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STATE OF CALIFORNIA

Energy Resources
Conservation and Development Commission

In the Matter of:	**DOCKET NO. 09-AFC-07C**
Petition For Amendment for the **PALEN SOLAR ELECTRIC GENERATING SYSTEM**	**DECLARATION OF DR. RICHARD KAAE**

I, Dr. Richard Kaae, declare as follows:

1. I am presently Owner-Operator of Pesteducation.Com.

2. A copy of my professional qualifications and experience is included with my Supplemental Rebuttal Testimony.

3. I prepared the attached supplemental rebuttal testimony relating to Biological Resources for the Petition for Amendment for the Palen Solar Electric Generating System (California Energy Commission Docket Number 09-AFC-07C).

4. It is my professional opinion that the attached prepared testimony is valid and accurate with respect to issues that it addresses.

5. I am personally familiar with the facts and conclusions related in the attached prepared testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury, under the laws of the State of California, that the foregoing is true and correct to the best of my knowledge and that this declaration was executed on 6/17/14 2014.

Richard Kaae

Dr. Richard Kaae

PALEN SOLAR ELECTRIC GENERATING SYSTEM
BIOLOGICAL RESOURCES
SUPPLEMENTAL REBUTTAL TESTIMONY
INSECTS

I. Names:

Dr. Richard S. Kaae

II. Purpose:

I provide this Rebuttal Testimony to address the issues relating to insects raised by the Opening Testimony of Dr. Gordon Pratt for the Palen Solar Electric Generating System (PSEGS) (09-AFC-7C).

III. Qualifications:

I have a Bachelors of Science in Entomology, a Ph.D. in Pest Management-Entomology and have done post doctorate education in insect behavior. I have over 55 years of experience in studying, researching and teaching entomology. My qualifications are detailed in my attached resume.

To the best of my knowledge all referenced documents and all of the facts contained in this testimony are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements and provide these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

IV. Rebuttal:

1. In 55 years of studying, researching and teaching entomology, I have had many, many opportunities to observe the attractiveness of light to insects. One of the collecting techniques that entomologists use in order to study insects is called black lighting. In this case, a light source is hung in front of a sheet beginning at sunset, or earlier. Of course I have done this more times than I can count and can remember only a few day-flying insects coming to this black lighting system and even then it occurs at or slightly after sunset. Even with night flying insects, their attraction to light typically begins well after sunset, typically when it is quite dark.

2. Based on the reported operational time of the proposed towers, a few of Dr. Pratt's reported statements seem somewhat counter to his suggestion that the towers will affect the insect population in the proposed area. He writes: "Most nocturnal insects are attracted to light

at different hours of the night, due to their differences in nocturnal activity. As an example there are many insects that fly only at twilight, others wait until it is completely dark, while others will not fly until after midnight, and some wait until near sunrise. It is normally assumed that diurnal or day flying insects are not specifically attracted to light, but I have found that they too will be attracted to light particularly as the sun sets."

3. Considering the reported operational timing of the towers, Dr. Pratt's statement negates the possibility of nocturnal insects being attracted to the proposed towers, including nocturnal insects that are attracted to light at twilight and near sunset, as the towers are operated to immediately shut down as soon as the sun's rays are no longer reflected, thus not producing attracting light at any time of those stated times. Apparently once the proposed towers shut down, it takes 30 to 40 minutes for them to cool off, but there are no indications that I am aware of, nor would there be, any reasons that any insects would be attracted to this type of temperature.

4. Dr. Pratt states "Considering how intense the focused light source is from the heliostats of the proposed Palen Solar Power Project, day flying insects could be drawn from miles away. I have also observed that the higher intensity of the light the further the insects seem to travel to get to the light source." First of all there is no evidence of which I'm aware, in the literature where day flying insects are drawn to a light source during the day. The most logical reason for this is the sun. If insects were drawn to light in the day, it would seem they would fly towards the sun, the most obvious and brightest light anywhere. Because the towers will reflect the sun's rays, there would be no difference in the types of rays from both sources. I really doubt that anyone really believes that day flying insects fly towards the sun. The same logic would follow for the proposed towers. In addition if he is referring to those few day flying insects he stated that are drawn to lights especially as the sun set, again the towers would be shut down around that time. As far as drawing day flying insects from miles away, hypothetically, if the tower was still on at that time, which doesn't seem likely, the insects attracted would have been nearby and not attracted from long distances (miles). For instance, let's say the tower was still on for a fifteen-minute period (again not likely) at sunset, insects attracted from a distance would need to fly to the tower. Most insects only fly a few miles an hour. In that fifteen minutes the maximum distance they could fly from would be 1/2 mile and not miles away. There is an added factor that determines when the proposed towers will exactly turn on and shut down. This occurs when sunlight focuses or ceases to focus

on the reflective mirrors. It would seem that due to the angle of the sun in relation to the towers at sunset and sunrise, the generation of a light source may occur much later than actual sunrise and earlier than sunset, making it much less likely that any insects will fly to the apparatus during these periods.

5. Regarding the migration of dragonflies, it has been documented that this does occur, but little is known about it. Documents that I have read indicate that most migrations occur at midday and commonly along coastlines in the U.S. or areas where there are fresh water sources. Again dragonflies are day flying insects and I can't remember when I have seen one fly to a night light. As far as I know there is no reason or scientific evidence to believe that huge migrations of dragonflies are moving through the particular proposed project area. Dragonfly migrations would appear to be very rare in the United States. I have been an entomologist for over 50 years and have never seen such migration in the U.S. I have observed migrating dragonflies in S.E. Asia and this typically occurred in areas where there is fresh water, as the immature forms of these insects are strictly fresh water organisms.

    - As for killing the dragon flies, thereby resulting in increase of mosquitoes and subsequently leading to more disease, this is rather convoluted in thinking. There are many other species of insects, fish, birds, amphibians and reptiles that feed on mosquitoes in both the immature and adult stages. The main way mosquito populations are kept in control in California is by Governmental Mosquito Abatement Districts throughout the state. This is accomplished by the reduction of breeding sites, application of mosquito specific biological pesticides, introduced predators (mosquito fish and others) and other ways. These techniques are quite effective.

    - As far as Dr. Pratt's conclusions that the presence of the towers in the proposed area will kill all the insects in this area over time, resulting in a wasteland surrounding the solar project, affecting not only the local birds and lizards in the immediate area, but ultimately the diversity of plants on and surrounding the site and in a larger area that could include Joshua Tree National Park is unfounded. As I understand it, the towers are operated so that they shut off at night at sunset and do not turn on again until sunrise which, according to Dr. Pratt's report, is when insects fly to lights. I cannot see how any of this could occur.

6. Again logically speaking, based on the above information I cannot see where the construction and operation of these towers as described would have any significant negative effect on the insect populations in the designated areas, certainly not in the doomsday scenario as

described by Dr. Pratt's report. The key factor here is that the towers are reportedly operated to shut off at those times when either day or night flying insects fly to lights. That said, I appreciate, support and share Dr. Pratt's desire to protect the ecology and environment of this area. However, in my understanding, I also see the need for development of creating new sources of renewable energy, especially when not harmful to the environment.

Resume

Richard S. Kaae

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Education

BS-Cal State Long Beach-1966 Entomology, Pest Management-1966.

PhD Pest Management-Entomology-University of California UC Riverside-1970.

Post Doctorate- University of California Riverside. Insect Behavior-1971-2

Employment

University of California at Riverside. Entomology Department, Staff Research Associate. 1972--3. Insect Behavior

Cal Poly Pomona-Plant and Soil Science. 1972 to present. Professor Pest Management.

Pest Control Education

Owner-Operator. Pesteducation.Com. 2004 to present. Our courses are accredited by the States of California, Oregon, Washington, Nevada, Colorado, Arizona and some of the eastern states and internationally, to provide the continuing education required for pest control individuals to maintain licenses (all fields).

Courses Offered by Dr. Kaae at Cal Poly Pomona and UC Riverside

- Introduction to Arthropods
- Urban Entomology
- Principles of Pest Management
- Insect Identification
- Medical Entomology
- Immature Insects
- Bees and Bee Keeping
- Vertebrate Pest Management
- Advanced Pest Management
- Insect Population Ecology
- Insect Ecology
- Field Entomology
- Pest Biology and Control
- Insects and Insects and Civilization
- Stored Product Pests
- Wood Destroying Insects

Recent Publications.

- Insects and Civilization. R.S. Kaae and Patricia Kaae. Two hundred + pages Textbook, Hayden-McNeil Publishers.

- Outdoor Vertebrate Pests. R.S. Kaae and Patricia Kaae. Covers Gophers, Squirrels, Mice, Rats, Moles and Other Vertebrate Pests.
- Medical Entomology. R.S. Kaae, Patricia Kaae and Janel Freeman. Covers Insects and Their Relatives that Feed on, Bite, Sting or Vector Disease to Humans and Animals.
- Weeds and Weed Control. R.S. Kaae and Patricia Kaae. Covers over 150 Weeds, Identification, Biology and Control.
- Insect Identification and Biology. R.S. Kaae and Patricia Kaae. Covers Identification of Insects Including Biology of Economic Species.
- Applicator's Guide to Wood Pests. R.S. Kaae. Covers Termites, Wood Infesting Beetles, and Various Molds and fungi that infest Wood, Others.
- Applicator's Guide to Vertebrate Pests. R. S. Kaae. Covers a Wide Variety of Vertebrate Pests (e.g. Carnivores, Rodents)
- Flea Biology and Control, R.S. Kaae and Patricia Kaae.
- Cockroach Biology and Control. R.S. Kaae and Patricia Kaae.
- Miscellaneous Household Pests. R.S. Kaae and Patricia Kaae.
- Honeybee Biology, Beekeeping and Pollination. R.S. Kaae and Patricia Kaae.
- Africanized Bees and Imported Fire Ants. R.S. Kaae and Patricia Kaae.
- Wood Destroying Beetles. R.S. Kaae and Patricia Kaae.
- Termite Biology and Control. R.S. Kaae and Patricia Kaae
- Predatory Insects. R.S. Kaae and Patricia Kaae.
- Spider Identification and Biology. R.S. Kaae and Patricia Kaae.
- Insecticide Label Development, History and Interpretation. R.S. Kaae and Patricia Kaae.
- Pesticide Poisoning. R.S. Kaae and Patricia Kaae.
- Carpenter Ant Biology and Control. R.S. Kaae and Patricia Kaae.
- Store Product and Fabric Pests-Identifrication, Biology and Control R. S Kaae, Taylor Lura and Patricia Kaae
- Bedbug Biology and Control. R. S, Kaae, Taylor Lura and Patricia Kaae.
- I have 15 additional publications that pertain to insect behavior in relation moths. These were published during my postdoctorate and staff research associate period at UCR.