

## APPENDIX 8

### *Air Quality and Greenhouse Gas Revisions to Applicant's Environmental Information\**

\* *No changes have been made to this appendix since  
publication in the Draft EIR/EIS.*



Dudek was provided criteria air pollutant and greenhouse gas (GHG) emission calculations for the East County (ECO) Substation, Tule Wind, and Energia Sierra Juarez (ESJ) Gen-Tie projects prepared by Insignia Environmental, Investigative Science and Engineering (ISE), and Entrix, respectively. Each consultant used a different approach to estimate the construction and operational emissions, and in some cases, left out important emissions sources or included calculations for some emission sources that were not evaluated by other consultants. Also, new suppliers for the water for construction were identified, which required a shift in the county in which the emissions would occur and a corresponding change in the estimated emissions.

In all cases, Dudek performed a third-party review of all technical information. Dudek corrected errors in methodologies or specific calculations, performed independent calculations to fill in data gaps, and attempted to make the reported emissions consistent between the three projects to the extent possible.

The document summarizes the revisions to the criteria pollutant and GHG emission information provided by the project applicants. For additional information, please see information provided below and in the pdf worksheet files for the revised calculations.

## **ECO SUBSTATION**

### *Criteria Air Pollutants*

1. Dudek corrected the daily operational emissions for the ECO Substation in Table 4.3-12 of the Proponent’s Environmental Assessment (PEA). Operational emissions were erroneously reported in the PEA. The daily operational emissions for the ECO Substation from the URBEMIS 2007 output were added to the estimated emissions from testing of two emergency generators.
2. Dudek estimated the criteria air pollutant emissions associated with transport of water for construction based on the values in the PEA. In the PEA, it was assumed that water truck trips would total 4,320 vehicle-miles traveled per day within Imperial County between the project site and a water supply in Imperial County. Truck emissions were estimated using California statewide emission factors; thus, they would still be valid for truck travel in San Diego County. Based on a revised water supply as far away as the city of San Diego (approximately 140 miles round trip) and 43 trips per day for a total of 6,020 vehicle-miles traveled, the estimated emissions were scaled up by multiplying the previously calculated values by a factor of 1.4 (6,020/4,320).
3. The emissions associated with hauling water were added to the emissions associated with mass grading for the ECO substation and use of two propane generators since this period would generate the maximum daily emissions during the 8-month period in which water would be

transported. Later phases that would require water deliveries would result in lower combined emissions than this period. Similarly, the annual emissions associated with water delivery were added to the 2010 emissions since water delivery was assumed to occur in 2010 at the beginning of the construction activity.

### *Greenhouse Gas Emissions*

1. Dudek estimated the GHG emissions for water hauling using the same approach as discussed above for criteria pollutant emissions except the previously estimated annual GHG emissions were scaled up by the different in vehicle-miles traveled. These emissions were added to the other construction emissions in 2010 because the water delivery was anticipated to occur between June 2010 and January 2011.
2. The PEA reported the annual GHG construction emissions (metric tons carbon dioxide equivalent (CO<sub>2</sub>E) per year) by project component but not total project emissions by calendar year (2010 to 2012). Dudek estimated the total project GHG construction emissions (as CO<sub>2</sub>E) by year and, in order to account for overlapping construction phases, the original values from the PEA for each of the four project components were put in a spreadsheet and then totaled by year. The estimated CO<sub>2</sub>E emissions for on-road trucks, on-road light-duty (LD) vehicles, and off-road equipment for each year were calculated using the annual CO<sub>2</sub> emissions for each source category multiplied by the ratio of the total CO<sub>2</sub>E emissions to the total CO<sub>2</sub> emissions for all three years. Adjusted GHG emissions associated with water hauling (as discussed above) were added to the 2010 emissions.

## **TULE WIND**

### *Criteria Air Pollutants and Greenhouse Gas Emissions*

1. Construction equipment – ISE conservatively used Tier 0 (pre-1996, pre-control) off-road diesel equipment emission factors for calculations of criteria air pollutants from diesel construction equipment, although the off-road equipment would likely be newer. Dudek also used the Tier 0 emission factors rather than recalculating the emissions from this equipment and corrected minor errors (e.g., application of emission factors from the wrong equipment category). ISE used a 1941 reference as the basis to assume that CO<sub>2</sub> from diesel engines would be emitted at a ratio of 27:1 compared to carbon monoxide (CO). This reference does not reflect that modern diesel engines have low CO emissions; thus, this ratio is too low. ISE assumed that methane (CH<sub>4</sub>) emissions were “trace, if not negligible.” Furthermore, ISE used an erroneous calculation for GHG emissions that assumed nitrous oxide (N<sub>2</sub>O) emissions are 30% of oxides of nitrogen (NO<sub>x</sub>) emissions. This assumption was not documented, and it could not be independently verified. N<sub>2</sub>O emissions are typically a small contribution relative to NO<sub>x</sub> emissions from combustion sources. Dudek recalculated the GHG emissions from construction

equipment using the California Air Resources Board’s (CARB’s) OFFROAD2007 CO<sub>2</sub> emission factor for diesel equipment (568.3 grams per horsepower hour). The CO<sub>2</sub> emissions were adjusted using factors for CH<sub>4</sub> and N<sub>2</sub>O for off-road vehicles from the California Climate Action Registry’s *General Reporting Protocol* (GRP) to calculate the total GHG emissions as CO<sub>2</sub>E.

2. Construction worker vehicles – ISE’s *Construction Air Quality Conformity Assessment* based the construction worker vehicle emission on the average daily trips (ADT) in the traffic study for the project. The traffic study reported an ADT of 1,250 passenger-car equivalents (PCE) based on round-trips by 125 workers per day and 200 trucks per day (converted to PCE as a ratio of 2.5 PCE per truck). Thus, the number of estimated worker vehicle trips was over-reported in the ISE report. Dudek recalculated the worker vehicle trip emissions from 125 workers (250 daily one-way trips) using the vehicle distribution for light-duty auto, light-duty truck, medium-duty truck, and motorcycles in the ISE report (renormalized the distribution to equal 100%), a one-way trip distance of 30 miles as indicated in the ISE report, and the EMFAC2007 emission factors for these vehicle classifications from the ISE report for criteria air pollutants and CO<sub>2</sub>. To estimate the total GHG emissions (as CO<sub>2</sub>E), the CO<sub>2</sub> emissions were adjusted using a U.S. Environmental Protection Agency (EPA) adjustment factor for passenger vehicles.
3. Delivery trucks – As noted above, ISE assumed 1,250 ADT for *construction worker vehicles*, while the traffic study reported 200 trucks per day. While the vehicle classifications used by ISE to calculate construction worker vehicle emissions did include medium-duty and heavy-duty trucks, the percentages of these trucks reflected normal roadway distributions of vehicles and not those associated with an intense construction project with substantial truck activity. Thus, trucks used for delivery of concrete materials (aggregate, sand, cement, water), water for fugitive dust control, wind turbine components, and other materials were under-reported by assuming approximately 70 trucks per day, which is fewer than the trucks in the traffic study. Dudek calculated the emissions of delivery and other trucks using a one-way trip distance of 30 miles as indicated in ISE’s *Construction Air Quality Conformity Assessment*, 400 daily one-way truck trips, and EMFAC2007 emissions factors for heavy-duty trucks from the ISE report for criteria air pollutants and CO<sub>2</sub>. To estimate the total GHG emissions (as CO<sub>2</sub>E), the CO<sub>2</sub> emissions were adjusted using GRP factors for CH<sub>4</sub> and N<sub>2</sub>O from heavy-duty diesel trucks.
4. Paved road dust – ISE’s *Construction Air Quality Conformity Assessment* did not estimate emissions associated with construction vehicles or operational employee vehicles traveling on paved roads to and from the construction site. These emissions were estimated for the ECO Substation and ESJ Gen-Tie projects. For consistency, Dudek estimated the emissions associated with on-road heavy-duty trucks and passenger vehicles traveling on paved roads

using emission calculations and factors from Section 13.2.1 (Paved Roads) of the EPA’s *Compilation of Air Pollutant Emission Factors* (AP-42) and San Diego County silt loading utilizing factors from CARB’s area-wide source methodology for paved road dust. The annual, but not daily, paved road dust emissions were adjusted for rainfall, assuming 18 days exceeding 0.01 inch of rainfall.

5. Employee vehicles – ISE’s *Construction Air Quality Conformity Assessment* did not include an estimate of criteria air pollutant or GHG emissions from employee vehicles during operation of the wind farm. Iberdrola updated the information related to the number of workers associated with operation of the Tule Wind Project. The facility would require 12 full-time workers for an ADT of 24 (12 employees per day × 2 trips per day). Dudek calculated the employee vehicle exhaust emissions using the vehicle distribution for light-duty auto and light-duty trucks in the ISE report (renormalized the distribution to equal 100%), a one-way trip distance of 30 miles as indicated in the ISE report, and the EMFAC2007 emission factors for these vehicle classifications from the ISE report for criteria air pollutants and CO<sub>2</sub>. To estimate the total GHG emissions (as CO<sub>2</sub>E), the CO<sub>2</sub> emissions were adjusted using an EPA adjustment factor for passenger vehicles. Paved road emissions for employee trips were also estimated using the method described previously.
6. Concrete plant emissions – ISE’s *Construction Air Quality Conformity Assessment* indicated the use of an on-site temporary concrete batch plant; however, the emissions associated with the concrete batch plant were not calculated. The Applicant’s Environmental Document indicated that the wind turbine foundations would need between 275 and 707 cubic yards of concrete (491 cubic yards average) per tower. Thus, a total of 65,794 cubic yards would be required if 134 wind turbines were installed. Assuming a 192-day period for installation of foundations (as indicated in the ISE report, foundations would be installed during the Underground Utilities Construction/ Tower Work Phase), the batch plant would produce an average of 343 cubic yards of concrete per day. The concrete batch plant’s PM<sub>10</sub> and PM<sub>2.5</sub> emissions were estimated using factors from Section 11.12 (Concrete Batching) of the EPA’s AP-42. The batch plant was assumed to use a 110-horsepower diesel generator, based on the size of generators used for a similar wind energy project. The concrete batch plant’s generator emissions utilized factors corresponding to the applicable CARB/EPA off-road emission standards for a Tier 3 compression-ignition (diesel) engine in 2011.
7. The Tule Wind project would also require imported water for construction, likely from sources near the project site in San Diego County. It was anticipated that 60 water trucks per day would be required. The estimated construction emissions assumed up to 200 total trucks each day, as discussed above. Therefore, water trucks are accounted for in current calculations, and separate calculations for these trips were not deemed necessary.
8. Turbine component delivery trucks could be traveling through Imperial County, and some

could be coming from the Port of San Diego or other locations. It is estimated that about 2,000 total trucks (134 turbines x 15 trucks per turbine) would be required to deliver turbine components over 192 days (the period for turbine installation in ISE’s *Construction Air Quality Conformity Assessment* for the Tule Wind Project). This would be equivalent to approximately 10 trucks per day. Conservatively assuming up to 20 trucks per day traveling 97 miles (approximately 200 miles round trip) through Imperial County, the total vehicle-miles traveled would be:

$$20 \text{ truck round trips/day} \times 200 \text{ miles/trip} \approx 4,000 \text{ vehicle-miles traveled/day}$$

The *Construction Air Quality Conformity Assessment* and traffic study for the Tule Wind Project assumed up to 200 trucks per day each traveling 60 miles round trip, which would be 12,000 vehicle-miles traveled per day. Because 4,000 is much less than 12,000 vehicle-miles traveled, it can be assumed that the turbine component delivery trucks are accounted for in current calculations and that separate calculations for these trips were not necessary. This approach would apply to criteria air pollutants and GHGs.

9. Transmission Line – The emissions associated with construction of aboveground portions of the on-site collector lines and the 9.7-mile off-site transmission line from the Tule Wind Project to the Boulevard Substation were not included in the ISE *Construction Air Quality Conformity Assessment*. Only the emissions associated with trenching and related activities for on-site collector lines were evaluated. Because the 13.3-mile 138 kV transmission line for the ECO Substation Project would involve comparable types and numbers of poles (116 steel poles for Tule Wind and 98 steel poles and 9 wooden poles for ECO), the same maximum daily and annual emissions for the ECO Substation transmission line were assumed for the Tule Wind transmission line. The emissions associated with the installation of the transmission line were added to the estimated emissions for the Tower Construction/Finish Work Phase, which would generally occur during the same time period, to estimate the total emissions associated with this time period.

## **ESJ GEN-TIE**

### *Greenhouse Gas Emissions*

1. Using spreadsheet calculations provided by Entrix, Dudek added the CO<sub>2</sub>E emissions associated with on-site construction equipment and vehicles for the ESJ Gen-Tie transmission line within San Diego County (220 short tons CO<sub>2</sub>E per year), 66 short tons CO<sub>2</sub>E per year from San Diego trucking wind turbine components from the Port of San Diego, 12% (portion of total travel distance within San Diego and Imperial Counties) of 4,985 short tons CO<sub>2</sub>E per year for trucking wind turbine components from Houston (a one-way distance of 178 miles through San Diego and Imperial Counties from the east), and 9% (portion of total travel

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distance within San Diego and Imperial Counties) of 6,647 short tons CO<sub>2</sub>E per year for trucking wind turbine components from the Midwest (a one-way distance of 178 miles through San Diego and Imperial Counties from the east). The annual tons CO<sub>2</sub>E were then divided total by 1.1023 to calculate metric tons CO<sub>2</sub>E per year.



APPENDIX A  
*ECO Substation Emissions Calculations*



**ECO Substation Project  
Estimated GHG Emissions by Calendar Year**

|                            | ECO Substation                 |            |            | SWPL        |            |            | 138 kW      |            |            | Boulevard Substation |            |            | Total      |
|----------------------------|--------------------------------|------------|------------|-------------|------------|------------|-------------|------------|------------|----------------------|------------|------------|------------|
|                            | tons<br>CO2                    | MT<br>CO2E | MT<br>CO2E | tons<br>CO2 | MT<br>CO2E | MT<br>CO2E | tons<br>CO2 | MT<br>CO2E | MT<br>CO2E | tons<br>CO2          | MT<br>CO2E | MT<br>CO2E | MT<br>CO2E |
| Total On-Road              |                                | 1,010.92   |            |             | 3.72       |            |             | 695.02     |            |                      | 262.04     |            |            |
| 2010 On-Road               | 177.79                         |            | 163.03     |             |            |            |             |            |            |                      |            |            | 163.03     |
| 2011 On-Road               | 226.10                         |            | 207.33     |             |            |            | 757.96      |            | 695.02     | 261.75               |            | 240.01     | 1,142.36   |
| 2012 On-Road               | 698.57                         |            | 640.57     | 4.06        |            | 3.72       |             |            |            | 24.02                |            | 22.03      | 666.31     |
| Total On-Road-LD           |                                | 2,099.31   |            |             | 6.68       |            |             | 450.97     |            |                      | 65.06      |            |            |
| 2010 On-Road-LD            | 57.81                          |            | 53.00      |             |            |            |             |            |            |                      |            |            | 53.00      |
| 2011 On-Road-LD            | 1,793.49                       |            | 1,644.21   | 0.47        |            | 0.43       | 491.91      |            | 450.97     | 50.27                |            | 46.08      | 2,141.69   |
| 2012 On-Road-LD            | 438.61                         |            | 402.10     | 6.82        |            | 6.25       |             |            |            | 20.70                |            | 18.98      | 427.33     |
| Total Off-Road             |                                | 3,382.26   |            |             | 95.43      |            |             | 1,282.50   |            |                      | 626.24     |            |            |
| 2010 Off-Road              | 1,485.84                       |            | 1,360.28   |             |            |            |             |            |            |                      |            |            | 1,360.28   |
| 2011 Off-Road              | 2,172.33                       |            | 1,988.75   | 6.08        |            | 5.57       | 1,400.88    |            | 1,282.50   | 603.78               |            | 552.75     | 3,829.57   |
| 2012 Off-Road              | 36.30                          |            | 33.23      | 98.16       |            | 89.86      |             |            |            | 80.27                |            | 73.49      | 196.58     |
| Grand Total for Components |                                |            | 6,492.49   |             |            | 105.83     |             |            | 2,428.49   |                      |            | 953.34     | 9,980.15   |
|                            | <u>Water and Fill Material</u> |            |            |             |            |            |             |            |            |                      |            |            |            |
| 2010 On-Road               | 1,600.10                       | 3,333.19   | 2,044.63   |             |            |            |             |            |            |                      |            |            | 2,044.63   |
| 2011 On-Road               | 2,034.91                       |            | 1,865.95   |             |            |            |             |            |            |                      |            |            | 1,865.95   |
|                            |                                |            | 3,910.58   |             |            |            |             |            |            |                      |            |            |            |
|                            | <u>Generators</u>              |            |            |             |            |            |             |            |            |                      |            |            |            |
| 2010 Off-Road              |                                |            | 42.84      |             |            |            |             |            |            |                      |            |            | 42.84      |
|                            |                                |            |            |             |            |            |             |            |            |                      |            |            | 13,933.57  |
| 2010                       | 3,663.77                       |            |            |             |            |            |             |            |            |                      |            |            |            |
| 2011                       | 8,979.58                       |            |            |             |            |            |             |            |            |                      |            |            |            |
| 2012                       | 1,290.22                       |            |            |             |            |            |             |            |            |                      |            |            |            |
| Total                      | 13,933.57                      |            |            |             |            |            |             |            |            |                      |            |            |            |

- Notes:
- The annual CO2 emissions for each source category (On-Road, On-Road-LD, and Off-Road) were calculated by multiplying the annual CO2 emissions by the ratio of the total CO2E emissions to the total CO2 emissions for the category.
  - Emissions for water hauling would occur within San Diego County in 2010. Estimated emissions from the ECO Substation PEA were increased by a factor of 6020/4320 to account for the revised trips between the City of San Diego and the project site instead of a location in Imperial County.
  - Emissions for hauling fill material would occur primarily in Imperial County in 2011.



APPENDIX B  
*Tule Wind Emissions Calculations*



***Criteria Air Pollutant Emissions***





**Tule Wind Project**  
**Summary of Construction Emissions**  
**(Rough Grading/Tower Base Work Phase and 2011 Annual)**

| Source                    | lbs/day      |               |               |             |               |               |
|---------------------------|--------------|---------------|---------------|-------------|---------------|---------------|
|                           | VOC          | NOx           | CO            | SOx         | PM10          | PM2.5         |
| Off-Road Equipment        | 20.27        | 177.30        | 103.10        | 4.87        | 9.92          | 9.10          |
| Fugitive Dust             | —            | —             | —             | —           | 44.70         | 9.30          |
| Worker Vehicles           | 1.29         | 5.38          | 38.05         | 0.05        | 0.17          | 0.17          |
| Delivery and Other Trucks | 10.63        | 235.03        | 99.21         | 0.34        | 7.14          | 7.12          |
| Paved Road Dust           | —            | —             | —             | —           | 537.90        | 80.33         |
| <b>Total</b>              | <b>32.20</b> | <b>417.71</b> | <b>240.35</b> | <b>5.27</b> | <b>599.83</b> | <b>106.02</b> |

Maximum daily emissions would occur during Rough Grading/Tower Base Work phase.

| Source                    | tons/year   |              |              |             |              |              |
|---------------------------|-------------|--------------|--------------|-------------|--------------|--------------|
|                           | VOC         | NOx          | CO           | SOx         | PM10         | PM2.5        |
| Off-Road Equipment        | 2.60        | 22.33        | 12.47        | 0.41        | 1.26         | 1.16         |
| Fugitive Dust             | —           | —            | —            | —           | 3.71         | 0.77         |
| Concrete Batch Plant      | 0.19        | 0.56         | 0.69         | 0.00        | 0.04         | 0.04         |
| Worker Vehicles           | 0.20        | 0.84         | 5.94         | 0.01        | 0.03         | 0.03         |
| Delivery and Other Trucks | 1.66        | 36.66        | 15.48        | 0.05        | 1.11         | 1.11         |
| Paved Road Dust           | —           | —            | —            | —           | 82.88        | 12.38        |
| <b>Total</b>              | <b>4.64</b> | <b>60.40</b> | <b>34.57</b> | <b>0.47</b> | <b>89.03</b> | <b>15.48</b> |

Maximum annual emissions would occur during 2011.

**Tule Wind Project**  
**Summary of Construction Emissions**  
**(Tower Construction/Finish Work and Transmission Line and 2012 Annual)**

| Source                    | lbs/day |        |        |      |        |        |
|---------------------------|---------|--------|--------|------|--------|--------|
|                           | VOC     | NOx    | CO     | SOx  | PM10   | PM2.5  |
| Off-Road Equipment        | 5.02    | 51.27  | 20.30  | 0.03 | 0.00   | 2.90   |
| Worker Vehicles           | 1.29    | 5.38   | 38.05  | 0.05 | 0.17   | 0.17   |
| Delivery and Other Trucks | 10.63   | 235.03 | 99.21  | 0.34 | 7.14   | 7.12   |
| Paved Road Dust           | —       | —      | —      | —    | 537.90 | 80.33  |
| Transmission Line         | 63.71   | 256.68 | 248.17 | 5.95 | 67.96  | 16.03  |
| Total                     | 80.66   | 548.35 | 405.72 | 6.37 | 613.18 | 106.54 |

Maximum daily emissions would occur during the Tower Construction/Finish Work phase.

| Source                    | tons/year |       |       |      |       |       |
|---------------------------|-----------|-------|-------|------|-------|-------|
|                           | VOC       | NOx   | CO    | SOx  | PM10  | PM2.5 |
| Off-Road Equipment        | 0.69      | 6.68  | 2.85  | 0.00 | 0.38  | 0.37  |
| Fugitive Dust             | —         | —     | —     | —    | —     | —     |
| Worker Vehicles           | 0.15      | 0.63  | 4.45  | 0.01 | 0.02  | 0.02  |
| Delivery and Other Trucks | 1.24      | 27.50 | 11.61 | 0.04 | 0.84  | 1.11  |
| Paved Road Dust           | —         | —     | —     | —    | 62.16 | 9.28  |
| Transmission Line         | 0.49      | 1.69  | 5.71  | 1.01 | 0.07  | 0.06  |
| Total                     | 2.58      | 36.50 | 24.62 | 1.06 | 63.46 | 10.84 |

Maximum annual emissions would occur during 2012.

**Tule Wind Project  
Construction Off-Road Equipment Emissions (Unmitigated)**

Emission Factors

|                  | lb/hp-hr |        |        |        |        |        |
|------------------|----------|--------|--------|--------|--------|--------|
|                  | VOC      | NOx    | CO     | SOx    | PM10   | PM2.5  |
| Track Backhoe    | 0.0030   | 0.0220 | 0.0150 | 0.0020 | 0.0010 | 0.0009 |
| Dozer            | 0.0030   | 0.0220 | 0.0150 | 0.0020 | 0.0010 | 0.0009 |
| Hydraulic Crane  | 0.0030   | 0.0230 | 0.0090 | 0.0020 | 0.0015 | 0.0014 |
| Loader/Grader    | 0.0030   | 0.0220 | 0.0150 | 0.0020 | 0.0010 | 0.0009 |
| Side Boom        | 0.0030   | 0.0310 | 0.0130 | 0.0020 | 0.0015 | 0.0014 |
| Water Truck      | 0.0020   | 0.0210 | 0.0060 | 0.0020 | 0.0015 | 0.0014 |
| Concrete Truck   | 0.0020   | 0.0210 | 0.0060 | 0.0020 | 0.0015 | 0.0014 |
| Concrete Pump    | 0.0020   | 0.0180 | 0.0110 | 0.0020 | 0.0010 | 0.0009 |
| Dump/Haul Trucks | 0.0020   | 0.0210 | 0.0060 | 0.0020 | 0.0015 | 0.0014 |
| Paver Blade      | 0.0010   | 0.0230 | 0.0070 | 0.0020 | 0.0010 | 0.0009 |
| Roller Compactor | 0.0020   | 0.0200 | 0.0070 | 0.0020 | 0.0010 | 0.0009 |
| Scraper          | 0.0010   | 0.0190 | 0.0110 | 0.0020 | 0.0015 | 0.0014 |

Rough Grading/Tower Base Work

| Qty. Used          | HP | Daily Load Factor (%) | Duty Cycle (hrs/day) | lbs/day |              |               |               |             |             | tons/period |             |              |             |             |             |             |
|--------------------|----|-----------------------|----------------------|---------|--------------|---------------|---------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|
|                    |    |                       |                      | VOC     | NOx          | CO            | SOx           | PM10        | PM2.5       | VOC         | NOx         | CO           | SOx         | PM10        | PM2.5       |             |
| Dozer - D6 Cat     | 2  | 250                   | 50                   | 6       | 4.50         | 33.00         | 22.50         | 0.02        | 1.50        | 1.38        | 0.43        | 3.17         | 2.16        | 0.00        | 0.14        | 0.13        |
| Dozer - D8 Cat     | 2  | 300                   | 50                   | 8       | 7.20         | 52.80         | 36.00         | 4.80        | 2.40        | 2.21        | 0.69        | 5.07         | 3.46        | 0.46        | 0.23        | 0.21        |
| Loader/Trencher    | 2  | 150                   | 50                   | 8       | 3.60         | 26.40         | 18.00         | 0.01        | 1.20        | 1.10        | 0.35        | 2.53         | 1.73        | 0.00        | 0.12        | 0.11        |
| Water Truck        | 2  | 200                   | 50                   | 4       | 1.60         | 16.80         | 4.80          | 0.01        | 1.20        | 1.10        | 0.15        | 1.61         | 0.46        | 0.00        | 0.12        | 0.11        |
| Mini Excavator     | 1  | 50                    | 50                   | 4       | 0.10         | 2.40          | 1.10          | 0.00        | 0.15        | 0.20        | 0.01        | 0.23         | 0.11        | 0.00        | 0.01        | 0.02        |
| Dump/Haul & Drills | 4  | 300                   | 20                   | 4       | 1.92         | 20.16         | 5.76          | 0.01        | 1.44        | 1.32        | 0.18        | 1.94         | 0.55        | 0.00        | 0.14        | 0.13        |
| Scraper            | 1  | 450                   | 75                   | 4       | 1.35         | 25.65         | 14.85         | 0.02        | 2.03        | 1.86        | 0.13        | 2.46         | 1.43        | 0.00        | 0.19        | 0.18        |
| <b>Total</b>       |    |                       |                      |         | <b>20.27</b> | <b>177.30</b> | <b>103.10</b> | <b>4.87</b> | <b>9.92</b> | <b>9.10</b> | <b>1.95</b> | <b>17.02</b> | <b>9.90</b> | <b>0.47</b> | <b>0.95</b> | <b>0.87</b> |

Underground Utilities Construction/Tower Work

| Qty. Used       | HP | Daily Load Factor (%) | Duty Cycle (hrs/day) | lbs/day |              |              |              |             |             | tons/period |             |             |             |             |             |             |
|-----------------|----|-----------------------|----------------------|---------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                 |    |                       |                      | VOC     | NOx          | CO           | SOx          | PM10        | PM2.5       | VOC         | NOx         | CO          | SOx         | PM10        | PM2.5       |             |
| Track Backhoe   | 2  | 150                   | 50                   | 6       | 2.70         | 19.80        | 13.50        | 0.01        | 0.90        | 0.83        | 0.26        | 1.90        | 1.30        | 0.00        | 0.09        | 0.08        |
| Dozer - D4 Cat  | 2  | 200                   | 50                   | 6       | 3.60         | 26.40        | 18.00        | 0.01        | 1.20        | 1.10        | 0.35        | 2.53        | 1.73        | 0.00        | 0.12        | 0.11        |
| Loader          | 1  | 150                   | 50                   | 6       | 1.35         | 9.90         | 6.75         | 0.01        | 0.45        | 0.50        | 0.13        | 0.95        | 0.65        | 0.00        | 0.04        | 0.05        |
| Water Truck     | 1  | 200                   | 50                   | 4       | 0.80         | 8.40         | 2.40         | 0.00        | 0.60        | 0.55        | 0.08        | 0.81        | 0.23        | 0.00        | 0.06        | 0.05        |
| Concrete Truck  | 16 | 250                   | 25                   | 0.5     | 1.00         | 10.50        | 3.00         | 0.01        | 0.75        | 0.69        | 0.10        | 1.01        | 0.29        | 0.00        | 0.07        | 0.07        |
| Dump/Haul Truck | 2  | 300                   | 45                   | 4       | 2.16         | 22.68        | 6.48         | 0.01        | 1.62        | 1.49        | 0.21        | 2.18        | 0.62        | 0.00        | 0.16        | 0.14        |
| <b>Total</b>    |    |                       |                      |         | <b>11.70</b> | <b>97.68</b> | <b>50.20</b> | <b>0.05</b> | <b>5.60</b> | <b>5.16</b> | <b>1.12</b> | <b>9.38</b> | <b>4.82</b> | <b>0.01</b> | <b>0.54</b> | <b>0.50</b> |

Tower Construction/Finish Work

| Qty. Used       | HP | Daily Load Factor (%) | Duty Cycle (hrs/day) | lbs/day |             |              |              |             |             | tons/period |             |             |             |             |             |             |
|-----------------|----|-----------------------|----------------------|---------|-------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                 |    |                       |                      | VOC     | NOx         | CO           | SOx          | PM10        | PM2.5       | VOC         | NOx         | CO          | SOx         | PM10        | PM2.5       |             |
| Skid Steer Cat  | 1  | 150                   | 50                   | 6       | 1.35        | 9.90         | 6.75         | 0.01        | 0.45        | 0.50        | 0.13        | 0.95        | 0.65        | 0.00        | 0.04        | 0.05        |
| Hydraulic Crane | 1  | 200                   | 25                   | 4       | 0.60        | 4.60         | 1.80         | 0.00        | 0.30        | 0.28        | 0.06        | 0.44        | 0.17        | 0.00        | 0.03        | 0.03        |
| Water Truck     | 1  | 200                   | 50                   | 4       | 0.80        | 8.40         | 2.40         | 0.00        | 0.60        | 0.55        | 0.08        | 0.81        | 0.23        | 0.00        | 0.06        | 0.05        |
| Welding Rig     | 1  | 50                    | 50                   | 4       | 0.20        | 1.80         | 1.10         | 0.00        | 0.10        | 0.09        | 0.02        | 0.17        | 0.11        | 0.00        | 0.01        | 0.01        |
| Dump/Haul Truck | 6  | 300                   | 45                   | 0.5     | 0.81        | 8.51         | 2.43         | 0.00        | 0.61        | 0.56        | 0.08        | 0.82        | 0.23        | 0.00        | 0.06        | 0.05        |
| Paver/Compactor | 1  | 150                   | 35                   | 8       | 0.42        | 9.66         | 2.94         | 0.01        | 0.42        | 0.39        | 0.04        | 0.93        | 0.28        | 0.00        | 0.04        | 0.04        |
| Roller          | 1  | 150                   | 35                   | 8       | 0.84        | 8.40         | 2.94         | 0.01        | 0.42        | 0.39        | 0.08        | 0.81        | 0.28        | 0.00        | 0.04        | 0.04        |
| <b>Total</b>    |    |                       |                      |         | <b>5.02</b> | <b>51.27</b> | <b>20.30</b> | <b>0.03</b> | <b>2.90</b> | <b>2.85</b> | <b>0.48</b> | <b>4.92</b> | <b>1.95</b> | <b>0.00</b> | <b>0.28</b> | <b>0.27</b> |

|                                 | lbs/day |        |        |      |      |       | tons/yr |       |       |      |      |       |
|---------------------------------|---------|--------|--------|------|------|-------|---------|-------|-------|------|------|-------|
|                                 | VOC     | NOx    | CO     | SOx  | PM10 | PM2.5 | VOC     | NOx   | CO    | SOx  | PM10 | PM2.5 |
| Maximum Daily Emissions         | 20.27   | 177.30 | 103.10 | 4.87 | 9.92 | 9.10  |         |       |       |      |      |       |
| 2010 Annual Emissions (tons/yr) |         |        |        |      |      |       | 0.26    | 2.30  | 1.34  | 0.06 | 0.13 | 0.12  |
| 2011 Annual Emissions (tons/yr) |         |        |        |      |      |       | 2.60    | 22.33 | 12.47 | 0.41 | 1.26 | 1.16  |
| 2012 Annual Emissions (tons/yr) |         |        |        |      |      |       | 0.69    | 6.68  | 2.85  | 0.00 | 0.38 | 0.37  |

(1) Period = 192 days for each construction phase

**Tule Wind Project  
Construction Motor Vehicle Emissions  
(San Diego County)**

EMFAC 2007 Year 2012 Emission Rates

|                          | gm/mile @ 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 | 2.662  | 0.005 | 0.018 | 0.018 |
| Motorcycles (MCY)        | 2.642            | 1.504 | 29.672 | 0.002 | 0.024 | 0.024 |
| Heavy Duty Trucks (HDT)  | 0.402            | 8.884 | 3.750  | 0.013 | 0.270 | 0.269 |

Proposed Project

| Worker Trips                | % of ADT | ADT | lb/day |        |        |      |      |       |
|-----------------------------|----------|-----|--------|--------|--------|------|------|-------|
|                             |          |     | ROG    | NOx    | CO     | SOx  | PM10 | PM2.5 |
| Light Duty Autos (LDA)      | 72.4%    | 91  | 0.66   | 3.05   | 23.32  | 0.04 | 0.10 | 0.10  |
| Light Duty Trucks (LDT)     | 20.4%    | 25  | 0.19   | 1.29   | 7.99   | 0.01 | 0.06 | 0.06  |
| Medium Duty Trucks (MDT)    | 6.7%     | 8   | 0.09   | 0.84   | 2.82   | 0.01 | 0.02 | 0.02  |
| Motorcycles (MCY)           | 0.5%     | 1   | 0.35   | 0.20   | 3.92   | 0.00 | 0.00 | 0.00  |
| Total                       | 100.0%   | 125 | 1.29   | 5.38   | 38.05  | 0.05 | 0.17 | 0.17  |
| Trucks (Delivery and Other) | % of ADT | 200 |        |        |        |      |      |       |
| Heavy Duty Trucks (HDT)     | 100.0%   | 200 | 10.63  | 235.03 | 99.21  | 0.34 | 7.14 | 7.12  |
| Total Motor Vehicles        |          |     | 11.93  | 240.41 | 137.25 | 0.40 | 7.32 | 7.29  |

Worker Trips

|                             | tons/yr |       |       |      |      |       |
|-----------------------------|---------|-------|-------|------|------|-------|
|                             | ROG     | NOx   | CO    | SOx  | PM10 | PM2.5 |
| Light Duty Autos (LDA)      | 0.10    | 0.48  | 3.64  | 0.01 | 0.02 | 0.02  |
| Light Duty Trucks (LDT)     | 0.03    | 0.20  | 1.25  | 0.00 | 0.01 | 0.01  |
| Medium Duty Trucks (MDT)    | 0.01    | 0.13  | 0.44  | 0.00 | 0.00 | 0.00  |
| Motorcycles (MCY)           | 0.05    | 0.03  | 0.61  | 0.00 | 0.00 | 0.00  |
| Total                       | 0.20    | 0.84  | 5.94  | 0.01 | 0.03 | 0.03  |
| Trucks (Delivery and Other) |         |       |       |      |      |       |
| Heavy Duty Trucks (HDT)     | 1.66    | 36.66 | 15.48 | 0.05 | 1.11 | 1.11  |
| Total Motor Vehicles        | 1.86    | 37.50 | 21.41 | 0.06 | 1.14 | 1.14  |

**Tule Wind Project  
Construction Paved Road Emissions  
(San Diego County)**

Emission Factor (1)

$$E = k * (sL/2)^{0.65} * (W/3)^{1.5} \text{ [maximum day]}$$

$$E = k * (sL/2)^{0.65} * (W/3)^{1.5} * (1 - P/4N) \text{ [annual]}$$

|    |   | Units            | Delivery and<br>Other Trucks | Worker Trips | Total  |
|----|---|------------------|------------------------------|--------------|--------|
| k  | particle size multiplier (PM <sub>10</sub> )  | lb/VMT           | 0.016                        | 0.016        |        |
| k  | particle size multiplier (PM <sub>2.5</sub> ) | lb/VMT           | 0.0024                       | 0.0024       |        |
| sL | silt loading (2)                              | g/m <sup>2</sup> | 0.047                        | 0.047        |        |
| W  | weight (empty)                                | tons             | 20                           |              |        |
|    | weight (loaded)                               | tons             | 40                           |              |        |
|    | weight (mean)                                 | tons             | 30                           | 2.4          |        |
| E  | emission factor (PM <sub>10</sub> )           | lb/VMT           | 0.0442                       | 0.00100      |        |
| E  | emission factor (PM <sub>2.5</sub> )          | lb/VMT           | 0.0066                       | 0.00015      |        |
| P  | days of rainfall > 0.01 in                    | days             | 18                           | 18           |        |
| N  | days in period                                | days             | 365                          | 365          |        |
|    | one-way trip distance                         | miles            | 30                           | 30           |        |
|    | average vehicle trips                         | ADT              | 200                          | 125          |        |
|    | VMT/day                                       |                  | 12,000                       | 7,500        |        |
|    | PM <sub>10</sub> daily                        | lb/day           | 530.40                       | 7.50         | 537.90 |
|    | PM <sub>2.5</sub> daily                       | lb/day           | 79.20                        | 1.13         | 80.33  |
|    | VMT/yr  |                  | 3,744,000                    | 2,340,000    |        |
|    | PM <sub>10</sub> annual w/ rain adjustment    | ton/yr           | 81.72                        | 1.16         | 82.88  |
|    | PM <sub>2.5</sub> annual w/ rain adjustment   | ton/yr           | 12.20                        | 0.17         | 12.38  |

Notes:

1. Emission factors from AP-42, Section 13.2.1 (Paved Roads).
2. Silt loading from California Air Resources Board, Areawide Source Methodologies, Section 7.9, Entrained Paved Road Dust, Paved Road Travel (July 1997).

**Tule Wind Project  
Motor Vehicle Operational Emissions**

EMFAC 2007 Year 2012 Emission Rates

|                         | gm/mile @ 45 MPH |       |       |       |       |       |
|-------------------------|------------------|-------|-------|-------|-------|-------|
|                         | VOC              | 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 |
| Paved Road Dust         | —                | —     | —     | —     | 0.454 | 0.068 |

Proposed Project

| Employee Trips          | % of ADT      | ADT       | lb/day      |             |             |             |             |             |
|-------------------------|---------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
|                         |               |           | VOC         | NOx         | CO          | SOx         | PM10        | PM2.5       |
| Light Duty Autos (LDA)  | 78.1%         | 19        | 0.14        | 0.64        | 4.87        | 0.01        | 0.02        | 0.02        |
| Light Duty Trucks (LDT) | 21.9%         | 5         | 0.04        | 0.26        | 1.60        | 0.00        | 0.01        | 0.01        |
| Paved Road Dust         |               |           | —           | —           | —           | —           | 0.72        | 0.11        |
| <b>Total</b>            | <b>100.0%</b> | <b>24</b> | <b>0.18</b> | <b>0.89</b> | <b>6.47</b> | <b>0.01</b> | <b>0.75</b> | <b>0.14</b> |

Employee Trips

|                         | tons/yr     |             |             |             |             |             |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                         | VOC         | NOx         | CO          | SOx         | PM10        | PM2.5       |
| Light Duty Autos (LDA)  | 0.02        | 0.10        | 0.76        | 0.00        | 0.00        | 0.00        |
| Light Duty Trucks (LDT) | 0.01        | 0.04        | 0.25        | 0.00        | 0.00        | 0.00        |
| Paved Road Dust         | —           | —           | —           | —           | 0.11        | 0.02        |
| <b>Total</b>            | <b>0.03</b> | <b>0.14</b> | <b>1.01</b> | <b>0.00</b> | <b>0.12</b> | <b>0.02</b> |

One-way Trip Distance                      30 miles

# ***Greenhouse Gas Emissions***





**Tule Wind Project  
Summary of Construction GHG Emissions**

|                           | metric ton CO2E/yr |                |                | Total           |
|---------------------------|--------------------|----------------|----------------|-----------------|
|                           | 2010               | 2011           | 2012           |                 |
| Wind Farm                 |                    |                |                |                 |
| Off-Road Equipment        | 123.6              | 1,193.6        | 356.4          | 1,673.7         |
| Worker Vehicles           | 64.0               | 767.5          | 575.6          | 1,407.0         |
| Delivery and Other Trucks | 437.3              | 5,247.3        | 3,935.5        | 9,620.0         |
| Transmission Line         | —                  | —              | 2,428.5        | 2,428.5         |
| <b>Total</b>              | <b>624.9</b>       | <b>7,208.4</b> | <b>7,296.0</b> | <b>15,129.2</b> |

1. GHG emissions associated with construction of the transmission line were assumed to be the same as those calculated for the ECO Substation Project. While the ECO Substation Project's transmission line consists of 13.3 miles and 98 poles, and the Tule Wind transmission line consists of 9.7 miles and 116 poles, the construction emissions are assumed to be the same for the purpose of this analysis.

**Tule Wind Project  
Construction Diesel Equipment GHG Emissions**

Rough Grading/Tower Base Work

|                    | Qty. Used | HP  | Daily Load<br>Factor (%) | Duty Cycle<br>(hrs/day) | CO2 Emission<br>Factor (lb/HP-hr) | Pounds/Day    | Tons/Period  |
|--------------------|-----------|-----|--------------------------|-------------------------|-----------------------------------|---------------|--------------|
| Dozer - D6 Cat     | 2         | 250 | 50                       | 6                       | 1.25                              | 1,875         | 180.0        |
| Dozer - D8 Cat     | 2         | 300 | 50                       | 8                       | 1.25                              | 3,000         | 288.0        |
| Loader/Trencher    | 2         | 150 | 50                       | 8                       | 1.25                              | 1,500         | 144.0        |
| Water Truck        | 2         | 200 | 50                       | 4                       | 1.25                              | 1,000         | 96.0         |
| Mini Excavator     | 1         | 50  | 50                       | 4                       | 1.25                              | 125           | 12.0         |
| Dump/Haul & Drills | 4         | 300 | 20                       | 4                       | 1.25                              | 1,200         | 115.2        |
| Scraper            | 1         | 450 | 75                       | 4                       | 1.25                              | 1,688         | 162.0        |
| <b>Total</b>       |           |     |                          |                         |                                   | <b>10,388</b> | <b>997.2</b> |

- (1) Emission factor from CARB OFFROAD model.  
(2) Period = 192 days

Underground Utilities Construction/Tower Work

|                 | Qty. Used | HP  | Daily Load<br>Factor (%) | Duty Cycle<br>(hrs/day) | CO2 Emission<br>Factor (lb/HP-hr) | Pound/Day    | Tons/Period  |
|-----------------|-----------|-----|--------------------------|-------------------------|-----------------------------------|--------------|--------------|
| Track Backhoe   | 2         | 150 | 50                       | 6                       | 1.25                              | 1,125        | 108.0        |
| Dozer - D4 Cat  | 2         | 200 | 50                       | 6                       | 1.25                              | 1,500        | 144.0        |
| Loader          | 1         | 150 | 50                       | 6                       | 1.25                              | 563          | 54.0         |
| Water Truck     | 1         | 200 | 50                       | 4                       | 1.25                              | 500          | 48.0         |
| Concrete Truck  | 16        | 250 | 25                       | 0.5                     | 1.25                              | 625          | 60.0         |
| Dump/Haul Truck | 2         | 300 | 45                       | 4                       | 1.25                              | 1,350        | 129.6        |
| <b>Total</b>    |           |     |                          |                         |                                   | <b>5,663</b> | <b>543.6</b> |

- (1) Emission factor from CARB OFFROAD model.  
(2) Period = 192 days

Tower Construction/Finish Work

|                 | Qty. Used | HP  | Daily Load<br>Factor (%) | Duty Cycle<br>(hrs/day) | CO2 Emission<br>Factor (lb/HP-hr) | Pound/Day    | Tons/Period  |
|-----------------|-----------|-----|--------------------------|-------------------------|-----------------------------------|--------------|--------------|
| Skid Steer Cat  | 1         | 150 | 50                       | 6                       | 1.25                              | 563          | 54.0         |
| Hydraulic Crane | 1         | 200 | 25                       | 4                       | 1.25                              | 250          | 24.0         |
| Water Truck     | 1         | 200 | 50                       | 4                       | 1.25                              | 500          | 48.0         |
| Welding Rig     | 1         | 50  | 50                       | 4                       | 1.25                              | 125          | 12.0         |
| Dump/Haul Truck | 6         | 300 | 45                       | 0.5                     | 1.25                              | 506          | 48.6         |
| Paver/Compactor | 1         | 150 | 35                       | 8                       | 1.25                              | 525          | 50.4         |
| Roller          | 1         | 150 | 35                       | 8                       | 1.25                              | 525          | 50.4         |
| <b>Total</b>    |           |     |                          |                         |                                   | <b>2,994</b> | <b>287.4</b> |

- (1) Emission factor from CARB OFFROAD model.  
(2) Period = 192 days

|                            |                        |
|----------------------------|------------------------|
| Total CO2 Emissions        | 1,828.2 tons/yr        |
| 2010 Annual CO2 Emissions  | 135.0 tons/yr          |
| 2011 Annual CO2 Emissions  | 1,303.8 tons/yr        |
| 2012 Annual CO2 Emissions  | 389.3 tons/yr          |
| 2010 Annual CO2E Emissions | 123.6 metric tons/yr   |
| 2011 Annual CO2E Emissions | 1,193.6 metric tons/yr |
| 2012 Annual CO2E Emissions | 356.4 metric tons/yr   |

**Tule Wind Project  
Construction Motor Vehicle GHG Emissions  
(San Diego County)**

|                                     |                        | CO2<br>gm/mile<br>@ 45 MPH |           |         |
|-------------------------------------|------------------------|----------------------------|-----------|---------|
| EMFAC 2007 Year 2012 Emission Rates |                        |                            |           |         |
|                                     |                        | <hr/>                      |           |         |
| Light Duty Autos (LDA)              |                        | 285.724                    |           |         |
| Light Duty Trucks (LDT)             |                        | 357.605                    |           |         |
| Medium Duty Trucks (MDT)            |                        | 485.087                    |           |         |
| Motorcycles (MCY)                   |                        | 125.795                    |           |         |
| Heavy Duty Trucks (HDT)             |                        | 1400.000                   |           |         |
| <br>Proposed Project Action         |                        |                            |           |         |
|                                     | % of                   | ADT                        | CO2       | CO2     |
| Worker Trips                        | ADT                    | 125                        | <hr/>     | <hr/>   |
| Light Duty Autos (LDA)              | 72.4%                  | 91                         | 3,439.27  | 536.5   |
| Light Duty Trucks (LDT)             | 20.4%                  | 25                         | 1,182.56  | 184.5   |
| Medium Duty Trucks (MDT)            | 6.7%                   | 8                          | 513.32    | 80.1    |
| Motorcycles (MCY)                   | 0.5%                   | 1                          | 16.64     | 2.6     |
| Total                               | 100.0%                 |                            | 5,151.79  | 803.7   |
| <br>                                |                        |                            |           |         |
|                                     | % of                   | ADT                        |           |         |
| Trucks (Delivery and Other)         | ADT                    | 200                        |           |         |
| Heavy Duty Trucks (HDT)             | 100.0%                 | 200                        | 37,037.04 | 5,777.8 |
| <br>                                |                        |                            |           |         |
| Total Motor Vehicles                |                        |                            | 42,188.82 | 6,581.5 |
| <br>                                |                        |                            |           |         |
| Total CO2 Emissions                 | 6,581.5 tons/yr        |                            |           |         |
| Worker Vehicles                     | 803.7 tons/yr          |                            |           |         |
| Trucks                              | 5,777.8 tons/yr        |                            |           |         |
| Total CO2E Emissions                | 6,014.7 metric tons/yr |                            |           |         |
| Worker Vehicles                     | 767.5 metric tons/yr   |                            |           |         |
| Trucks                              | 5,247.3 metric tons/yr |                            |           |         |

**Tule Wind Project  
Motor Vehicle Operational GHG Emissions**

|                                     |                            |
|-------------------------------------|----------------------------|
| EMFAC 2007 Year 2012 Emission Rates | CO2<br>gm/mile<br>@ 45 MPH |
| Light Duty Autos (LDA)              | 285.724                    |
| Light Duty Trucks (LDT)             | 357.605                    |

Proposed Project

|                         | % of<br>ADT | ADT | CO2<br>lb/day | CO2<br>ton/yr |
|-------------------------|-------------|-----|---------------|---------------|
| Employee Trips          |             | 24  |               |               |
| Light Duty Autos (LDA)  | 78.1%       | 19  | 718.09        | 112.0         |
| Light Duty Trucks (LDT) | 21.9%       | 5   | 236.51        | 36.9          |
| Total                   | 100.0%      |     | 954.60        | 148.9         |

Total CO2 Emissions           149 tons/yr  
Total CO2E Emissions       142 metric tons/yr

One-way Trip Distance           30 miles

**Tule Wind Project  
CO<sub>2</sub>-to-CO<sub>2</sub> Equivalent Factors**

|                          | <b>Source</b> | <b>Units</b> | <b>CO<sub>2</sub></b> | <b>CH<sub>4</sub></b> | <b>N<sub>2</sub>O</b> | <b>CO<sub>2</sub>E/CO<sub>2</sub></b> |
|--------------------------|---------------|--------------|-----------------------|-----------------------|-----------------------|---------------------------------------|
| Global Warming Potential |               |              | 1                     | 21                    | 310                   |                                       |
| Diesel Equipment         | 1             | kg/gal       | 10.15                 | 0.00058               | 0.00026               | 1.009                                 |
| Diesel Trucks            | 2             | g/mi         | 1,450.00              | 0.0051                | 0.0048                | 1.001                                 |
| Passenger Vehicles       | 3             |              |                       |                       |                       | 1.053                                 |

1. California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Tables C.6 and C.7.
2. California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Tables C.3 and C.4.
3. US EPA, Office of Transportation and Air Quality. 2005. *Greenhouse Gas Emissions from a Typical Passenger Vehicle* (EPA420-F-05-004), p. 4.



# ***Concrete Batch Plant Emissions***





**Tule Wind Project  
Concrete Batch Plant Emissions Calculations**

**Assumptions**

- 491 cubic yards of concrete per tower (average of 275 and 707 from Project Description) --> 65,794 cubic yards total
- batch plant emissions would occur over a 192-day phase
- batch plant would therefore produce approximately 343 cubic yards of concrete per day

**Batch Plant Emissions**

| <b>Batch Plant Activity</b>            | <b>PM-10<br/>Emission<br/>Factor<br/>lb/yd<sup>3</sup></b> | <b>PM10<br/>lb/day</b> | <b>PM2.5<br/>lb/day<sup>1</sup></b> | <b>PM10<br/>tons/year</b> | <b>PM2.5<br/>tons/year</b> |
|--|--|------------------------|-------------------------------------|---------------------------|----------------------------|
| Aggregate delivery to ground storage   | 0.0031   | 1.06                   | 0.71                                | 0.10                      | 0.07                       |
| Sand delivery to ground storage        | 0.0007   | 0.24                   | 0.16                                | 0.02                      | 0.02                       |
| Aggregate transfer to conveyor         | 0.0031   | 1.06                   | 0.71                                | 0.10                      | 0.07                       |
| Sand transfer to conveyor              | 0.0007   | 0.24                   | 0.16                                | 0.02                      | 0.02                       |
| Aggregate transfer to elevated storage | 0.0031   | 1.06                   | 0.71                                | 0.10                      | 0.07                       |
| Sand transfer to elevated storage      | 0.0007   | 0.24                   | 0.16                                | 0.02                      | 0.02                       |
| Cement delivery to Silo                | 0.0001   | 0.03                   | 0.02                                | 0.00                      | 0.00                       |
| Cement supplement delivery to Silo     | 0.0002   | 0.07                   | 0.05                                | 0.01                      | 0.00                       |
| Weigh hopper loading                   | 0.0038   | 1.30                   | 0.87                                | 0.13                      | 0.08                       |
| Central mix loading                    | 0.0048   | 1.65                   | 1.10                                | 0.16                      | 0.11                       |
| <b>TOTAL</b>                           |  | <b>6.96</b>            | <b>4.67</b>                         | <b>0.67</b>               | <b>0.45</b>                |

Source (Emission Factors): AP-42, Section 11.12 Concrete Batching, Table 11.12-6.  
 Source (PM2.5 percentage): [http://www.arb.ca.gov/ei/speciate/pmsize\\_07242008.xls](http://www.arb.ca.gov/ei/speciate/pmsize_07242008.xls)  
 1. PM2.5 calculated as 67% of PM10.

**Tule Wind Project  
Concrete Batch Plant Emissions Calculations**

**Batch Plant Generator Emissions**

Engine Rating                    110 HP  
 Fuel Input                        2.0 MMBtu/hr  
 Operating Schedule            8.0 hr/day  
    1,536 hr/yr

|               | VOC (2) | NOx  | CO   | SOx (3) | PM10 | PM2.5 (4) | CO2 (5) |
|---------------|---------|------|------|---------|------|-----------|---------|
| gm/BHP-hr (1) | 1.00    | 3.00 | 3.70 | 0.005   | 0.22 | 0.21      | 568.3   |
| lb/hr         | 0.24    | 0.73 | 0.90 | 0.00    | 0.05 | 0.05      | 137.82  |
| lb/day        | 1.94    | 5.82 | 7.18 | 0.01    | 0.43 | 0.42      | 1102.52 |
| tons/yr       | 0.19    | 0.56 | 0.69 | 0.00    | 0.04 | 0.04      | 105.84  |

Notes:

- (1) Based on EPA/CARB off-road engine emission standards for Tier 3 engine, except ROC, SOx, and CO2.
- (2) Tier 3 standard is NOx + HC. HC/VOC is assumed to be 1.0 gm/BHP-hr. Diesel engines generally have HC emissions emissions well below 1.0 gm/BHP-hr.
- (3) Based on 15 ppm (0.0015%) sulfur by weight.
- (4) PM2.5 fraction = 97.6% of PM10 ([http://www.arb.ca.gov/ei/speciate/pmsize\\_07242008.xls](http://www.arb.ca.gov/ei/speciate/pmsize_07242008.xls) for "STAT. I.C. ENGINE - DIESEL")
- (5) Emission factor from CARB OFFROAD model.

| Equipment             | HP  | # of Units | Duration (Days) | Category | Emissions (lb/day) |      |      |      |      |                    |         |
|-----------------------|-----|------------|-----------------|----------|--------------------|------|------|------|------|--------------------|---------|
|                       |     |            |                 |          | VOC                | NOx  | CO   | SOx  | PM10 | PM2.5 <sup>1</sup> | CO2     |
| Batch Plant Generator | 110 | 1          | 192             | Off-Road | 1.94               | 5.82 | 7.18 | 0.01 | 0.43 | 0.42               | 1102.52 |

| Emissions (tons/year) |      |      |      |      |                    |        |
|-----------------------|------|------|------|------|--------------------|--------|
| VOC                   | NOx  | CO   | SOx  | PM10 | PM2.5 <sup>1</sup> | CO2    |
| 0.19                  | 0.56 | 0.69 | 0.00 | 0.04 | 0.04               | 105.84 |