Scientific Resources Associated
1328 Kaimalino Lane
San Diego, CA 92109

To:	Patrick O'Neill HDR	**From:**	Valorie Thompson
Re:	Tule Wind Project Air Quality Analysis	**Date:**	February 22, 2011

This technical memorandum presents the results of an air quality analysis of the proposed Tule Wind Project to be located in eastern San Diego County.

The Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Tule Wind Project was prepared in December 2010. Since the preparation of that analysis, the project description for the project has changed. Accordingly, an updated analysis was prepared to update the project description and to address revisions to the air quality analysis.

The main source of air emissions associated with the Tule Wind Project is construction activities. To address the potential for impacts associated with construction of the project, it was assumed that overall project construction would require 24 months. Emissions from the project were originally calculated based on several assumptions that were updated in this analysis; namely:

- Emissions from heavy construction equipment (off-road equipment) have been updated to utilize recent emission factors from the ARB's OFFROAD Model, as developed by the South Coast Air Quality Management District. These emission factors represent the current fleet of construction equipment within southern California and provide more accurate estimates of emissions than the use of Tier 0 emission factors.

- Emissions from all phases of project construction were included in the analysis.

- Emissions of fugitive dust were modified to (a) include initial grading fugitive dust for the site and for access roads, and (b) to account for paved road dust based on typical dust loadings for limited-access roadways, where the majority of the vehicle trip length will occur.

- Based on information from the project applicant, emissions from the construction of the transmission line were removed because it was assumed that these emissions would not be simultaneous with tower construction/finish work.

A summary of the maximum daily construction emission estimates is provided below. This analysis is based on the maximum construction scenario.

Table 1
Tule Wind Project Estimated Daily Construction Emissions

Emission Source	Pounds per Day					
	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Rough Grading/Tower Base Work						
Construction Equipment	6.6	23.9	57.7	0.1	2.5	2.2
Worker Commute Trips	0.5	2.6	17.3	0.0	0.1	0.1
Paved Road Dust	—	—	—	—	6.1	0.9
Fugitive Dust	—	—	—	—	141.4	29.7
Maximum Daily Emissions	**7.1**	**26.5**	**75**	**0.1**	**150.1**	**32.9**
Significance Criteria	75	250	550	250	100	55
Exceeds Threshold?	No	No	No	No	Yes	No
Underground Utilities/Tower Work						
Construction Equipment	3.1	11.1	24.7	0.0	1.4	1.3
Concrete Batch Plant	—	—	—	—	7.0	4.7
Concrete Batch Plant Generator	1.9	5.8	7.2	0.0	0.4	0.4
Worker Commute Trips	1.3	5.4	38.3	0.1	0.2	0.2
Delivery and Other Trucks	10.6	235.0	99.2	0.3	7.1	7.1
Paved Road Dust	—	—	—	—	141.4	21.2
Maximum Daily Emissions	**16.9**	**257.3**	**169.4**	**0.4**	**157.5**	**34.9**
Significance Criteria	75	250	550	250	100	55
Exceeds Threshold?	No	Yes	No	No	Yes	No
Tower Construction/Finish Work						
Construction Equipment[1]	4.4	14.5	29.1	0.0	1.9	1.7
Worker Commute Trips	1.3	5.4	38.3	0.1	0.2	0.2
Delivery and Other Trucks	10.6	235.0	99.2	0.3	7.1	7.1
Paved Road Dust	—	—	—	—	141.38	21.2
Maximum Daily Emissions	**16.3**	**254.9**	**166.6**	**0.4**	**150.58**	**30.2**
Significance Criteria	75	250	550	250	100	55
Exceeds Threshold?	No	Yes	No	No	Yes	No

Sources: Iberdrola Renewables 2010. Additional calculations are provided in Appendix 8, Air Quality Calculations.
Note:
[1] Maximum daily emissions for off-road equipment would occur during the Tower Construction/Finish Work phase.

The analysis within the EIR/EIS was updated accordingly to reflect the revised project description and calculation assumptions. Emission calculation tables are provided as an attachment to this memorandum.

Valorie L. Thompson, Ph.D.

Principal

Table A-1
Heavy Equipment Emissions
Tule Wind Project

Construction Off-Road Equipment Emissions		SCAQMD OFFROAD Emission Factors, lbs/hr						
Emission Factors	Horsepower	ROG	CO	NOx	SOx	PM10	CO2	CH4
Tractor/Loader/Backhoe	108	0.0833	0.3589	0.5288	0.0006	0.0478	51.7	0.0075
Dozer D4	84	0.0833	0.3589	0.5288	0.0006	0.0478	51.7	0.0075
Dozer D6	150	0.1135	0.5873	0.8955	0.0011	0.0530	101	0.0102
Dozer D8	310	0.2500	0.8065	2.4813	0.0039	0.0877	345	0.0226
Hydraulic Crane	399	0.1726	0.6137	1.6493	0.0018	0.0627	180	0.0156
Scraper	313	0.3488	1.4023	3.2148	0.0032	0.1286	321	0.0315
Excavator	44	0.0684	0.2411	0.2428	0.0003	0.0198	25.5	0.0062
Water Truck	189	0.1550	0.4101	1.4773	0.0019	0.0515	167	0.0140
Concrete Truck	189	0.1550	0.4101	1.4773	0.0019	0.0515	167	0.0140
Dump/Haul Trucks	479	0.2372	0.7058	2.1240	0.0027	0.0785	272	0.0214
Skid-Steer Loader	44	0.0684	0.2411	0.2428	0.0003	0.0198	25.5	0.0062
Paver	100	0.1551	0.5163	0.9242	0.0008	0.0819	69.2	0.0140
Roller Compactor	95	0.1126	0.4136	0.7005	0.0007	0.0612	59.0	0.0102
Welder	45	0.1157	0.2949	0.2683	0.0003	0.0275	26.0	0.0104

			Emissions, lbs/day							Emissions, tons/year						
	Quantity Used	Duty Cycle (hrs/day)	ROG	CO	NOx	SOx	PM10	CO2	CH4	ROG	CO	NOx	SOx	PM10	CO2	CH4
Rough Grading/Tower Base Work																
Dozer - D6 Cat	2	6	0.68	3.52	5.37	0.01	0.32	608.32	0.06	0.07	0.34	0.52	0.00	0.03	58.40	0.01
Dozer - D8 Cat	2	8	2.00	6.45	19.85	0.03	0.70	2758.83	0.18	0.19	0.62	1.91	0.00	0.07	264.85	0.02
Tractor/Loader/Backhoe	2	8	0.67	2.87	4.23	0.00	0.38	413.82	0.06	0.06	0.28	0.41	0.00	0.04	39.73	0.01
Water Truck	2	4	0.62	1.64	5.91	0.01	0.21	666.18	0.06	0.06	0.16	0.57	0.00	0.02	63.95	0.01
Mini Excavator (Skid Ste	1	4	0.27	0.96	0.97	0.00	0.08	102.08	0.02	0.03	0.09	0.09	0.00	0.01	9.80	0.00
Dump Truck	4	4	0.95	2.82	8.50	0.01	0.31	1089.34	0.09	0.09	0.27	0.82	0.00	0.03	104.58	0.01
Scraper	1	4	1.40	5.61	12.86	0.01	0.51	1285.71	0.13	0.13	0.54	1.23	0.00	0.05	123.43	0.01
Total			**6.58**	**23.88**	**57.69**	**0.07**	**2.52**	**6924.28**	**0.59**	**0.63**	**2.29**	**5.54**	**0.01**	**0.24**	**664.73**	**0.06**
Underground Utilities Construction/Tower Work																
	2	6	0.50	2.15	3.17	0.00	0.29	310.37	0.05	0.05	0.21	0.30	0.00	0.03	29.80	0.00
Dozer - D4 Cat	2	6	0.50	2.15	3.17	0.00	0.29	310.37	0.05	0.05	0.21	0.30	0.00	0.03	29.80	0.00
Tractor/Loader/Backhoe	1	6	0.50	2.15	3.17	0.00	0.29	310.37	0.05	0.05	0.21	0.30	0.00	0.03	29.80	0.00
Water Truck	1	4	0.62	1.64	5.91	0.01	0.21	666.18	0.06	0.06	0.16	0.57	0.00	0.02	63.95	0.01
Concrete Truck	16	0.5	0.08	0.21	0.74	0.00	0.03	83.27	0.01	0.01	0.02	0.07	0.00	0.00	7.99	0.00
Dump Truck	2	4	0.95	2.82	8.50	0.01	0.31	1089.34	0.09	0.09	0.27	0.82	0.00	0.03	104.58	0.01
Total			**3.14**	**11.13**	**24.66**	**0.03**	**1.41**	**2769.89**	**0.28**	**0.30**	**1.07**	**2.37**	**0.00**	**0.14**	**265.91**	**0.03**
Tower Construction/Finish Work																
Skid Steer Loader	1	6	0.41	1.45	1.46	0.00	0.12	153.11	0.04	0.04	0.14	0.14	0.00	0.01	14.70	0.00
Hydraulic Crane	1	4	0.69	2.45	6.60	0.01	0.25	720.41	0.06	0.07	0.24	0.63	0.00	0.02	69.16	0.01
Water Truck	1	4	0.62	1.64	5.91	0.01	0.21	666.18	0.06	0.06	0.16	0.57	0.00	0.02	63.95	0.01
Welding Rig	1	4	0.46	1.18	1.07	0.00	0.11	103.83	0.04	0.04	0.11	0.10	0.00	0.01	9.97	0.00
Dump Truck	6	0.5	0.12	0.35	1.06	0.00	0.04	136.17	0.01	0.01	0.03	0.10	0.00	0.00	13.07	0.00
Paver	1	8	1.24	4.13	7.39	0.01	0.66	553.57	0.11	0.12	0.40	0.71	0.00	0.06	53.14	0.01
Roller	1	8	0.90	3.31	5.60	0.01	0.49	471.91	0.08	0.09	0.32	0.54	0.00	0.05	45.30	0.01
Total			**4.44**	**14.51**	**29.10**	**0.03**	**1.87**	**2805.18**	**0.40**	**0.43**	**1.39**	**2.79**	**0.00**	**0.18**	**269.30**	**0.04**
Maximum Tons/Year	(assumes grading occurs first, utilities and tower construction could occur in same year)									**0.73**	**2.46**	**5.16**	**0.01**	**0.31**	**535.21**	**0.07**

Table A-2
On-Road Vehicle Emissions
Tule Wind Project

EMFAC 2007 Year 2012 Emission Rates

	Running Emission Factors, grams/mile at 45 mph					
	ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Light Duty Autos (LDA)	0.055	0.253	1.937	0.003	0.008	0.008
Light Duty Trucks (LDT)	0.057	0.391	2.416	0.003	0.017	0.017
Medium Duty Trucks)MDT)	0.087	0.796	2.552	0.005	0.018	0.018
Motorcycles (MCY)	2.642	1.504	30	0.002	0.024	0.024
Heavy Duty Trucks (HDT)	0.402	8.884	3.75	0.013	0.27	0.27

Rough Grading/Tower Base Work

			Emissions, lbs/day					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		63						
Light Duty Autos (LDA)	72.40%	46	0.33	1.54	11.79	0.02	0.05	0.05
Light Duty Trucks (LDT)	20.40%	13	0.10	0.67	4.15	0.01	0.03	0.03
Medium Duty Trucks)MDT)	6.70%	4	0.05	0.42	1.35	0.00	0.01	0.01
Motorcycles (MCY)	0.50%	0	0.00	0.00	0.00	0.00	0.00	0.00
	100.00%		**0.48**	**2.63**	**17.29**	**0.03**	**0.09**	**0.09**

			Emissions, tons/year					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		63						
Light Duty Autos (LDA)	72.40%	46	0.03	0.15	1.13	0.00	0.00	0.00
Light Duty Trucks (LDT)	20.40%	13	0.01	0.06	0.40	0.00	0.00	0.00
Medium Duty Trucks)MDT)	6.70%	4	0.00	0.04	0.13	0.00	0.00	0.00
Motorcycles (MCY)	0.50%	0	0.00	0.00	0.00	0.00	0.00	0.00
	100.00%		**0.05**	**0.25**	**1.66**	**0.00**	**0.01**	**0.01**

Underground Utilities Construction/Tower Work and Tower Construction/Finish Work

			Emissions, lbs/day					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		125						
Light Duty Autos (LDA)	72.40%	91	0.66	3.05	23.32	0.04	0.10	0.10
Light Duty Trucks (LDT)	20.40%	26	0.20	1.34	8.31	0.01	0.06	0.06
Medium Duty Trucks)MDT)	6.70%	8	0.09	0.84	2.70	0.01	0.02	0.02
Motorcycles (MCY)	0.50%	1	0.35	0.20	3.92	0.00	0.00	0.00
	100.00%		**1.30**	**5.43**	**38.25**	**0.05**	**0.18**	**0.18**
Truck Trips	**% of ADT**	**ADT**						
Heavy Duty Trucks (HDT)	100%	200	10.64	235.03	99.21	0.34	7.14	7.14
Total On-Road Vehicles			**11.93**	**240.46**	**137.46**	**0.40**	**7.32**	**7.32**

			Emissions, tons/year					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		125						
Light Duty Autos (LDA)	72.40%	91	0.10	0.48	3.64	0.01	0.02	0.02
Light Duty Trucks (LDT)	20.40%	26	0.03	0.21	1.30	0.00	0.01	0.01
Medium Duty Trucks)MDT)	6.70%	8	0.01	0.13	0.42	0.00	0.00	0.00
Motorcycles (MCY)	0.50%	1	0.05	0.03	0.61	0.00	0.00	0.00
	100.00%		**0.20**	**0.85**	**5.97**	**0.01**	**0.03**	**0.03**
	% of ADT	**ADT**						
Heavy Duty Trucks (HDT)	100%	200	1.66	36.66	15.48	0.05	1.11	1.11
Total On-Road Vehicles			**1.86**	**37.51**	**21.44**	**0.06**	**1.14**	**1.14**
Total Annual Workers			**0.25**	**1.10**	**7.63**	**0.01**	**0.04**	**0.04**
Total Annual Trucks			**1.66**	**36.66**	**15.48**	**0.05**	**1.11**	**1.11**

Operations

			Emissions, lbs/day					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		12						
Light Duty Autos (LDA)	72.40%	9	0.07	0.30	2.31	0.00	0.01	0.01
Light Duty Trucks (LDT)	20.40%	2	0.02	0.10	0.64	0.00	0.00	0.00
Medium Duty Trucks)MDT)	6.70%	1	0.01	0.11	0.34	0.00	0.00	0.00
Motorcycles (MCY)	0.50%	0	0.00	0.00	0.00	0.00	0.00	0.00
	100.00%		**0.09**	**0.51**	**3.28**	**0.01**	**0.02**	**0.02**

			Emissions, tons/year					
Worker Trips	**% of ADT**	**ADT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
		12						
Light Duty Autos (LDA)	72.40%	9	0.01	0.05	0.36	0.00	0.00	0.00
Light Duty Trucks (LDT)	20.40%	2	0.00	0.02	0.10	0.00	0.00	0.00
Medium Duty Trucks)MDT)	6.70%	1	0.00	0.02	0.05	0.00	0.00	0.00
Motorcycles (MCY)	0.50%	0	0.00	0.00	0.00	0.00	0.00	0.00
	100.00%		**0.01**	**0.08**	**0.51**	**0.00**	**0.00**	**0.00**

Table A-3
Fugitive Dust Emissions
Tule Wind Project

Emission Factor[1]

$E = k * (sL)^{0.91} * (W)^{1.02}$ (maximum day)

$E = k * (sL)^{0.91} * (W)^{1.02} * (1 - P/4N)$ (annual)

			Rough Grading/ Tower Base Work	Underground Utilities Construction/Tower Work and Tower Construction/Finish Work		
		Units	**Worker Trips**	**Delivery and Other Trucks**	**Worker Trips**	
k	particle size multiplier (PM10)	lb/VMT	0.016	0.016	0.016	
k	particle size multiplier (PM2.5)	lb/VMT	0.0024	0.0024	0.0024	
sL	silt loading[2]	g/m^2	0.015	0.015	0.015	
W	weight (empty)	tons		20		
	weight (loaded)	tons		40		
	weight (mean)	tons	2.4	30	2.4	
E	emission factor (PM10)	lb/VMT	0.0009	0.0112	0.0009	
	emission factor (PM2.5)	lb/VMT	0.0001	0.0017	0.0001	
P	days of rainfall > 0.01 inch		18	18	18	
N	days in period		365	365	365	
	One-way trip distance	miles	30	30	30	
	Average vehicle trips	ADT	63	200	125	
	VMT/day	miles	3780	12000	7500	**Total**
	PM10 emissions	lbs/day	3.23	134.96	6.42	141.38
	PM2.5 emissions	lbs/day	0.49	20.24	0.96	21.21
	PM10 emissions	tons/year	0.50	21.05	1.00	22.05
	PM2.5 emissions	tons/year	0.08	3.16	0.15	3.31

Site Disturbance			**Daily Distubance**
	Site Area	acres	725.32
	Daily Disturbance	%	3%
	Emission Factor[3]	lbs/acre-day	20
	Control	%	61%
	PM10 emissions	lbs/day	141.4374
	PM2.5 emissions	lbs/day	29.701854
	PM10 emissions	tons/year	13.58
	PM2.5 emissions	tons/year	2.85

1. Emission factors from EPA AP-42, Section 13.2, Paved Roads
2. Silt loading from EPA AP-42, ubiquitious baseline for limited access roadways with 10,000 ADT
It was assumed that the main portion of vehicle trips would occur on I-8.
3. Fugitive dust for site disturbance from URBEMIS Model, Version 9.2.4.