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STATE OF CALIFORNIA

Energy Resources
Conservation and Development Commission

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

I, Gustavo Buhacoff, declare as follows:

1. I am presently employed by BrightSource Energy as a Director of O&M.

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

3. I prepared the attached 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 June 23 2014.

Gustavo Buhacoff

PALEN SOLAR ELECTRIC GENERATING SYSTEM
BIOLOGICAL RESOURCES
SUPPLEMENTAL OPENING TESTIMONY
HELIOSTAT OPERATIONS

I. Name:

Gustavo Buhacoff

II. Purpose:

My testimony addresses the subject of operation of the heliostat field associated with the Palen Solar Electric Generating System (PSEGS) (09-AFC-7C).

III. Qualifications:

I am presently Director of Operations and Maintenance with BrightSource Energy and have been the Commissioning and Startup Manager for the past two years. I have a Degree in Mechanical Engineering and I have over four years of experience in solar power plants. I am responsible for the heliostat operations at the Ivanpah Solar Electric Generating System (ISEGS) Project. A detailed description of my qualifications is presented in my resume, which is included in Attachment A to this Opening Testimony package.

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. Opinion and Conclusions

I am responsible for the operation of the heliostat fields at ISEGS. I believe that the PSEGS heliostats would operate similarly to ISEGS. The purpose of my testimony is to describe how the heliostats are operated at these types of projects and to describe the amount of time that the heliostats at ISEGS were generating solar flux since February 2014.

To explain the operation of heliostats, it is useful to first establish some definitions. Every heliostat is always in one of five possible modes: tracking, standby, calibration, stow, and protection.

- “Tracking” means the heliostat is maintaining a position to reflect sunlight onto the receiver at the top of the tower. Tracking heliostats are constantly adjusting their position to keep reflecting sunlight on the receiver, since the sun is constantly moving relative to the earth.
- “Standby” means the heliostat is reflecting sunlight to a point that is near, but not actually on, the receiver. The purpose is to have the heliostat in position so that it can be quickly called upon to reflect sunlight on the receiver when additional energy input is needed.
- “Calibration” means the heliostat is reflecting sunlight at a camera mounted on the top of the tower. The camera identifies the heliostat and gives it calibration data. This ensures that the heliostat can continue to be controlled with a high degree of accuracy.
- “Stow” means the heliostat is parked in a stationary position and is not expected to deliver energy to the receiver in the immediate term. The stow position at ISEGS is vertical, or perpendicular to the ground surface. Heliostat cleaning takes place in the stow position.
- “Protection” is similar to “stow,” in that the heliostat is parked in a stationary position. When wind speeds exceed a certain threshold, heliostats are placed in protection mode, which means they are stored horizontally, or near parallel to the ground surface. This reduces the load placed on the heliostat structures by reducing the profile that is exposed to the wind, thereby protecting the equipment.

Through experience gained on similar projects, we have developed procedures to reduce the number of heliostats in standby at one time when performing calibration only. When a field of heliostats is inactive and needs to be brought into operation, rather than bring all heliostats up at one time for calibration, we will now bring the heliostats into position in groups of 10,000 at a time which will reduce standby time.

It takes a heliostat 30 minutes to move from vertical to horizontal or vice versa. To move the heliostats from stow position to standby position takes each heliostat anywhere from 5 to 30 minutes. Each heliostat has a unique position relative to the sun and the receiver and, therefore, may have a small arc or large arc over which it needs to move to get in its proper position. It is also important to note that, in addition to mechanical limitations that control how fast a heliostat can move, there are also “red zones,” or positions that individual heliostats are programmed to minimize glint and glare impacts. Thus, oftentimes a heliostat cannot move in a “straight line” to get from point A to point B, but must travel in a large arc to avoid red zones. This has the effect of increasing travel time for heliostats.

A typical day involves moving the heliostats from the stow position to standby position just before sunrise. Since at least some heliostats typically need to move over a full range of motion, it is safe to say that it takes up to 30 minutes to bring the entire field up to standby. When the sun comes up, heliostats are moved from the standby position to tracking mode in a careful and coordinated manner in order to start producing steam. The heliostats are focused on the receiver for one hour or more in order to assist in warm up the steam-handling equipment and start producing steam at the appropriate conditions for the turbine to use to generate electricity. During operations, individual heliostats are often moving on and off the receiver in order to respond to climatic and process conditions and to maintain steady-state steam conditions.

If I am called upon to stop generating flux at the receiver (for instance, the turbine has tripped or some form of maintenance needs to be initiated), it would take 30 minutes to move all the heliostats from tracking to stow. To bring the heliostats back into position when plant operations are to resume would take an additional 30 minutes. If the turbine is still warm, it would take about 30 minutes to start generating electricity once the heliostats are back in tracking mode. Otherwise, if the turbine has cooled, it would take about an hour. An additional 15 minutes is needed to synchronize the steam turbine with the electrical grid and to begin delivery of electricity to the grid. Therefore, if the heliostat field is taken out of operation and placed in stow position, it will typically be two hours before the plant can deliver electricity again. This is the primary reason that the heliostats are placed into standby position more often than stowed.

During the months of February, March, April and May 2014, the heliostat fields at ISEGS have generated solar flux in either tracking position, standby position, or were undergoing calibration approximately 85% percent of the daylight hours. The amount of time that the solar fields create solar flux should not and cannot be equated to the electricity production at any one time, especially during these early months of facility operation.

Gustavo Y. Buhacoff

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Objective --

Combine my interest in sustainable development with my experience in industry to create the best solar power projects.

Professional Experience ---

BrightSource Energy Ivanpah, CA, USA

May 2014 – Current. Director, O&M. Managed BSE operations at Ivanpah and Coalinga sites. Responsible for BrightSource daily operation of the plants, achieving maximum performance from each plant as well as managing the warranty responsibility.

BrightSource Energy Ivanpah, CA, USA

March 2012 – April 2014. Solar Plant Performance and Startup Manager. Managed BSE commissioning, startup and performance at the Ivanpah project. Responsible for commissioning of SFINCS (BrightSource's Solar Field Controller), integration with DCS balance of plant, commissioning and startup of the entire plant as a single unit and getting the plants to maximum performance. Managed team of engineers that was composed of home office support engineers and locally based engineers to achieve a smooth commissioning and startup process under very short schedules due to construction delays. Created a cohesive team from several different entities that covered the entire duration despite the delays.

BrightSource Energy Coalinga, CA, USA

December 2010 – February 2012. Solar Plant Performance Engineer. Managed BSE commissioning, startup and performance at the Coalinga project in absence of CSU manager. Performed commissioning of mechanical, process, electrical and I&C systems as well as manage the commissioning of SFINCS (BrightSource's Solar Field Controller), and integration with balance of plant controller. Managed plant operation during startup phase and initial testing phases.

SolarWorld USA Hillsboro, OR, USA

June 2008 – December 2010. Senior Mechanical Engineer. Project engineer lead, system owner and maintenance engineer for Hillsboro mechanical systems simultaneously. Worked with A/E, contractors and SWIA personnel on development and construction of mechanical systems, system startup, creation of maintenance procedures, personnel training and factory operation.

Intel Corporation Hillsboro, OR, USA

July 1997 – June 2008. Senior Mechanical Engineer in Intel's Strategic Facilities Technology Development group. Developed design concepts for Intel's new technology factories, supported existing facilities as corporate system expert and team leader for various task forces including LEED implementation. Managed suppliers of mechanical systems, both newly developed technology as well as existing suppliers – performed technical evaluations, quality audits, failure analysis and managed corrective actions when needed.

DEKA Research & Development Manchester, NH, USA
September 1995 – June 1997. New Products Program with MIT. Mechanical design engineer working on innovative design concepts for iBot special mobility wheel chair.

Key Achievements:

- Invented, designed, tested and prototyped the Constant Pressure Seating System (US Patent 6,092,249) for iBot.

Education ---

Portland State University Portland, OR, USA
Master of International Management, August 2005.
Specialization in Sustainability, including:
- Global Business and Sustainability
- Product Design and Stewardship for Global Corporations
- Stakeholder Management and Cross-Sector Partnerships

Exit project: Development of Sustainability Indicators & Metrics for Urban and Rural Development for the China-US Center for Sustainable Development.

Massachusetts Institute of Technology Cambridge, MA, USA
Master of Science in Mechanical Engineering, June 1997.
Research and thesis: Development of a Constant Pressure Seating System done with DEKA R&D, Manchester, NH.

New Mexico State University Las Cruces, NM, USA
Bachelor of Science in Mechanical Engineering, 1995.

Language Skills ---

- English
- Spanish
- French
- Hebrew
- Basic Chinese