# RICE SOLAR ENERGY, LLC

An Affiliate of SOLARRESERVE

March 16, 2010

# **DOCKET**

09-AFC-10

DATE MAR 16 2010

**RECD. MAR 26 2010** 

Sam Oktay Lead Air Quality Engineer Mojave Desert Air Quality Management District 14306 Park Avenue Victorville, CA 92392-2310

Subject: Additional Authority to Construct Applications for the Rice Solar Energy Project

Dear Mr. Oktay:

Per your request, Rice Solar Energy LLC has prepared the attached "Application for Authority to Construct General Form" for the salt commissioning sources:

- Multi-stage wet chemical scrubber proposed for use during the salt system commissioning; and
- Material handling equipment associated with the salt system commissioning with the fabric filter baghouse proposed for the control of the emissions from the salt milling and handling processes.

A check for \$452 has also been included to cover the application fee. These forms are being submitted to supplement the application forms originally submitted for the Rice Solar Energy Project (RSEP).

As discussed in Section 5.1.4 of the RSEP Application for Certification (AFC), a multi-stage wet chemical scrubber will be installed to remove the NOx emissions emitted from the salt melting/heating systems and the hot salt storage tank during the salt system commissioning period. The scrubber will be used 24 hours per day, 7 days per week throughout the salt system commissioning period. Because the final make and model of the scrubber have not been determined at this time, Rice Solar Energy LLP would be willing to accept a permit condition that requires the reporting of the make, model, and serial number to the MDAQMD 60 days prior to the installation of the equipment. At the completion of the salt system commissioning, the scrubber and all salt melting/heating systems will be removed from the site.

The hourly, daily, and annual emission estimates associated with the scrubber are provided in Table 1. The conditioning emission estimate is a conservative estimate based on the maximum guarantee level of impurity (chiefly magnesium nitrate) concentrations in the salt and not the typical or expected impurity concentration. Furthermore, the scrubber NOx control level was assumed to be 85 percent effective in reducing NOx emissions, and the RSEP project expects the control efficiency to be above 90 percent. The information is excerpted from Table 5.1-12 of the RSEP AFC. The detailed emission calculations are also available in RSEP AFC Volume II, Table 5.1B-3 (attached for your reference).

Tel: (310) 315 2291

Suite 500 East

Fax: (310) 315 2201

Santa Monica, CA 90404

Sam Oktay Page 2 March 15, 2010

TABLE 1 (REFERENCE TABLE 5.1-12 OF THE AFC)

RSEP Salt System Commissioning Scrubber Emission Rates

	NO <sub>x</sub>	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Maximum hourly, lb/hr						
Conditioning*	10.9	_	_	_		_
Maximum daily, lb/day						
Conditioning*	261	_	_	_	_ ·	_
Salt system commissioning period, lb/period						
Conditioning*	17,901		_	_	_	_

<sup>\*</sup>Conditioning emissions represent post-control emissions.

lb/hr = pound(s) per hour

lb/period = pound(s) per duration of the commissioning activities

The salt milling, blending, and handling activities will take place within a temporary enclosure and the emissions will be collected and exhausted through a fabric filter baghouse unit. The salt will be conveyed from the blended storage hopper to the salt-melting operation via an enclosed mechanical screw conveyor (or other similar conveyor). There are no plans at this time to convey the salt pneumatically. The salt will drop into the melting system, where the drop height will be minimized to reduce salt loss. Additionally, the drop point will include a snorkel to reduce the salt drop height and fugitive dust emissions will be controlled by implementing a housekeeping program to minimize the collection of salt on the floor of the enclosure. The salt handling activities will take place up to 24 hours per day, 7 days per week throughout the 70 day salt melting period. Because the final make and model of the milling and handling equipment have not been determined at this time, Rice Solar Energy LLP would be willing to accept a determination of compliance condition that will require the reporting of the final design details to the MDAQMD 90 days prior to the installation of the equipment. All salt milling and handling equipment will be removed from the site at the completion of the salt system commissioning.

The specific emission factors for estimating the fugitive dust emissions from the milling, handling, and conveying of sodium nitrate and potassium nitrate salts are unavailable in general reference materials such as AP-42. However, in order to provide an order of magnitude estimate of emissions, the AP-42 approach (EPA, 1995) for estimating phosphate rock emissions was used as a surrogate. Phosphate rock was selected as a surrogate because all three compounds are common materials used in fertilizers and the phosphate grinding would represent a conservative estimate because the rock-grinding emissions are expected to be higher than the milling activities used to break up salt clumps. It is expected that the fabric filter baghouse unit will achieve control efficiency greater than 99 percent.

The hourly, daily, and annual total particulate emission estimates associated with the salt milling and material handling emissions are provided in Table 2, and show less than 151 pounds of total particulate, conservatively assumed to be both 100 percent  $PM_{10}$  and  $PM_{2.5}$ , would be released inside the enclosure during the 70 day salt handling period. The hourly and daily emission rates assume the total particulate emissions would be emitted over 70, 8-hour work days.

Sam Oktay Page 3 March 15, 2010

#### TABLE 2 (REFERENCE ATTACHMENT DR8-1 OF THE CEC DATA REQUEST RESPONSES)

RSEP Salt Milling and Material Handling Emission Rates

	NO <sub>x</sub>	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub> a	PM <sub>2.5</sub> a
Maximum hourly, lb/hr <sup>b</sup>	-	-	-	-	0.27	0.27
Maximum daily, lb/day <sup>c</sup>	-	-	-		2.2	2.2
Salt system commissioning period, lb/period <sup>d</sup>	-	-	-	-	151	151

<sup>&</sup>lt;sup>a</sup>Conservatively assumes the PM<sub>10</sub> and PM<sub>2.5</sub> emissions would be equivalent to the total post-control particulate emissions

lb/hr = pound(s) per hour

Ib/period = pound(s) per duration of the commissioning activities

If you have any questions regarding this information, please contact me at (310) 315-2212, Jerry Salamy (CH2M HILL) at (916) 286-0207, or Keith McGregor (CH2M HILL) at (916) 286-0221.

Sincerely,

Rice Solar Energy LLC

Jeff Benoit

Rice Solar Energy Project Director

Attachment

c:

**CEC Docket List** 

CH2MHILL Project File

<sup>&</sup>lt;sup>b</sup>The maximum hourly emission rate is based on the total particulate period emissions divided by 70, 8-hour work days.

<sup>&</sup>lt;sup>c</sup>The maximum daily emission rate is based on the total particulate period emission divided by 70 work days. <sup>d</sup>The maximum period emission rate is based on the phosphate rock grinding estimates for 35,000 tons of salt material (see Attachment DR8-1).

## MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT

14306 Park Avenue, Victorville, CA 92392-2310 (760) 245-1661 Facsimile: (760) 245-2022

www.mdaqmd.ca.gov Eldon Heaston Executive Director

## APPLICATION FOR AUTHORITY TO CONSTRUCT AND PERMIT TO OPERATE

Page 1 of 2: please type or print REMIT	\$226.00 WITH THIS DOCUMENT (\$	\$129.00 FOR CHANGE OF OWNER				
Permit To Be Issued To (company name to receive permit):	118	a. Federal Tax ID No.:				
Rice Solar Energy, LLC.		27-0967061				
2. Mailing/Billing Address (for above company name):						
2425 Olympic Blvd., Suite 500 East, Santa I	Monica, CA 90404					
3. Facility or Business License Name (for equipment location):						
Rice Solar Energy, LLC.						
4. Facility Address - Location of Equipment (if same as for com	pany, enter "Same"):	ocation UTM or Lat/Long:				
Rural Address: Rice, CA		Reference AFC				
5. Contact Name/Title:	Email Address: P	hone/Fax Nos.:				
Jeff Benoit / SR. Project Manager	Jeff.Benoit@SolarRese	erve.com				
6. Application is hereby made for Authority To Construct (ATC)	and Permit To Operate (PTO) the	ne following equipment:				
Dry Salt Milling / Blending / Handling (Temp	orary - Salt Commissioni	ing Only)				
Air Pollution Control Equipment, if any (note that most APCE re	equire a separate application):					
Fabric Filter Baghouse						
7. Application is for:	For modification of	or change of owner:				
X New Construction	f Owner*   *Current Permit N	lumber:				
8. Type of Organization (check one):						
	ty Local Agency State A	<u> </u>				
9. General Nature of Business:	Principal Product:	SIC Code (if known):				
Solar Powered Electrical Generating Facility	Electricity					
10. Distances (feet and direction to closest):	<i>)</i>					
NA Fenceline 79200NE Residence	8 9 7 6 0 W Business	1 2 1 4 4 0 E School				
11. Facility Annual Throughput by Quarters (percent):	12. Expected Facility Opera	ting Hours:				
25 % 25 % 25 % 25 %	2 4 7	52 8760				
Jan-Mar Apr-Jun Jul-Sep Oct-Dec	Hrs/Day Days/Wk	Wks/Yr Total Hrs/Yr				
	13. Do you claim Confidentiality of Data (if yes, state nature of data on reverse in Remarks)?					
14. Signature of Responsible Official: Official Title:						
L Benal	Sr. Project Manager					
Typed or Printed Name of Responsible Official:	Phone Number:	Date Signed:				
Jeff Benoit	( 3 1 0 ) 3 1 5 - 2 2 1 2					
	ct Use Only -					
Application Number: Invoice Number:	Permit Number:	Company/Facility Number:				

# MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT GENERAL APPLICATION, continued

Page 2 of 2: please type or print

15. Stack Emi	ssions Information	on:					
Stack No.	Stack Height	Stack Diameter	Exhaust Temp	Exhaust Flow Rate	Exhaust Velocity		
-1 <b>*</b>	TBD	TBD	TBD	TBD_	TBD		
2 _		·		<u> </u>			
3 _							
*Fabric Filter Baghouse details will be provided prior to start of construction (see discussion below).  (list additional stacks on a separate sheet)  Stack Height is the distance above ground level to discharge point (feet)  Stack Diameter is the diameter (or equivalent circular diameter) of discharge point (nearest tenth foot)  If using cross-sectional area (A in square feet), equivalent diameter is D = (1.273A)^0.5  Exhaust Temp in degrees F, acutal or estimated to nearest 50 deg F							
		rge point in actual of second, design or m	•	e (ACFM)	<u> </u>		

16. Remarks (basis for confidentiality of data, process description, modification description, etc.): The salt milling, blending, and handling activities will take place within a temporary enclosure and the emissions will be collected and exhausted through a fabric filter baghouse unit. The salt will be conveyed from the blended storage hopper to the salt-melting operation via an enclosed mechanical screw conveyor (or other similar conveyor). There are no plans at this time to convey the salt pneumatically. The salt will drop into the melting system, where the drop height will be minimized to reduce salt loss. Additionally, the drop point will include a snorkel to reduce the salt drop height and fugitive dust emissions will be controlled by implementing a housekeeping program to minimize the collection of salt on the floor of the enclosure. The salt handling activities will take place up to 24 hours per day, 7 days per week throughout the 70 day salt melting period. It is expected that the fabric filter baghouse unit will achieve control efficiency greater than 99 percent.

Because the final make and model of the milling and handling equipment have not been determined at this time, Rice Solar Energy LLP would be willing to accept a determination of compliance condition that will require the reporting of the final design details to the MDAQMD 90 days prior to the installation of the equipment. All salt milling and handling equipment will be removed from the site at the completion of the salt system commissioning.

Specific emission factors for estimating the fugitive dust emissions from the milling, handling, and conveying of sodium nitrate and potassium nitrate salts are unavailable in general reference materials such as AP-42. However, in order to provide an order of magnitude estimate of emissions, the AP-42 approach (EPA, 1995) for estimating phosphate rock emissions was used as a surrogate. Phosphate rock was selected as a surrogate because all three compounds are common materials used in fertilizers and the phosphate grinding would represent a conservative estimate because the rock-grinding emissions are expected to be higher than the milling activities used to break up salt clumps.

Based on the phosphate rock grinding estimates, less than 151 pounds of total particulate would be released inside the enclosure during the 70 day salt handling period. Assuming the milling and handling emissions would be emitted over 70, 8-hour work days, the hourly and daily emission rates would be 0.27 lb/hr and 2.2 lb/day.

If you wish to specify process information as proprietary or confidential, space is provided for this purpose. The kinds and rates of emissions may not be held confidential; emissions are subject to public disclosure.

## MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT

14306 Park Avenue, Victorville, CA 92392-2310 (760) 245-1661 Facsimile: (760) 245-2022

www.mdaqmd.ca.gov Eldon Heaston Executive Director

## APPLICATION FOR AUTHORITY TO CONSTRUCT AND PERMIT TO OPERATE

Page 1 of 2: please type or print REMIT	\$226.00 WITH THIS DOCUMENT	T (\$129.00 FOR CHANGE OF OWNER)				
1. Permit To Be Issued To (company name to receive permit):		1a. Federal Tax ID No.:				
Rice Solar Energy, LLC.		27-0967061				
Mailing/Billing Address (for above company name):		•				
2425 Olympic Blvd., Suite 500 East, Santa N	Monica, CA 90404					
3. Facility or Business License Name (for equipment location):		,				
Rice Solar Energy, LLC.						
4. Facility Address - Location of Equipment (if same as for com	pany, enter "Same"):	Location UTM or Lat/Long:				
Rural Address: Rice, CA	,	Reference AFC				
5. Contact Name/Title:	Email Address:	Phone/Fax Nos.:				
Jeff Benoit / SR. Project Manager	Jeff.Benoit@SolarRes	serve.com				
6. Application is hereby made for Authority To Construct (ATC)	and Permit To Operate (PTO	) the following equipment:				
Multi-Stage Wet Chemical Scrubber (Temporar	y - Salt Commissioning (	Only)				
Air Pollution Control Equipment, if any (note that most APCE re	equire a separate application):					
See Sections 5.1.4.1.1 of the AFC						
7. Application is for:	For modification	n or change of owner:				
X New Construction ☐ Modification* ☐ Change of	f Owner*	Number:				
8. Type of Organization (check one):						
☐ Individual Owner ☐ Partnership ☐ Corporation ☐ Utility ☐ Local Agency ☐ State Agency ☐ Federal Agency						
General Nature of Business:	Principal Product:	SIC Code (if known):				
Solar Powered Electrical Generating Facility	Electricity					
10. Distances (feet and direction to closest):						
NA Fenceline 79200NE Residence	e <u>89760W</u> Busine	ess <u>1 2 1 4 4 0 E</u> School				
11. Facility Annual Throughput by Quarters (percent):	12. Expected Facility Ope	rating Hours:				
25 % 25 % 25 % 25 %	2 4 7	52 8760				
Jan-Mar Apr-Jun Jul-Sep Oct-Dec	Hrs/Day Days/Wk	Wks/Yr Total Hrs/Yr				
13. Do you claim Confidentiality of Data (if yes, state natu	13. Do you claim Confidentiality of Data (if yes, state nature of data on reverse in Remarks)?					
14. Signature of Responsible Official:	Official Title:					
L. Benal	Sr. Project Manager					
Typed or Priced Name of Responsible Official:	Phone Number:	Date Signed:				
Jeff Benoit	(310)315-221	2				
	ct Use Only -					
Application Number: Invoice Number:	Permit Number:	Company/Facility Number:				

## MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT GENERAL APPLICATION, continued

5. Stack Em	issions Informati	on:			
Stack No.	Stack Height	Stack Diameter	Exhaust Temp	Exhaust Flow Rate	Exhaust Velocit
STACK3*_	50 feet	1.13 feet	120 degrees F	3,000 acfm	50 feet/second
2 _				· 	
3 _					
STACK3 corr	esponds to the s	tack numbering cor	nvention used for t	he AFC dispersion mod	deling files.
		(list additional	stacks on a separa	ate sheet)	
Stack Diame Exhaust Ter Exhaust Flo	eter is the diame f using cross-sed mp in degrees F, w Rate at discha		rcular diameter) of juare feet), equival d to nearest 50 deg cubic feet per minu	discharge point (neare ent diameter is D = (1.2 ı F	
6. Remarks	(basis for confide	entiality of data, pro	cess description, r	nodification description	, etc.):
	•				
		•	•		
•	•	•			
				•	
		,			
			•		
,		·			

#### **Table 5.1B-3** Rice Solar Energy Project - Solar Salt Commissioning Solar Salt Conditioning - Off-Gas Emission Characterization October 2009

#### Solar Salt Purification - Decomposition of Inpurities (Short-Term - Non-Recurring)

#### Descriptions:

Because the salts contain a fractional amount of magnesium nitrate as an impurity, conditioning the salt to 1,100 F will oxidize the magnesium nitrate (Mg(NO3)2) to magnesium oxide (MgO) and release oxides of nitrogen (NO & NO2).

$$Mg(NO_3)_2 \rightarrow MgO_{(s)} + 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$$

Total salt amount:

35,000 Short Tons

(Maximum)

Max % (wt) Mg:

0.045 % (based on vendor guarantee)

Max % (wt) Mg(NO3)2:

0.275

Total mass of Mg(NO3)2:

192,162 lb (maximum guarantee)

MWt of Mg: MWt of Mg(NO3)2:

24.31 lb/lb-mole 148.30 lb/lb-mole

MWt of NO2:

46.05 lb/lb-mole

Max NO2 Emissions:

119,340 lbs - Lifetime estimate (Emission higher initially then tail off)

Salt curing duration:

69 24-hour days

NO2 release rate:

72.5 lb/hr (pre-control)

NO2 control efficiency:

85% (4-stage packed bed chemical scrubber will exceed this requirement)

#### NO2 Release Rate (Calculated based on maximum salt melting rate & ideal gas law)

Molecular Wt of NO2:

46.02 .1b/lb-mole

NO2 gas pressure:

14.7 psi

NO2 gas temperature:

1210 R (750 F)

Universal gas constant:

10.73159 ft3-psi/R/lb-mole

1,391.66 ft3/hr

Max. NO2 release rate:

#### Emission Source Data (Based on wet chemical scrubbing technology)

Stack Id:	Stack 3	Units (Descriptions)
Stack height:	50	ft above ground
Stack location:	STK 3	
Stack diameter:	14	in.
Est. Exhaust temperature:	120	°F
Exhaust flowrate:	3,000	ACFM

#### Emissions (Based on control equipment performing at above stated efficiency)

Criteria Pollutants	Max. NOx Emissions	Units (Comments)
Max Hourly Pre-Control:	72.55	lb/hr
Max Hourly Post-Control:	. 10.88	lb/hr
Lifetime Pre-Control:	119,340	lb
Lifetime Post-Control:	17,901	lb .

#### Energy Requirement for Salt Purification (Assumed electrical heating in Hot Tank)

0.363 BTU/lb Eutectic salt specific heat:

Energy to raise salt temp:

199.7 BTU/lb (0.363 BTU/lb-F) Additional

Total energy requirement:

13.976 mmBTU

Total electrical load:

4,836 MWh (Assume 85% heat transfer efficiency)

Hot tank heating element:

3.0 MWe

Length of curing:

1,612 hours or

67 days

þ.	Emission	
	Factors	Total Process Emissions
Indirect Greenhouse Gases	(lb/MWh)	(metric tons
CO2:	724.12	1,588
CH4:	0.0302	0.07
N2O:	0.0081	0.02

Greenhouse gas emission factors from the California Climate Action Registry, General Reporting Protocol v. 3.1, January 2005

# Attachment DR8-1 Rice Solar Energy Project Emission Estimates Associated with Salt Milling Activities During the Salt Commissioning Process March 2010

Note: Emission factors for milling magnesium and sodium nitrate were not readily available. Therefore, phosphate rock processing was used to develop a conservative estimate of emissions from the salt milling activities.

	Quantity of Salt		Emission Factor *		
	Material Milled		(total particulate)	Total PM Emissions	
	_ (pounds)	(tons)	lb/ton	(pounds)	(tons)
Uncontrolled	70,000,000	35,000	1.50	52500	26.3
Controlled	70,000,000	35,000	0.0043	150.5	0.075

<sup>\*</sup>Reference: Emission rate is based on the emission factors for phosphate rock grinding (AP-42, Table 11.21-4).



# BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA 1516 NINTH STREET, SACRAMENTO, CA 95814 1-800-822-6228 – WWW.ENERGY.CA.GOV

# APPLICATION FOR CERTIFICATION FOR THE RICE SOLAR ENERGY POWER PLANT PROJECT

#### **APPLICANT**

Jeffrey Benoit
Project Manager
Solar Reserve
2425 Olympic Boulevard, Ste. 500 East
Santa Monica, CA 90404
Jeffrey Benoit@solarreserve.com

#### APPLICANT'S CONSULTANTS

Andrea Grenier Grenier and Associates 1420 East Roseville Parkway, Ste. 140-377 Roseville, CA 95661 andrea@agrenier.com

Douglas Davy CH2MHILL 2485 Natomas Park Drive, Ste. 600 Sacramento, CA 95833 ddavy@ch2m.com

#### **COUNSEL FOR APPLICANT**

Scott Galati Galati & Blek, LLP 455 Capitol Mall, Suite 350 Sacramento, CA 95814 sgalati@gb-llp.com

#### **INTERESTED AGENCIES**

California ISO e-recipient@caiso.com

Liana Reilly Westem Area Power Administration PO Box 281213 Lakewood CO 80228-8213 reilly@wapa.gov

## Docket No. 09-AFC-10

# PROOF OF SERVICE (Revised 3/4/2010)

Allison Shaffer
Bureau of Land Management
Palm Springs/South Coast Field Office
1201 Bird Center Drive
Palm Springs, Ca 92262
allison\_shaffer@blm.gov

#### INTERVENORS

ENERGY COMMISSION
\*ROBERT WEISENMILLER
Commissioner and Presiding Member
rweisenm@energy.state.ca.us

\*KAREN DOUGLAS
Chairman and Associate Member kldougla@energy.state.ca.us

Kourtney Vaccaro Hearing Officer kvaccaro@energy.state.ca.us

John Kessler Siting Project Manager jkessler@energy.state.ca.us

Deborah Dyer Staff Counsel ddyer@energy.state.ca.us

\*Jennifer Jennings Public Adviser's Office publicadviser@energy.state.ca.us