to ARM 17.8.745 that would include a change in control equipment, stack height, stack diameter, stack flow, stack gas temperature, source location, or fuel specifications, or would result in an increase in source capacity above its permitted operation or the addition of a new emission unit. The notice must be submitted to the Department, in writing, 10 days prior to start up or use of the proposed de minimis change, or as soon as reasonably practicable in the event of an unanticipated circumstance causing the de minimis change, and must include the information requested in ARM 17.8.745(1)(d) (ARM 17.8.745).
 3. REC shall document, by month, the incoming Metallurgical Grade Silicon processed at the facility. By the 25th day of each month, REC shall total the incoming Metallurgical Grade Silicon processed at the facility for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.5. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).
 4. REC shall document, by month, the natural gas consumed at the facility. By the 25th day of each month, REC shall total the natural gas consumed at the facility for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.6. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).
 5. REC shall document, by month, the particulate SiO₂ emissions from EP#111. By the 25th day of each month, REC shall total the particulate SiO₂ emissions from EP#111 for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.23. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).
 6. The records compiled in accordance with this permit shall be maintained by REC as a permanent business record for at least five years following the date of the

measurement, shall be submitted to the Department upon request, and shall be available at the plant site for inspection by the Department (ARM 17.8.749).

Section III: General Conditions

- A. Inspection - The recipient shall allow the Department's representatives access to the source at all reasonable times for the purpose of making inspections or surveys, collecting samples, obtaining data, auditing any monitoring equipment (CEMS, CERMS) or observing any monitoring or testing, and otherwise conducting all necessary functions related to this permit.
- B. Waiver - The permit and all the terms, conditions, and matters stated herein shall be deemed accepted if REC fails to appeal as indicated below.
- C. Compliance with Statutes and Regulations - Nothing in this permit shall be construed as relieving the permittee of the responsibility for complying with any applicable federal or Montana statute, rule or standard, except as specifically provided in ARM 17.8.740, *et seq.* (ARM 17.8.756).
- D. Enforcement - Violations of limitations, conditions and requirements contained herein may constitute grounds for permit revocation, penalties or other enforcement as specified in Section 75-2-401 *et seq.*, MCA.
- E. Appeals – Any person or persons jointly or severally adversely affected by the Department’s decision may request, within 15 days after the Department renders its decision, upon affidavit setting forth the grounds therefore, a hearing before the Board of Environmental Review (Board). A hearing shall be held under the provisions of the Montana Administrative Procedures Act. The filing of a request for a hearing does not stay the Department’s decision, unless the Board issues a stay upon receipt of a petition and a finding that a stay is appropriate under Section 75-2-211(11)(b), MCA. The issuance of a stay on a permit by the Board postpones the effective date of the Department’s decision until conclusion of the hearing and issuance of a final decision by the Board. If a stay is not issued by the Board, the Department’s decision on the application is final 16 days after the Department’s decision is made.
- F. Permit Inspection - As required by ARM 17.8.755, Inspection of Permit, a copy of the air quality permit shall be made available for inspection by Department personnel at the location of the permitted source.
- G. Construction Commencement - Construction must begin within 3 years of permit issuance and proceed with due diligence until the project is complete or the permit shall be revoked.
- H. Permit Fees - Pursuant to Section 75-2-220, MCA, as amended by the 1991 Legislature, failure to pay the annual operation fee by REC may be grounds for revocation of this permit, as required by that Section and rules adopted thereunder by the Board.

Permit Analysis
Renewable Energy Corporation - Advanced Silicon Materials LLC
Permit #2940-05

I. Introduction

A. Permitted Equipment

A listing of the significant emission sources is contained in Table I below. The original application contains a complete listing and description of the emission sources located at the Renewable Energy Corporation - Advanced Silicon Materials LLC (REC) facility.

Table I

STACK IDENTIFIER	SOURCE(S)	SIZE	CONTROL EQUIPMENT
EP#100	M.G. Silicon Bag Unloader (BN-1106) and Unloading Hoppers (BN-1101 through F-1108)		Bin Vent Filter - 1000 dscfm
EP#101A	M.G. Silicon Storage Bin Filter Vent (BN-1105A)		Bin Vent Filter
EP#101B	M.G. Silicon Storage Bin Filter Vent (BN-1105B)		Bin Vent Filter
EP#113	Boiler #1	50.22 MMBtu/hr (natural gas fired)	
EP#114	Boiler #2	6.70 MMBtu/hr (natural gas fired)	
EP#107	Hot Oil Heater	40 MMBtu/hr (natural gas fired)	Low NO _x burners w/FGR
EP#207	Hot Oil Heater	40 MMBTU/hr (natural gas fired)	Low NO _x burner w/FGR
EP#102	M.G. Silicon Feed Hopper		Baghouse – 245 dscfm
EP#104	M.G. Silicon Lock Hopper		Bin Vent Filter - 100 dscfm
EP#116	Lime Storage System		Bin Vent Filter - 750 dscfm
EP#118	Cooling Tower	10,400 gpm/cell	
EP#122	Dryer Scrubber Vent	1 Stack	Wet Scrubber
EP#105	Chlorosilane Scrubber System		Wet Scrubber (alkaline)
EP#106	Silane Scrubber System		Wet Scrubber (alkaline)
EP#127	Maintenance and Emergency Scrubber Vent (ST-1602)		Wet Scrubber (alkaline)
EP#128	Emergency Scrubber Bypass Vent Stack		Wet Scrubber (alkaline)

STACK IDENTIFIER	SOURCE(S)	SIZE	CONTROL EQUIPMENT
EP#129	Process Scrubber System Emergency Bypass Vent Stack		Wet Scrubber (alkaline)
EP#130	Dryer Dump Scrubber Vent		Wet Scrubber (alkaline)
EP#108-01 to EP#108-50	Reactor Atmos. Vents (TDF-L)		
EP#108-51 to EP#108-58	Reactor Atmos. Vents (TDF-M)		
EP#109-01 to EP#109-50	Reactor Analyzer Vents (TDF-L)		
EP#109-51 to EP#109-58	Reactor Analyzer Vents (TDF-M)		
EP#202	M.G. Silicon Feed Hopper		Baghouse – 245 dscfm
EP#204	M.G. Silicon Lock Hopper		Bin Vent Filter - 100 dscfm
EP#111	Hydrogen Vent Stack		
EP#112	Silane Storage Tanks Emergency Vent Stack		Flare
EP#218	Cooling Tower	10,400 gpm/cell	
	Emergency Generators	2 @ 2000 kw ea.	
	Emergency Generator	490 Hp	
	Emergency Fire Water Pump Diesel Storage	560-gal tank	
	Emergency Generator Diesel Storage	2 – 3000-gal tanks	
	Lab Hood		
	Dryer Reactor Atmospheric Safety Vents	2 Stacks	

B. Process Description

The REC facility produces high-purity polycrystalline silicon for the electronics industry by refining metallurgical grade (M.G.) silicon. This facility will be permitted for an incoming raw material feed processing capacity of 5400 metric tons per year of metallurgical grade silicon feed. This will result in a final production capacity of 3850 metric tons per year of polysilicon.

The process areas of the plant are referred to as the Silane Area and the Polyreaction Area. The Silane Area contains three sections: the Hydrogenation Section, the Distillation Section, and the Silane Storage. In the Silane Area-Hydrogenation Section, metallurgical grade silicon is first fed to a pressurized, heated vessel where it reacts with a mixture of hydrogen and chlorosilanes to yield a higher silicon content chlorosilane liquid. This liquid is distilled and catalytically rearranged to yield silane and unconverted chlorosilanes in the Silane Area-Distillation Section. Reclaimed chlorosilanes are recycled back to the initial reactor to react

with more metallurgical grade silicon. Silane is an intermediate product from these operations and is transferred into intermediate storage tanks that feed the Polyreaction Area. The Polyreaction Area consists of large thermal decomposition furnace reactors that are housed in a building that maintains clean room conditions. In the Polyreaction Area, the silane is decomposed in heated vessels to yield both a high-purity silicon product and hydrogen. The hydrogen is totally recycled back to the initial reactor in the Silane Area. After cooling, the product silicon is removed in rod form, broken, cleaned, and packaged for shipment.

C. Permit History

On June 6, 1996, Advanced Silicon Materials Incorporated (ASiMI) applied for Permit **#2940-00**, proposing to construct and operate a high-purity polycrystalline silicon manufacturing plant at 119410 Rick Jones Way near Butte, Montana. This permit was issued final on August 3, 1996. The legal description is Section 35, Township 3 North, Range 9 West, Silver Bow County. ASiMI's facility would be constructed in two phases. Phase I construction would begin in August 1996, with operations of the first phase expected to begin in early 1998. Phase II construction was expected to begin during the second quarter of 1997, with operation of the second phase expected to begin during the second quarter of 1999.

On October 30, 1998, Permit **#2940-01** was issued to ASiMI. Permit #2940-01 was an alteration which identified that the scrubber system for the chlorosilane vents had been reconfigured and maintenance emissions could be routed and controlled by the Maintenance Scrubber (T-1604) and then vented to atmosphere through stack ST-1602. This change was contained in Section II.A.19 and resulted in a negligible emissions increase because maintenance emissions are small and infrequent. This alteration also identified that a neutralized solids bin (EP#126) was proposed to be added to the facility. This bin vented to a baghouse (F-1602) and would have an allowable PM-10 emission limitation of 2 lb/hr.

In a January 12, 1998, letter to the Department of Environmental Quality (Department), several projects were identified that could be conducted pursuant to ARM 17.8.705(1)(q). These changes were incorporated into ASiMI's permit at this time and were identified in the equipment list, as appropriate, and more completely in the January 12, 1998, letter from Foster Wheeler USA Corporation and subsequent correspondence. In addition, the address on the permit was changed to the address of the facility now that construction was progressing.

On June 24, 1999, ASiMI was issued Permit **#2940-02** in response to a request from ASiMI. On December 9, 1998, the Department received a request from ASiMI to modify Permit #2940-01. The permit identified projects that were excluded from the requirement to obtain a permit pursuant to ARM 17.8.705(1)(q). These projects affected the metals dryer process at the facility. The dryer neutralizes aluminum and iron chlorides by treating these acidic solids in the dryer with calcium carbonate and water. However, because of the potential to create an unsafe, exothermic reaction (which often results in plugged lines), ASiMI proposed to discharge the metal solids from the dryer into a water scrubber for neutralization. Any off gases (mainly HCl) would be routed to a high-energy venturi scrubber for emission control. The venturi scrubber was a new emission point called the Dryer Dump Scrubber Vent (EP#130). EP#126, which was the Neutralized Solids Bin Vent, was removed from Table I. As part of this project, ASiMI proposed to test a new chemical, sodium sesquicarbonate, as a replacement for calcium carbonate for metals chloride neutralization in the dryer process.

This permit also identified the testing required of ASiMI, updated the equipment list in the permit analysis so it more accurately reflected the design of the facility, and increased the

number of days the Reactor Hydrogen Vent (EP#111) could be used during maintenance operations in the Silane Area to 60 days. Permit #2940-02 replaced Permit #2940-01.

On October 13, 2000, ASiMI was issued Permit #2940-03. On September 11, 2000, ASiMI requested a permit change to allow for more operational flexibility by more accurately quantifying emissions from Reactor Hydrogen Vent Stack (EP#111). ASiMI requested that the condition limiting the days of use of the hydrogen vent stack be replaced with a condition that directly relates to the permitted emissions from EP#111 (25.5 tons per year). ASiMI exceeded the 60-day use limit on EP#111, but because of the current reactor type, they only emitted approximately 13 tons per year. The permit condition limiting the use of EP#111 was intended to limit emissions to 25.5 tons per year or less. ASiMI was capable of more accurately measuring the recycle gas composition. ASiMI proposed to use the monthly polycrystalline silicon production, the silane concentration in the reactor hydrogen recycle stream, and the time that the vent stack is in operation to calculate the annual silica (SiO₂) particulate emissions from EP#111. Permit #2940-03 replaced Permit #2940-02.

On July 22, 2005, ASiMI requested a permit change to more accurately reflect the emission limits for Hot Oil Heater H-1201 (EP#107) and Hot Oil Heater H-2201 (EP#207). Incorrect emission data was provided in the initial 1996 air permit application. In the permit application, ASiMI provided updated carbon monoxide (CO) and nitrogen oxides (NO_x) emissions and emission factors. ASiMI requested that the condition limiting the CO and NO_x emissions from EP#107 and EP#207 be modified. In addition, the permit format, language, and rule references were updated to reflect current Department permit format, language and rule references. Permit #2940-04 replaced Permit #2940-03.

D. Current Permit Action

On January 24, 2006 the Department received a letter from ASiMI notifying the Department that ownership had been transferred to Renewable Energy Corporation and would change the corporate name to REC. The current permit action changes the corporate name on Permit #2940-04 from ASiMI to REC. Permit #2930-05 replaces Permit #2940-04.

E. Additional Information

Additional information, such as applicable rules and regulations, Best Available Control Technology (BACT)/Reasonably Available Control Technology (RACT) determinations, air quality impacts, and environmental assessments, is included in the analysis associated with each change to the permit.

II. Applicable Rules and Regulations

The following are partial explanations of some applicable rules and regulations that apply to the facility. The complete rules are stated in the Administrative Rules of Montana (ARM) and are available, upon request, from the Department. Upon request, the Department will provide references for locations of complete copies of all applicable rules and regulations or copies where appropriate.

A. ARM 17.8, Subchapter 1, General Provisions, including, but not limited to:

1. ARM 17.8.101 Definitions. This rule includes a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.
2. ARM 17.8.105 Testing Requirements. Any person or persons responsible for the emission of any air contaminant into the outdoor atmosphere shall, upon written request of the Department, provide the facilities and necessary equipment (including instruments and sensing devices) and shall conduct tests, emission or ambient, for

such periods of time as may be necessary using methods approved by the Department.

3. ARM 17.8.106 Source Testing Protocol. The requirements of this rule apply to any emission source testing conducted by the Department, any source or other entity as required by any rule in this chapter, or any permit or order issued pursuant to this chapter, or the provisions of the Clean Air Act of Montana, 75-2-101, *et seq.*, Montana Code Annotated (MCA).

REC shall comply with the requirements contained in the Montana Source Test Protocol and Procedures Manual, including, but not limited to, using the proper test methods and supplying the required reports. A copy of the Montana Source Test Protocol and Procedures Manual is available from the Department upon request.

4. ARM 17.8.110 Malfunctions. (2) The Department must be notified promptly by telephone whenever a malfunction occurs that can be expected to create emissions in excess of any applicable emission limitation or to continue for a period greater than 4 hours.
5. ARM 17.8.111 Circumvention. (1) No person shall cause or permit the installation or use of any device or any means that, without resulting in reduction of the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant that would otherwise violate an air pollution control regulation. (2) No equipment that may produce emissions shall be operated or maintained in such a manner as to create a public nuisance.

B. ARM 17.8, Subchapter 2, Ambient Air Quality, including, but not limited to:

1. ARM 17.8.210 Ambient Air Quality Standards for Sulfur Dioxide,
2. ARM 17.8.211 Ambient Air Quality Standards for Nitrogen Dioxide,
3. ARM 17.8.212 Ambient Air Quality Standards for Carbon Monoxide,
4. ARM 17.8.214 Ambient Air Quality Standard for Hydrogen Sulfide,
5. ARM 17.8.220 Ambient Air Quality Standard for Settled Particulate Matter, and
6. ARM 17.8.223 Ambient Standard for PM-10.

REC must maintain compliance with the applicable ambient air quality standards. REC has submitted modeling for previous applications that demonstrates compliance with the applicable ambient air quality standards.

C. ARM 17.8, Subchapter 3, Emission Standards, including, but not limited to:

1. ARM 17.8.304 Visible Air Contaminants. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.
2. ARM 17.8.308 Particulate Matter, Airborne. This section requires an opacity limitation of 20% for all fugitive emission sources and that reasonable precautions be taken to control emissions of airborne particulate matter.
3. ARM 17.8.309 Particulate Matter, Fuel Burning Equipment. This section states that emissions of particulate matter caused by the combustion of fuel shall not exceed the hourly rate set forth in this section.
4. ARM 17.8.310 Particulate Matter, Industrial Process. This rule requires that no

person shall cause, allow, or permit to be discharged into the atmosphere particulate matter in excess of the amount set forth in this rule.

5. ARM 17.8.322 Sulfur Oxide Emissions--Sulfur in Fuel. Commencing July 1, 1971, no person shall burn any gaseous fuel containing sulfur compounds in excess of 50 grains per 100 cubic feet of gaseous fuel, calculated as hydrogen sulfide at standard conditions.
6. ARM 17.8.340 Standards of Performance for New Stationary Sources. 40 CFR Part 60 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units does apply to Boiler #1 because it was manufactured after June 9, 1989, and has a heat input greater than 10 MMBtu/hr, but less than 100 MMBtu/hr.

40 CFR Part 60, Subpart Dc, Standards of Performance for Small-Industrial-Commercial-Institutional Steam Generating Units, does not apply to Boiler #2 because the boiler has a heat input less than 10 MMBtu/hr.

- D. ARM 17.8, Subchapter 5, Air Quality Permit Application, Operation and Open Burning Fees, including, but not limited to:

1. ARM 17.8.504 Air Quality Permit Application Fees. REC shall submit an air quality permit application fee concurrent with the submittal of an air quality permit application. A permit application is incomplete until the proper application fee is paid to the Department. REC submitted the required application fee for the current permit action.
2. ARM 17.8.505 Air Quality Operation Fees. An annual air quality operation fee must, as a condition of continued operation, be submitted to the Department by each source of air contaminants holding an air quality permit, excluding an open burning permit, issued by the Department; and the air quality operation fee is based on the actual or estimated actual amount of air pollutants emitted during the previous calendar year.

The annual assessment and collection of the air quality operation fee, described above, shall take place on a calendar-year basis. The Department may insert into any final permit issued after the effective date of these rules, such conditions as may be necessary to require the payment of an air quality operation fee on a calendar-year basis, including provisions which pro-rate the required fee amount.

- E. ARM 17.8, Subchapter 7, Permit, Construction, and Operation of Air Contaminant Sources, including, but not limited to:

1. ARM 17.8.740 Definitions. This rule is a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.
2. ARM 17.8.743 Montana Air Quality Permits--When Required. This rule requires a person to obtain an air quality permit or permit alteration to construct, alter, or use any air contaminant sources that have the Potential to Emit (PTE) greater than 25 tons per year of any pollutant. REC has a PTE greater than 25 tons per year of TSP, PM-10, NO_x, and CO; therefore, an air quality permit is required.
3. ARM 17.8.744 Montana Air Quality Permits--General Exclusions. This rule identifies the activities that are not subject to the Montana Air Quality Permit program.

4. ARM 17.8.745 Montana Air Quality Permits--Exclusion for De Minimis Changes. This rule identifies the de minimis changes at permitted facilities that do not require a permit under the Montana Air Quality Permit Program.
5. ARM 17.8.748 New or Modified Emitting Units--Permit Application Requirements.
(1) This rule requires that a permit application be submitted prior to installation, alteration, or use of a source. REC was not required to submit a permit application for the current permit action because the change is considered administrative. (7) This rule requires that the applicant notify the public by means of legal publication in a newspaper of general circulation in the area affected by the application for a permit. REC was not required to submit a permit application or public notice for the current permit action because the current permit action is an administrative amendment.
6. ARM 17.8.749 Conditions for Issuance or Denial of Permit. This rule requires that the permits issued by the Department must authorize the construction and operation of the facility or emitting unit subject to the conditions in the permit and the requirements of this subchapter. This rule also requires that the permit must contain any conditions necessary to assure compliance with the Federal Clean Air Act (FCAA), the Clean Air Act of Montana, and rules adopted under those acts.
7. ARM 17.8.752 Emission Control Requirements. This rule requires a source to install the maximum air pollution control capability that is technically practicable and economically feasible, except that BACT shall be utilized. The required BACT analysis is included in Section III of this permit analysis.
8. ARM 17.8.755 Inspection of Permit. This rule requires that air quality permits shall be made available for inspection by the Department at the location of the source.
9. ARM 17.8.756 Compliance with Other Requirements. This rule states that nothing in the permit shall be construed as relieving REC of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq.*
10. ARM 17.8.759 Review of Permit Applications. This rule describes the Department's responsibilities for processing permit applications and making permit decisions on those permit applications that do not require the preparation of an environmental impact statement.
11. ARM 17.8.762 Duration of Permit. An air quality permit shall be valid until revoked or modified, as provided in this subchapter, except that a permit issued prior to construction of a new or altered source may contain a condition providing that the permit will expire unless construction is commenced within the time specified in the permit, which in no event may be less than 1 year after the permit is issued.
12. ARM 17.8.763 Revocation of Permit. An air quality permit may be revoked upon written request of the permittee, or for violations of any requirement of the Clean Air Act of Montana, rules adopted under the Clean Air Act of Montana, the FCAA, rules adopted under the FCAA, or any applicable requirement contained in the Montana State Implementation Plan (SIP).
13. ARM 17.8.764 Administrative Amendment to Permit. An air quality permit may be amended for changes in any applicable rules and standards adopted by the Board of Environmental Review (Board) or changed conditions of operation at a source or

stack that do not result in an increase of emissions as a result of those changed conditions. The owner or operator of a facility may not increase the facility's emissions beyond permit limits unless the increase meets the criteria in ARM 17.8.745 for a de minimis change not requiring a permit, or unless the owner or operator applies for and receives another permit in accordance with ARM 17.8.748, ARM 17.8.749, ARM 17.8.752, ARM 17.8.755, and ARM 17.8.756, and with all applicable requirements in ARM Title 17, Chapter 8, Subchapters 8, 9, and 10.

14. ARM 17.8.765 Transfer of Permit. This rule states that an air quality permit may be transferred from one person to another if written notice of Intent to Transfer, including the names of the transferor and the transferee, is sent to the Department.

F. ARM 17.8, Subchapter 8, Prevention of Significant Deterioration of Air Quality, including, but not limited to:

1. ARM 17.8.801 Definitions. This rule is a list of applicable definitions used in this subchapter.
2. ARM 17.8.818 Review of Major Stationary Sources and Major Modifications-- Source Applicability and Exemptions. The requirements contained in ARM 17.8.819 through 17.8.827 shall apply to any major stationary source and any major modification, with respect to each pollutant subject to regulation under the Federal Clean Air Act (FCAA) that it would emit, except as this subchapter would otherwise allow.

This facility is not a major stationary source since this facility is not a listed source and the facility's PTE is below 250 tons per year of any pollutant (excluding fugitive emissions).

G. ARM 17.8, Subchapter 12, Operating Permit Program, including, but limited to:

1. ARM 17.8.1201 Definitions. (23) Major Source under Section 7412 of the FCAA is defined as any stationary source having:
 - a. PTE > 10 tons/year of any one Hazardous Air Pollutant (HAP),
 - b. PTE > 25 tons/year of a combination of all HAPS, or
 - c. PTE > 100 tons/year of any pollutant.
 - d. Sources with the PTE > 70 tons/year of PM-10 in a serious PM-10 nonattainment area.
2. ARM 17.8.1204 Air Quality Operating Permit Program Applicability. Title V of the FCAA of 1990 requires that all sources, as defined in ARM 17.8.1204 (1), obtain a Title V Operating Permit. In reviewing and issuing air quality Permit #2940-05 for REC's facility, the following conclusions were made:
 - a. The emission limitations and conditions set in the permit will limit criteria pollutant emissions to less than 100 tons per year.
 - b. The emission limitations and conditions set in the permit will limit HAP emissions to less than 10 tons/year of any one HAP, and less than 25 tons/year of a combination of all HAPs.

- c. The source is not located in a serious PM-10 nonattainment area.
- d. The facility is not subject to any current NESHAP standards.
- e. The source is not a Title IV affected source nor a solid waste combustion unit.
- f. The source is not an EPA designated Title V source.

Therefore, REC's facility is not subject to Title V Operating Permit requirements.

III. Best Available Control Technology Analysis

A BACT determination is required for each new or altered source. REC shall install on the new or altered source the maximum air pollution control capability which is technically practicable and economically feasible, except that BACT shall be utilized. A BACT analysis was not required for the current permit action because the current permit action is considered an administrative permit action.

IV. Emission Inventory

	Tons/Year					
	TSP	PM-10	SO _x	NO _x	VOC	CO
Boilers < 10 MMBtu/hr	0.09	0.09	0.02	2.94	0.16	0.59
All Boilers > 10 MMBtu/hr	2.20	2.20	0.22	26.39	3.52	32.99
Natural Gas Hot Oil Heaters	4.20	4.20	0.22	21.28	0.98	38.84
M.G. Silicon Storage Bins	0.34	0.34				
M.G. Silicon Feed Hopper	0.09	0.09				
M.G. Silicon Lock Hopper	0.08	0.08				
Lime Storage System			5.27			
Cooling Tower	4.07	4.07				
Chlorosilane Scrubber System	0.07	0.07				
Silane Scrubber System	0.43	0.43				
Reactor Atmos. Vents	13.37	13.37				
Reactor Analyzer Vents	0.16	0.16				
M.G. Silicon Feed Hopper	0.09	0.09				
M.G. Silicon Lock Hopper	0.08	0.08				
Chlorosilane Scrubber System	0.07	0.07				
Silane Scrubber System	0.21	0.21				
Hydrogen Vent Stack	24.84	24.84				
Cooling Tower	4.07	4.07				
Emergency Generators	0.72	0.47	5.41	30.80	0.97	7.04
Emergency Generator	0.27	0.27	0.25	3.77	0.30	0.82
Total	60.72	60.47	6.11	76.16	5.93	54.40

Boilers < 10 MMBtu/hr	Boiler #2	EP#114
N.G. Heat Value	1000 Btu/ft**3	
Total Heat	6.7 MMBtu/hr	
Fuel Consumed	58.7 MMft**3/yr	
TSP Emissions		
Emission Factor:	3.00 lbs/MMft**3	{AFSSCC 1-02-006-03}
Control Efficiency:	0.0%	
Fuel Consumption:	58.7 MMft**3/yr	(Maximum Consumption)
Calculations:	58.7 MMft**3/yr*3.00 lb/MMft**3*0.0005 ton/lb = 0.09 ton/yr	
PM-10 Emissions:		
Emission Factor:	3.00 lbs/MMft**3	{AFSSCC 1-02-006-03}
Control Efficiency:	0.0%	
Fuel Consumption:	58.7 MMft**3/yr	(Maximum Consumption)
Calculations:	58.7 MMft**3/yr*3.00 lb/MMft**3*0.0005 ton/lb = 0.09 ton/yr	

NO_x Emissions:
 Emission Factor: 100.00 lbs/MMft**3 {AFSSCC 1-02-006-03}
 Control Efficiency: 0.0%
 Fuel Consumption: 58.7 MMft**3/yr (Maximum Consumption)
 Calculations: 58.7 MMft**3/yr*100 lb/MMft**3*0.0005 ton/lb = 2.94 ton/yr

VOC Emissions:
 Emission Factor: 5.30 lbs/MMft**3 {AFSSCC 1-02-006-03}
 Control Efficiency: 0.0%
 Fuel Consumption: 58.7 MMft**3/yr (Maximum Consumption)
 Calculations: 58.7 MMft**3/yr*5.30 lb/MMft**3*0.0005 ton/lb = 0.16 ton/yr

CO Emissions:
 Emission Factor: 20.00 lb/MMft**3 {AFSSCC 1-02-006-03}
 Control Efficiency: 0.0%
 Fuel Consumption: 58.7 MMft**3/yr (Maximum Consumption)
 Calculations: 58.7 MMft**3/yr*20 lb/MMft**3*0.0005 ton/lb = 0.59 ton/yr

SO_x Emissions:
 Emission Factor: 0.60 lb/MMft**3 {AFSSCC 1-02-006-03}
 Control Efficiency: 0.0%
 Fuel Consumption: 58.7 MMft**3/yr (Maximum Consumption)
 Calculations: 58.7 MMft**3/yr*0.6 lb/MMft**3*0.0005 tons/lb = 0.02 ton/yr

All Boilers > 10 MMBtu/hr Boiler #1 EP#113

N.G. Heat Value 1000 Btu/ft**3
 Total Heat 50.22 MMBtu/hr
 Fuel Consumed 440 MMft**3/yr

TSP Emissions
 Emission Factor: 0.01 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Firing Rate: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MMBtu/hr*0.01 lb/MMBtu *8760 hr/yr*0.0005 ton/lb = 2.20 ton/yr

PM-10 Emissions:
 Emission Factor: 0.01 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Firing Rate: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MMBtu/hr*0.01 lb/MMBtu *8760 hr/yr*0.0005 ton/lb = 2.20 ton/yr

NO_x Emissions:
 Emission Factor: 0.120 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Fuel Consumption: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MMBtu/hr*0.120 lb/MMBtu *8760*0.0005 ton/lb = 26.39 ton/yr

VOC Emissions:
 Emission Factor: 0.016 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Fuel Consumption: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MMBtu/hr*0.016 lb/MMBtu *8760*0.0005 ton/lb = 3.52 ton/yr

CO Emissions:
 Emission Factor: 0.15 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Fuel Consumption: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MBtu/hr*0.15 lb/MMBtu *8760*0.0005 ton/lb = 32.99 ton/yr

SO_x Emissions:
 Emission Factor: 0.001 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Fuel Consumption: 50.22 MMBtu/hr (Maximum Firing Rate)
 Calculations: 50.22 MMBtu/hr*0.001 lb/MMBtu *8760*0.0005 ton/lb = 0.22 ton/yr

Natural Gas Hot Oil Heaters H-1201 & H-2201 EP#107 & EP#207

TSP Emissions

Emission Factor: 0.012 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0% (LOW NO_x BURNERS &FGR)
 Firing Rate: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.012 lb/MMBtu *8760 hr/yr*0.0005 ton/lb = 4.20 ton/yr

PM-10 Emissions:

Emission Factor: 0.012 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0% (LOW NO_x BURNERS &FGR)
 Firing Rate: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.012 lb/MMBtu *8760 hr/yr*0.0005 ton/lb = 4.20 ton/yr

NO_x Emissions:

Emission Factor: 0.061 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0% (LOW NO_x BURNERS &FGR)
 Fuel Consumption: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.061 lb/MMBtu *8760*0.0005 ton/lb = 21.28 ton/yr

VOC Emissions:

Emission Factor: 0.0028 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0% (LOW NO_x BURNERS &FGR)
 Fuel Consumption: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.0028 lb/MMBtu *8760*0.0005 ton/lb = 0.98 ton/yr

CO Emissions:

Emission Factor: 0.111 lb/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0% (LOW NO_x BURNERS &FGR)
 Fuel Consumption: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.037 lb/MMBtu *8760*0.0005 ton/lb = 38.84 ton/yr

SO_x Emissions:

Emission Factor: 0.0006 ls/MMBtu {Manufacturer's Information}
 Control Efficiency: 0.0%
 Fuel Consumption: 80.00 MMBtu/hr (Maximum Firing Rate)
 Calculations: 80.00 MMBtu/hr*0.0006 ls/MMBtu *8760*0.0005 ton/lb = 0.21 ton/yr

PHASE I EMISSION SOURCES

M.G. Silicon Storage Bins EP#101A&B

PM Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control)
 Baghouse Flow: 450 dscfm
 Calculations: 0.02 gr/dscf * 450 dscfm * 60 *8760*1lb/7000gr= 676 lb/yr
 676 lb/yr * 0.0005 ton/lb = 0.34 ton/yr

PM-10 Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control & Assume 100% PM-10)
 Baghouse Flow: 450 dscfm
 Calculations: 0.02 gr/dscf * 450 dscfm * 60 *8760*1lb/7000gr = 676 lb/yr
 676 lb/yr * 0.0005 ton/lb = 0.34 ton/yr

M.G. Silicon Feed Hopper EP#102

PM Emissions

Emission Factor: 0.02 gr/dscf (Baghouse Control)
 Baghouse Flow: 122.5 dscfm
 Calculations: 0.02 gr/dscf * 122.5 dscfm * 60 *8760*1lb/7000gr = 184 lb/yr
 184 lb/yr * 0.0005 ton/lb = 0.09 ton/yr

PM-10 Emissions

Emission Factor: 0.02 gr/dscf (Baghouse Control & Assume 100% PM-10)
 Baghouse Flow: 122.5 dscfm
 Calculations: 0.02 gr/dscf *122.5 dscfm * 60 *8760*1lb/7000gr = 184 lb/yr
 184 lb/yr * 0.0005 ton/lb = 0.09 ton/yr

M.G. Silicon Lock Hopper EP#104

PM Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control)
Baghouse Flow: 100 dscfm
Calculations: $0.02 \text{ gr/dscf} * 100 \text{ dscfm} * 60 * 8760 * 1\text{lb}/7000\text{gr} = 150 \text{ lb/yr}$
 $150 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.08 \text{ ton/yr}$

PM-10 Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control & Assume 100% PM-10)
Baghouse Flow: 100 dscfm
Calculations: $0.02 \text{ gr/dscf} * 100 \text{ dscfm} * 60 * 8760 * 1\text{lb}/7000\text{gr} = 150 \text{ lb/yr}$
 $100 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.08 \text{ ton/yr}$

Lime Storage System EP#116

PM Emissions

Emission Factor: 0.187 gr/dscf (Bin Vent Filter Control)
Baghouse Flow: 750 dscfm
Calculations: $0.187 \text{ gr/dscf} * 750 \text{ dscfm} * 60 * 8760 * 1\text{lb}/7000\text{gr} = 10,530 \text{ lb/yr}$
 $10,530 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 5.27 \text{ ton/yr}$

PM-10 Emissions

Emission Factor: 0.187 gr/dscf (Bin Vent Filter Control & Assume 100% PM-10)
Baghouse Flow: 750 dscfm
Calculations: $0.187 \text{ gr/dscf} * 750 \text{ dscfm} * 60 * 8760 * 1\text{lb}/7000\text{gr} = 10,530 \text{ lbs/yr}$
 $10,530 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 5.27 \text{ ton/yr}$

Cooling Tower EP#118

PM Emissions

Circulation Rate: 10400.00 gpm/cell
Max Drift: 0.005%
Total Dissolved Solids: 1200 ppm
Calculations: $10400 \text{ gpm} * 500 \text{ lb/hr/gpm} * 0.005\% * 1200 * 10^{-6} = 0.31 \text{ lb/hr/cell}$
 $0.31 * 3 \text{ cells} * 8760 * 0.0005 = 4.07 \text{ ton/yr}$

PM-10 Emissions

Circulation Rate: 10400.00 gpm/cell
Max Drift: 0.005%
Total Dissolved Solids: 1200 ppm
Calculations: $10400 \text{ gpm} * 500 \text{ lb/hr/gpm} * 0.005\% * 1200 * 10^{-6} = 0.31 \text{ lb/hr/cell}$
 $0.31 * 3 \text{ cells} * 8760 * 0.0005 = 4.07 \text{ ton/yr}$

Chlorosilane Scrubber System EP#105

PM Emissions

TPY SiO₂ Formed: 72.70 ton/yr (From Permit Application, 6/6/96)
Control: 99.90% (WET SCRUBBER)
Calculations: $72.7 * (1 - 0.999) = 0.07 \text{ ton/yr}$

PM-10 Emissions

TPY SiO₂ Formed: 72.70 ton/yr (From Permit Application, 6/6/96)
Control: 99.90% (WET SCRUBBER)
Calculations: $72.7 * (1 - 0.999) = 0.07 \text{ ton/yr}$

Silane Scrubber System EP#106

PM Emissions

TPY Silane: 23.00 ton/yr (From Permit Application, 6/6/96)
Control: 99.00% (WET SCRUBBER)
Calculations: $23 * (1 - 0.99) * 1.87 = 0.43 \text{ ton/yr}$

PM-10 Emissions

TPY Silane: 23.00 ton/yr (From Permit Application, 6/6/96)
Control: 99.00% (WET SCRUBBER)
Calculations: $23 * (1-0.99) * 1.87 = 0.43$ ton/yr

Reactor Atmos. Vents EP#108-01 through EP#108-50 for TDF-L
EP#108-51 through EP#108-58 for TDF-M

PM Emissions

TDF-L Reactors:
Calculations: $5.58 \text{ lb SiO}_2 * 50 \text{ reactors} * 34 \text{ cycles/reactor/yr} = 9486 \text{ lbs SiO}_2/\text{yr}$
 $9486 * 0.0005 = 4.74$ ton/yr

TDF-M Reactors:
Calculations: $21.8 \text{ lb SiO}_2 * 8 \text{ reactors} * 99 \text{ cycles/reactor/yr} = 17265.6 \text{ lbs SiO}_2/\text{yr}$
 $17265.6 * 0.0005 = 8.63$ ton/yr

TOTAL: 13.37 tons SiO₂/yr

PM-10 Emissions

TDF-L Reactors:
Calculations: $5.58 \text{ lb SiO}_2 * 50 \text{ reactors} * 34 \text{ cycles/reactor/yr} = 9486 \text{ lbs SiO}_2/\text{yr}$
 $9486 * 0.0005 = 4.74$ ton/yr

TDF-M Reactors:
Calculations: $21.8 \text{ lb SiO}_2 * 8 \text{ reactors} * 99 \text{ cycles/reactor/yr} = 17265.6 \text{ lbs SiO}_2/\text{yr}$
 $17265.6 * 0.0005 = 8.63$ ton/yr

TOTAL: 13.37 tons SiO₂/yr

Reactor Analyzer Vents EP#109-01 through EP#109-50 for TDF-L
EP#109-51 through EP#109-58 for TDF-M

PM Emissions

TDF-L Reactors:
Calculations: $50 \text{ reactors} * 4.67 \text{ lb/yr/reactor} = 233.5 \text{ lbs SiO}_2/\text{yr}$
 $233.5 * 0.0005 = 0.12$ ton/yr

TDF-M Reactors:
Calculations: $8 \text{ reactors} * 9.31 \text{ lb/yr/reactor} = 74.48 \text{ lbs SiO}_2/\text{yr}$
 $74.48 * 0.0005 = 0.04$ ton/yr

TOTAL: 0.16 tons SiO₂/yr

PM-10 Emissions

TDF-L Reactors:
Calculations: $50 \text{ reactors} * 4.67 \text{ lb/yr/reactor} = 233.5 \text{ lbs SiO}_2/\text{yr}$
 $233.5 * 0.0005 = 0.12$ ton/yr

TDF-M Reactors:
Calculations: $8 \text{ reactors} * 9.31 \text{ lb/yr/reactor} = 74.48 \text{ lbs SiO}_2/\text{yr}$
 $74.48 * 0.0005 = 0.04$ ton/yr

TOTAL: 0.16 tons SiO₂/yr

PHASE II EMISSION SOURCES

M.G. Silicon Feed Hopper EP#202

PM Emissions

Emission Factor: 0.02 gr/dscf (Baghouse Control)
Baghouse Flow: 122.5 dscfm
Calculations: $0.02 \text{ gr/dscf} * 122.5 \text{ dscfm} * 60 * 8760 * 1 \text{ lb}/7000 \text{ gr} = 184 \text{ lb/yr}$
 $184 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.09$ ton/yr

PM-10 Emissions

Emission Factor: 0.02 gr/dscf (Baghouse Control & Assume 100% PM-10)
Baghouse Flow: 245 dscfm
Calculations: $0.02 \text{ gr/dscf} * 245 \text{ dscfm} * 60 * 8760 * 1 \text{ lb}/7000 \text{ gr} = 184 \text{ lb/yr}$
 $184 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.09$ ton/yr

M.G. Silicon Lock Hopper EP#204

PM Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control)
Baghouse Flow: 100 dscfm
Calculations: $0.02 \text{ gr/dscf} * 100 \text{ dscfm} * 60 * 8760 * 1 \text{ lb}/7000 \text{ gr} = 150 \text{ lb/yr}$
 $150 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.08 \text{ ton/yr}$

PM-10 Emissions

Emission Factor: 0.02 gr/dscf (Bin Vent Filter Control & Assume 100% PM-10)
Baghouse Flow: 100 dscfm
Calculations: $0.02 \text{ gr/dscf} * 100 \text{ dscfm} * 60 * 8760 * 1 \text{ lb}/7000 \text{ gr} = 150 \text{ lb/yr}$
 $100 \text{ lb/yr} * 0.0005 \text{ ton/lb} = 0.08 \text{ ton/yr}$

Chlorosilane Scrubber System EP#105

PM Emissions

TPY SiO₂ Formed: 72.70 ton/yr (From Permit Application, 6/6/96)
Control: 99.90% (WET SCRUBBER)
Calculations: $72.7 * (1 - 0.999) = 0.07 \text{ tons/yr}$

PM-10 Emissions

TPY SiO₂ Formed: 72.70 ton/yr (From Permit Application, 6/6/96)
Control: 99.90% (WET SCRUBBER)
Calculations: $72.7 * (1 - 0.999) = 0.07 \text{ ton/yr}$

Silane Scrubber System EP#106

PM Emissions

TPY Silane: 11.30 ton/yr (From Permit Application, 6/6/96)
Control: 99.00% (WET SCRUBBER)
Calculations: $11.3 * (1 - 0.99) * 1.87 = 0.21 \text{ ton/yr}$

PM-10 Emissions

TPY Silane: 11.30 ton/yr (From Permit Application, 6/6/96)
Control: 99.00% (WET SCRUBBER)
Calculations: $11.3 * (1 - 0.99) * 1.87 = 0.21 \text{ ton/yr}$

Hydrogen Vent Stack EP#111

PM Emissions

Calculations: $34.5 \text{ lb/hr} * 24 \text{ hr/day} * 60 \text{ day/yr} * 0.0005 = 24.84 \text{ tons SiO}_2/\text{yr}$

PM-10 Emissions

Calculations: $34.5 \text{ lb/hr} * 24 \text{ hr/day} * 60 \text{ day/yr} * 0.0005 = 24.84 \text{ tons SiO}_2/\text{yr}$

Cooling Tower EP#218

PM Emissions

Circulation Rate: 10400.00 gpm/cell
Max Drift: 0.005%
Total Dissolved Solids: 1200 ppm
Calculations: $10400 \text{ gpm} * 500 \text{ lb/hr/gpm} * 0.005\% * 1200 * 10^{-6} = 0.31 \text{ lb/hr/cell}$
 $0.31 * 3 \text{ cells} * 8760 * 0.0005 = 4.07 \text{ ton/yr}$

PM-10 Emissions

Circulation Rate: 10400.00 gpm/cell
Max Drift: 0.005%
Total Dissolved Solids: 1200 ppm
Calculations: $10400 \text{ gpm} * 500 \text{ lb/hr/gpm} * 0.005\% * 1200 * 10^{-6} = 0.31 \text{ lb/hr/cell}$
 $0.31 * 3 \text{ cells} * 8760 * 0.0005 = 4.07 \text{ ton/yr}$

Emergency Generators

(2) 2000-kw generators

TSP Emissions

Emission Factor: 0.3253 gr/kw-hr {AP-42 Table 3.4-5}
Design Capacity 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $0.3253 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 0.72 \text{ ton/yr}$

PM-10 Emissions

Emission Factor: 0.2116 gr/kw-hr {AP-42 Table 3.4-5}
Design Capacity 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $0.2116 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 0.47 \text{ ton/yr}$

NO_x Emissions

Emission Factor: 14.00 gr/kw-hr {AP-42 Table 3.4-2}
Design Capacity 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $14.0000 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 30.80 \text{ ton/yr}$

VOC Emissions

Emission Factor: 0.44 gr/kw-hr {AP-42 Table 3.4-2}
Design Capacity: 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $0.4400 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 0.97 \text{ ton/yr}$

CO Emissions

Emission Factor: 3.20 gr/kw-hr {AP-42 Table 3.4-2}
Design Capacity 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $3.2000 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 7.04 \text{ ton/yr}$

SO_x Emissions

Emission Factor: 2.46 gr/kw-hr {AP-42 Table 3.4-2 & Assume 0.5% S}
Design Capacity 4000.00 kw
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $2.4600 \text{ gr/kw-hr} * 4000.00 \text{ kw} * 500 \text{ hr/yr} * .0022 * 0.0005 = 5.41 \text{ ton/yr}$

Emergency Generator

(1) 490-Hp generator

TSP Emissions

Emission Factor: 1.0 gr/hp-hr {AP-42 Table 3.3-1, Assume TSP & PM-10 are equal}
Design Capacity 490 Hp
Hours of Operation: 500.00 hrs/yr (EPA PTE Policy)
Calculations: $1.0 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 0.27 \text{ ton/yr}$

PM-10 Emissions

Emission Factor: 1.0 gr/hp-hr {AP-42 Table 3.3-1, Assume TSP & PM-10 are equal}
Design Capacity 490 Hp
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $1.0 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 0.27 \text{ ton/yr}$

NO_x Emissions

Emission Factor: 14.0 gr/hp-hr {AP-42 Table 3.3-1}
Design Capacity 490 Hp
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $14.0 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 3.77 \text{ ton/yr}$

VOC Emissions

Emission Factor: 1.12 gr/hp-hr {AP-42 Table 3.3-1}
Design Capacity 490 Hp
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $1.12 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 0.30 \text{ ton/yr}$

CO Emissions

Emission Factor: 3.03 gr/hp-hr {AP-42 Table 3.3-1}
Design Capacity 490 Hp
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $3.03 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 0.82 \text{ ton/yr}$

SO_x Emissions

Emission Factor: 0.931 gr/hp-hr {AP-42 Table 3.3-1}
Design Capacity 490 Hp
Hours of Operation: 500.00 hr/yr (EPA PTE Policy)
Calculations: $0.931 \text{ gr/hp-hr} * 490 \text{ Hp} * 500 \text{ hr/yr} * 0.0022 * 0.0005 = 0.25 \text{ ton/yr}$

V. Ambient Air Impact Analysis

The area in and around Butte is currently a nonattainment area for previous violations of the PM-10 standards. Foster Wheeler USA Corporation, on behalf of REC, conducted ambient air quality modeling for previous permitting actions. The models have demonstrated that the facility will not cause or contribute to a violation of the NAAQS or a significant impact on the nonattainment area. Therefore, it is expected that REC's facility will continue to operate in compliance with the ambient standards

VI. Taking or Damaging Implication Analysis

As required by 2-10-105, MCA, the Department has conducted a private property taking and damaging assessment and has determined there are no taking or damaging implications.

VII. Environmental Assessment

This permitting action will not result in an increase of emissions from the facility and is considered an administrative action; therefore, an Environmental Assessment is not required.

Prepared by: Trista Glazier

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