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Carrizo Energy Solar Farm
Responses to CURE Data Requests Set One
07-AFC-08

TECHNICAL AREA: AIR QUALITY

Background: Maximum Annual and Daily Construction Equipment Combustion Emissions

Data Request 1: Please revise project construction emissions estimates for combustion equipment for those months during which the highest emissions occur.

Response: In response to *California Unions for Reliable Energy Data Requests, Set One* dated June 13, 2008, air quality construction emissions were revised and dispersion modeling redone based on Data Request No. 1 (DR1). URS agrees that the previous construction emissions and modeling may not have addressed the worst month and year of the project construction schedule in terms of pollutant emissions. Accordingly, construction emissions and modeling were revised to use the equipment and activities corresponding to Month 4 of the construction schedule as the basis for estimating the worst-case pollutant emissions for averaging times from one hour to 24 hours (CO 1 and 8 hour; PM_{10} 24 hours; $PM_{2.5}$ 24 hours; SO_2 1, 3, and 24 hours; and NO_2 1 hour). Similarly, Months 1-12 were selected to represent worst-case construction emissions over the annual averaging time.

Detailed spreadsheets are provided in Appendix A showing the estimation of emissions from all project construction activities and equipment. Table 1-1 presents the estimated maximum daily and annual emissions of criteria air pollutants due to project construction. The same meteorological and ozone data described in the Project AFC were used with the AERMOD model for this remodeling analysis. Revised construction modeling results are presented in Table 1-2. PM_{10} concentrations above the California 24-hour standard for this pollutant have been recorded on multiple occasions at San Luis Obispo County monitoring stations during recent years. Because of the land use characteristics of this area, it is probable that these conditions result primarily from high wind episodes, agricultural activities or other soil disturbances. The predicted contribution of the proposed construction activities would be minor by comparison with these sources, but would have the potential to temporarily contribute to existing violations of the state and federal PM_{10} standards if construction occurs during a period of high background concentrations.

AERMOD with OLM predicted maximum 1-hour and annual NO_2 concentration due to project construction emissions, which, when added to conservative background values from the nearest SLOAQMD monitoring stations, are below the 1-hour California standard. Predicted maximum impacts for CO and SO_2 are also less than the most stringent ambient standards.

Construction modeling results and a CD of modeling files are being submitted to the CEC with this data request response.

Table 1-1
Daily Maximum Construction Emissions of Criteria Pollutants (lbs/day)

Activity	PM_{10}	$PM_{2.5}$	CO	ROC	NO_x	SO_x
Onsite Combustion Emissions						
Diesel Construction Equipment	17.47	16.06	128.39	43.97	233.10	0.26
Dump trucks, pickup trucks, buses, and worker vehicles	0.22	0.19	2.15	0.44	4.72	0.01
Construction Combustion Subtotal (lbs)	***17.7***	***16.2***	***130.5***	***44.4***	***237.8***	***0.3***
Onsite Fugitive Dust Emissions						
Vehicle Travel on Unpaved Roads and Parking Lot	5.47	1.16				
Earth clearing/Bulldozing	16.86	3.51				
Earth Loading/Storage	5.75	1.20				
Subtotal of Offsite Emissions (lbs)	***28.1***	***5.9***				
Offsite On-Highway Emissions						
Worker Passenger Vehicle, Buses, Delivery Trucks – Combustion Emissions	9.58	8.31	122.11	21.57	208.24	0.35
Worker Passenger Vehicle, Buses, Delivery Trucks – Paved Road Dust	91.99	15.55				
Subtotal of Offsite Emissions (lbs)	***101.58***	***23.86***	***122.11***	***21.57***	***208.24***	***0.35***
Total Max. Daily Emissions (lbs)		**46.0**	**252.6**	**66.0**	**446.1**	**0.6**

Notes:
PM_{10} = particulate matter less than 10 micrometers in diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
ROC = reactive organic compounds
CO = carbon monoxide
NO_x = nitrogen oxide(s)
SO_x = sulfur oxide(s)

Maximum Annual Construction Emissions of Criteria Pollutants (ton/year)						
Activity	PM_{10}	$PM_{2.5}$	CO	ROC	NO_x	SO_x
Onsite Combustion Emissions						
Diesel Construction Equipment	1.68	1.55	12.57	4.32	21.72	0.02
Gasoline Construction Equipment	0.02	0.02	1.06	0.58	0.01	0.00
Dump trucks, pickup trucks and worker vehicles	0.024	0.021	0.238	0.047	0.511	0.001
Construction Combustion Subtotal (tpy)	***1.7***	***1.6***	***13.9***	***4.9***	***22.2***	***0.0***
Onsite Fugitive Dust Emissions						
Vehicle Travel on Unpaved Roads and Parking Lot	0.59	0.13				
Earth clearing/Bulldozing	1.16	0.24				
Earth Loading/Storage	0.50	0.10				
Subtotal of Offsite Emissions (tpy)	***2.3***	***0.5***				
Offsite On-Highway Emissions						
Worker Passenger Vehicle, Buses, Delivery Trucks – Combustion Emissions	1.265	1.097	16.118	2.847	27.488	0.046
Worker Passenger Vehicle, Buses, Delivery Trucks – Paved Road Dust	12.14	2.05				
Subtotal of Offsite Emissions (tpy)	***13.41***	***3.15***	***16.12***	***2.85***	***27.49***	***0.046***
Total Max. Annual Emissions (tpy)	**17.4**	**5.2**	**30.0**	**7.8**	**49.7**	**0.1**

Notes:
PM_{10} = particulate matter less than 10 micrometers in diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
ROC = reactive organic compounds
CO = carbon monoxide
NO_x = nitrogen oxide(s)
SO_x = sulfur oxide(s)

Table 1-2
Maximum Modeled Criteria Pollutant Impacts Due to CESF Construction Emissions

Pollutant	Averaging Period	Maximum Modeled Impact (micrograms/m³)	Background (micrograms/m³)	Maximum Total Predicted Concentration (micrograms/m³)	Most Stringent AAQS (micrograms/m³)	UTM Coordinates	
						East (m)	North (m)
NO_2	1-hour	229.60	105.3	334.90	339	766,000	3,915,100
	Annual	1.13	17.0	18.13	57	767,981	3,919,085
SO_2	1-hour	0.24	309.2	309.44	655	766,000	3,915,100
	3-hour	0.12	109.2	109.32	1300	768,900	3,920,000
	24-hour	0.02	52.5	52.52	105	766,900	3,921,000
	Annual	0.001	8.0	8.00	80	767,981	3,919,085
CO	1-hour	124.36	2,415	2,539	23,000	766,000	3,915,100
	8-hour	31.26	1,367	1,398	10,000	767,500	3,919,600
PM_{10}	24-hour	18.92	55.0	73.92	50	767,337	3,919,069
	Annual	1.24	18.0	19.24	20	767,832	3,919,082
$PM_{2.5}$	24-hour	4.26	30.7	34.96	35	767,709	3,919,078
	Annual	0.31	8.3	8.61	12	767,832	3,919,082

APPENDIX A

Short term Fugitive Dust Emissions

Maximum earth work activity occurs in month 4.

Bulldozing/Earth clearing

$E = 0.45 * G^{1.5} / H^{1.4} * 2.2046$ PM10 Emissions from bulldozing (lb/hr) from SCAQMD Table A9-9-F

15 G = Silt content (%) (from Table A9-9-F-1 for blended ore and dirt)

15 H = Moisture content of surface material (%) (from Table A9-9-F-2 for moist dirt)

1.30 lb/hr of PM10

Equipment	Quantity	Hours/Day	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Dozer	4	7.2	85%	0.78	5.62	0.16	1.17
Scraper	4	7.2	85%	0.78	5.62	0.16	1.17
Grader	4	7.2	85%	0.78	5.62	0.16	1.17
			Total	**2.34**	**16.86**	**0.49**	**3.51**

22 construction days per month

6 Total months of soil movement

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

Dirt Piling or Material Handling

$E = 0.00112 * (G/5)^{1.3} / (H/2)^{1.4}$ PM10 Emissions from Dirt Piling or Material Handling (lb/hr) from SCAQMD Table A9-9-G

12 G = Mean Wind speed (mph) default

15 H = Moisture content of surface material (%) (from Table A9-9-G-1 for moist dirt)

0.00021 lb/ton of PM10

Equipment	Quantity	Hours/Day	Material Handled (ton/day)	Material Handled (ton)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Wheeled Loader	3	7.2	22941	3,028,214	85%	0.0995	0.7163	0.0207	0.1490
Excavator	3	7.2	22941	3,028,214	85%	0.0995	0.7163	0.0207	0.1490
Backhoe	1	7.2	22941	3,028,214	85%	0.0995	0.7163	0.0207	0.1490
Dump Trucks	9	7.2	22941	3,028,214	85%	0.0995	0.7163	0.0207	0.1490
					Total	**0.2985**	**2.1490**	**0.0621**	**0.4470**

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

18773 yd3/day 22941 ton/day

2,478,080 yd3 3,028,214 tons 2444 density of soil (lb/yd3)

(USDA NRCS Physical Soil Properties from San Luis Obispo County Carrizo Valley for Yaguas-Pinspring complex soil)

512 acres = 2,478,080 cubic yds, assume depth of soils moved is 1 yd

Cover Storage Pile

SCAQMD Table A9-9-E

$E = 1.7 * G/1.5 * (365-H)/235 * I/15 * J$

PM10 Emission factor from wind erosion of storage piles per day per acre

15 G = Silt content (%) (from Table A9-9-E-1 for blended ore and dirt)

46 H = Mean number of days per year with at least 0.01 inches of precipitation (from Western Regional Climate Center for Paso Robles COOP Station)

1.56 I = Percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height

0.5 J = Fraction of TSP that is PM10 = 0.5

1.200 lb/acre/day

wind speed percentage based on 2001-2005 (5 yrs) of wind speed data as recorded at La Panza COOP station

Source	Quantity	Size of Pile (acre)	Hours/Day	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Cover Storage Pile	20	1	24	85%	0.15	3.60	0.031	0.749

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

pile size assumed

APPENDIX A continued

Travel on unpaved road

$F = 2.1 * G/12 * H/30 * (J/3)^{0.7} * (I/4)^{0.5} * (365-K)/365$ SCAQMD Table A9-9-D

Emission factor for vehicle travel on unpaved roads (lb/VMT)

4 G = Surface silt loading (%) (value for gravel road)

5 H = Mean vehicle speed (mph)

value listed in table I = Mean number of wheels on vehicle

value listed in table J = Mean vehicle weight (ton)

46 K = Mean number of days per year with at least 0.01 inches of precipitation (from WRCC for Paso Robles COOP Station)

Vehicle Type	No. Of Unit	Round Trips /Day/ Unit	Round Trip Distance (mile)	Daily VMT (all units)	Mean Vehicle Weight (tons)	Number of Wheels on Vehicle	PM10 EF (lbs/VMT)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Pickup, 1/2 Ton	6	4	1	24.0	3	4	0.10	85%	0.03	0.37	0.01	0.08
1 Ton Flat Bed Stake Body Truck	6	1	0.5	3.0	5	6	0.18	85%	0.01	0.08	0.00	0.02
Truck Tractor	1	1	0.5	0.5	13	10	0.45	85%	0.00	0.03	0.00	0.01
Compactor	4	1	0.01	0.0	0	0	0.00	85%	0.00	0.00	0.00	0.00
Water Truck	2	4	6	48.0	13	10	0.45	85%	0.27	3.24	0.06	0.69
Fuel Truck	2	1	0	0.0	13	10	0.45	85%	0.00	0.00	0.00	0.00
ATV	6	2	2	24.0	0.25	4	0.02	85%	0.01	0.06	0.00	0.01
Pile Driving Hammer	1	1	1	1.0	15	12	0.54	85%	0.01	0.08	0.00	0.02
Forklift	0	1	0.5	0.0	17	4	0.34	85%	0.00	0.00	0.00	0.00
Concrete Pump Truck	0	2	1.5	0.0	13	10	0.45	85%	0.00	0.00	0.00	0.00
Telescopic Handler	4	1	0.25	1.0	3	4	0.10	85%	0.00	0.02	0.00	0.00
Portable Welding Machine	1	0	0	0.0	0.5	2	0.02	85%	0.00	0.00	0.00	0.00
Plate Compactor	4	1	0.01	0.0	0	0	0.00	85%	0.00	0.00	0.00	0.00
Manlift	2	1	0.25	0.5	13	4	0.28	85%	0.00	0.02	0.00	0.00
Light Plant	1	0	0	0.0	0.5	2	0.02	85%	0.00	0.00	0.00	0.00
Bus (50 Seat)	6	11	0.2	13.2	15	10	0.50	85%	0.08	0.98	0.02	0.21
Bus (20 Seat)	6	10	0.2	12.0	10	6	0.29	85%	0.04	0.52	0.01	0.11
worker personal vehicles	67	1	0.2	13.4	0.5	4	0.03	85%	0.00	0.06	0.00	0.01
								Total	**0.46**	**5.47**	**0.10**	**1.16**
							Total Fugitive Dust Emissions		**3.25**	**28.07**	**0.68**	**5.86**

Assumed maximum travel speed is 5 mph

Equipment weight from SCAQMD Table A9-9-D-3 and various websites

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions.

PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for appropriate fugitive dust sources.

Water trucks operate at least 4 times per day. Service trucks use 1 trip per day.

Distances measured from plot plan from highway along access road to center of construction area and parking lot.

12 Maximum number of construction work hours per day

Model Input:

Emission spread over Main and Laydown areas

Main Site		Laydown	
Total MODEL EMISSION RATE (lb/hr)		Total MODEL EMISSION RATE (lb/hr)	
PM10	PM2.5	PM10	PM2.5
24hr	24hr	24hr	24hr
1.493	0.3118	0.846	0.1767
MODEL EMISSION RATE per Source (g/s-m2)			
8.37E-08	1.7475E-08	8.36987E-08	1.74746E-08

Location	X (m)	Y (m)	AREA (m2)	percent of total area
MAINDUST	1500	1500	2250000	0.638
LAYDUST	1500	850	1275000	0.362
Total Construction Area			3525000	

Docket Optical System - Carrizo Energy Solar Farm - CURE Data Requests Set One - Additional Air Quality Impact Modeling

From: <Alison_Millard@URSCorp.com>
To: <docket@energy.state.ca.us>
Date: 7/30/2008 5:59 PM
Subject: Carrizo Energy Solar Farm - CURE Data Requests Set One - Additional Air Quality Impact Modeling
CC: <Perry.Fontana@ausra.com>, <Kristen_E_Walker@URSCorp.com>
Attachments: 01800-d-l.pdf; 01800-d-l-ATT.doc; Appendix A.xls

Attention Docket Unit:

Please find attached below a copy of the additional information we stated we would send at the end of July 2008, regarding the CURE Data Requests Set one for Air Quality.
Hard copies, as well as a CD containing Air Quality Construction Modeling Files are being Fed-Ex'd separately.

Regards,
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