DOCKET
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May 25, 2010

Alan Solomon
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: **Palen Solar Power Project, Docket No. 09-AFC-7**
Revised Rule 1401 Health Risk Assessment for Auxiliary Boiler Operations at the Palen Solar Power Project *Technical Area: Air Quality*

Dear Mr. Solomon:

Attached please find the following Revised Rule 1401 Health Risk Assessment for Auxiliary Boiler Operations at the Palen Solar Power.

If you have any questions on this submittal, please feel free to contact me directly.

Sincerely,

Alice Harron
Senior Director, Development

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Memorandum

To	Ken Coats, South Coast AQMD	Page	1
CC	Gregory Wolffe (AECOM)		
Subject	Revised Rule 1401 Health Risk Assessment for Auxiliary Boiler Operations at the Palen Solar Power Project		
From	Russ Kingsley		
Date	May 25, 2010	Docket No. 09-AFC-7	

This correspondence presents the methodology and results of a revised health risk assessment (HRA) performed to assess impacts and public exposure associated with emissions of toxic air contaminants (TACs) from the Palen Solar Power Project (PSPP). The HRA is being submitted in response to the South Coast Air Quality Management District (SCAQMD) request for a revised HRA to demonstrate compliance with SCAQMD Rule 1401, *New Source Review of Toxic Air Contaminants*, due to changes in the operating hours for the two auxiliary boilers. Annual operating hours of the boilers and the load profile were revised slightly to account for the removal of a previously proposed natural gas-fired heat transfer fluid (HTF) heater from the project design.

Health Risk Assessment Procedures

The methods used to assess potential health risks are consistent with the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* published by the California Office of Health Hazard Assessment (OEHHA 2003). The latest OEHHA cancer potency factors, and chronic and acute reference exposure levels (RELs) for each TAC were used. The California Air Resources Board (ARB) Hot Spots Analysis and Reporting Program (HARP, Version 1.4a) software was used to perform the risk analysis. The HARP software contains the latest OEHHA toxicity values, as well as the now outdated United States Environmental Protection Agency (USEPA) Industrial Source Complex (ISCST3) dispersion model.

For this HRA, the ISCST3 model which is built-in to HARP was not used. Instead, the USEPA current guideline model, AERMOD was used along with the ARB-provided HARP On-Ramp tool. The HARP On-Ramp provides a convenient mechanism to convert AERMOD dispersion results into a format that is compatible with HARP's risk module.

Emissions Characterization

Auxiliary boiler emissions were calculated based on operational data for two auxiliary boilers. **Table 1** summarizes the modeled TAC emission rates for the Auxiliary Boilers. The emission calculations are based on a proposed annual operating schedule of 5,100 hours with 600 hours at full load (100 percent of heat capacity) and 4,500 hours at low load (25 percent of heat capacity). This revision represents an increase in the annual operation of each boiler by 100 hours at full load.

Table 1 Modeled Auxiliary Boilers TAC Emissions [1]

Pollutant	CAS Number Used in HARP	Maximum Hourly Emission Rate (lb/hr)	Annual Average Emission Rate (lb/yr)
Benzene	71432	7.21E-05	1.24E-01
Formaldehyde	50000	2.57E-03	4.44E+00
Hexane	110543	6.18E-02	1.07E+02
Naphthalene	91203	2.09E-05	3.61E-02
Total PAH's [2]	50328	2.05E-06	3.53E-03
7,12-Dimethylbenz(a)anthracene	---	5.49E-07	9.47E-04
Acenaphthene	---	6.18E-08	1.07E-04
Acenaphthylene	---	6.18E-08	1.07E-04
Anthracene	---	8.24E-08	1.42E-04
Benz(a)anthracene	---	6.18E-08	1.07E-04
Benzo(a)pyrene	---	4.12E-08	7.10E-05
Benzo(b)fluoranthene	---	6.18E-08	1.07E-04
Benzo(g,h,i)perylene	---	4.12E-08	7.10E-05
Benzo(k)fluoranthene	---	6.18E-08	1.07E-04
Chrysene	---	6.18E-08	1.07E-04
Dibenz(a,h)anthracene	---	4.12E-08	7.10E-05
Fluoranthene	---	1.03E-07	1.78E-04
Indeno(1,2,3-cd)pyrene	---	6.18E-08	1.07E-04
Phenanthrene	---	5.83E-07	1.01E-03
Pyrene	---	1.72E-07	2.96E-04
p-Dichlorobenzene	106467	4.12E-05	7.10E-02
Toluene	108883	1.17E-04	2.01E-01

[1] Emissions for each auxiliary boiler

[2] Aggregate emissions of all polycyclic aromatic hydrocarbon (PAH) species were attributed to benzo(a)pyrene as a surrogate. Since the surrogates for total PAH (B(a)P) are the most or nearly-the-most potent carcinogens in the class, use of the cancer potency factors for these with total emissions will overestimate the risk (OEHHA, 2003).

Risk Assessment Dispersion Modeling Methodology

The AERMOD (version 09292) dispersion model was used in this assessment. The stationary source locations, stack parameters, receptor grids, and meteorology were consistent with the criteria pollutant modeling submitted with the California Energy Commission Application for Certification (AFC). Modeled stack parameters for the boilers are shown in **Table 2**. The coordinates are in Universe Transverse Mercator (UTM), Zone 11, referenced in U.S. Geological Survey (USGS) North American Datum 1983 (NAD83).

Table 2 Modeled Stack Parameters

Source ID	UTM E (m)	UTM N (m)	Stack Height (m)	Stack Diameter (m)	Stack Temp. (K)	Stack Velocity (m/s)
AuxBoil1	666813	3729833	15.240	0.914	422.04	7.19
AuxBoil2	664441	3729806	15.240	0.914	422.04	7.19

Meteorological data consisted of three years (January 2002-December 2004) of surface meteorological data collected at the Blythe Riverside County Airport and upper air soundings from the Desert Rock, Nevada station, as submitted with the AFC. Meteorological data for calendar year 2003 showed the highest modeled annual ground-level concentrations and was used for this HRA update. The meteorological data year that produced the highest (worst-case) annual average concentrations was used for modeling health risk impacts. The annual variation was generally less than 5 percent, with the highest impact shown in 2004 for auxiliary boiler 1. **Table 3** shows a summary of modeled annual concentrations. These results are based on a modeled emission of 1.0 gram per second.

Table 3 Modeled Maximum Annual Concentrations

Source ID	2002	2003	2004
AuxBoil1	0.63550	0.60279	0.63722
AuxBoil2	0.63049	0.59956	0.62667

Based on the concentration shown above, maximum annual ground-level concentrations for the 2004 modeled year was used to conservatively estimate health risks for the boilers in HARP due to TAC emissions.

A summary of the modeled receptor grid is provided below:

- Property line receptors placed every 25-meters (m);
- Cartesian receptor grid at 100-m spacing out to 3 km;
- Cartesian receptor grid at 200-m spacing out to 5 km from the facility; and
- Cartesian receptor grid at 500-m spacing out to 10 km from the facility.

The receptor grids were generated in UTM Zone 11 NAD83 coordinates. The AERMOD dispersion results were loaded into HARP using the HARP On-Ramp to calculate the maximum individual cancer risk, and the chronic non-carcinogenic and acute hazard indices over the entire receptor grid, as described below.

Risk Characterization

Carcinogenic risks, chronic non-carcinogenic, and acute health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. The HARP software performs the necessary risk calculations following the OEHHA risk assessment guidelines and the ARB Interim Risk Management Policy for risk management decisions (ARB 2003). These guidelines recommend that the following risk analysis methods be employed:

- Residential Cancer Risk: Derived (Adjusted) Method;

- Residential Chronic Hazard Index: Derived (OEHHA) Method;
- Acute Hazard Index for All Exposures: Acute HI Simple (Concurrent Max.); and
- Off-Site Worker Standard Work Schedule for Cancer Risk and Chronic Hazard Index.

To estimate the maximum cancer risk for residential exposures, the modeled exposure pathways included inhalation, homegrown produce (using non-urban default ingestion fractions), dermal, soil, and mother's milk absorption. The same pathways were assumed for off-site worker exposure.

Health Risk Assessment Results

The residential maximum individual cancer risk (MICR) from both boilers is 0.00178 in one million, and 0.00139 in one million on a per boiler basis. A breakdown of the residential MICR by exposure pathway is provided in **Table 4**. Because cancer risk impacts for auxiliary boiler 1 are based on the highest annual average concentration of the three year meteorological data set used in the air dispersion modeling analysis, this represents the highest residential MICR on a per boiler basis.

Table 4 Maximum Cancer Risk Impacts by Pathway

Source ID	Inhalation	Dermal	Soil	Vegetable	Oral	Total
AuxBoil1	3.32E-10	4.36E-10	6.53E-11	5.53E-10	1.05E-09	1.39E-09
AuxBoil2	9.46E-11	1.24E-10	1.86E-11	1.58E-10	3.00E-10	3.95E-10
SUM	4.27E-10	5.60E-10	8.39E-11	7.11E-10	1.35E-09	1.78E-09

A summary of all cancer risk and non-cancer health hazard impacts for boiler operations is shown in **Table 5**.

Table 5 Maximum Predicted Health Risk Impacts[1]

Exposure Assumption	Cancer Risk (Per Million)	Chronic Hazard Index	Acute Hazard Index
Full-Time Resident	0.00178 (5578)	0.00000587 (5574)	0.000418 (5477)
Off-Site Worker	0.000325 (5574)	Same as resident	Same as resident
Moderate Risk Thresholds	**1.0**	**1.0**	**1.0**
Significant Impact?	No	No	No

[1] Receptor number is shown in parentheses.

The maximum residential and off-site worker risks are below the SCAQMD Rule 1401 risk threshold for cancer risk (1.0-per-million), and chronic and acute hazard indices (1.0). HARP output files for each health risk impact evaluation, and for the impact evaluations at each maximum receptor identified in **Table 5**, is provided with this memorandum along with the HARP input files (emissions, source, and concentration data). Based on these results, no further health risk analysis is required.

References

California Air Resources Board (ARB) 2003. Air Resources Board Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk. October 2003.

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of: **APPLICATION FOR CERTIFICATION** **for the *PALEN SOLAR POWER PROJECT***	**Docket No. 09-AFC-7** **PROOF OF SERVICE** ***(Revised 5/14/2010)***

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DECLARATION OF SERVICE

I, Carl Lindner, declare that on, May 25, 2010, I served and filed copies of the attached **Revised Rule 1401 Health Risk Assessment for Auxiliary Boiler Operations at the Palen Solar Power Project**

The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:
[http://www.energy.ca.gov/sitingcases/solar_millennium_palen].
The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

__X__ sent electronically to all email addresses on the Proof of Service list;

_____ by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

__X__ sending an original paper copy and one electronic copy, mailed respectively, to the address below (preferred method);

OR

_____ depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

CALIFORNIA ENERGY COMMISSION
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docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Carl E. Lindner