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DOCKET
11-AFC-2
DATE MAR 05 2012
RECD. MAR 06 2012

March 5, 2012

427930.DI.DR

Mike Monasmith
Senior Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Subject: Data Response, Set 2C
Hidden Hills Solar Electric Generating System (11-AFC-2)

Dear Mr. Monasmith:

On behalf of Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC, please find attached an electronic copy of Data Response Set 2C in response to Staff's Data Request Set 2C filed on February 3, 2012. Five CD-ROMs of Attachment DR153-1 are being provided for staff.

Hard copies will be sent out tomorrow. Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

Encl.

c: POS List
Project file

Data Response 2C

Hidden Hills

Solar Electric Generating System

(11-AFC-2)

Application for Certification

Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC

March 2012

With Technical Assistance from

CH2MHILL®

IS061411043744SAC

Hidden Hills Solar Electric Generating System (HHSEGS)

(11-AFC-2)

Data Response, Set 2C
(Response to Data Requests 147 through 155)

Submitted to the

California Energy Commission

Submitted by

Hidden Hills Solar I, LLC; and
Hidden Hills Solar II, LLC

March 5, 2012

With Assistance from

CH2MHILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833

Contents

Introduction

Attached are Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC (collectively, “Applicant”) responses to the California Energy Commission (CEC) Staff’s data requests numbers 147 through 155 for the Hidden Hills Solar Electric Generating System (HHSEGS) Project (11-AFC-2). The CEC Staff served these data requests on February 3, 2012. The responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as provided by CEC Staff and are keyed to the Data Request numbers (147 through 155). New graphics are numbered in reference to the data request number. For example, the first figure used in response to Data Request 149 would be Figure DR149-1, and so on.

Figures (unless imbedded) and Attachments submitted in response to a data request are at the end of this document and are also numbered to match the data request number. The figures and attachments are in numerical order of the data request number.

Air Quality (147)

BACKGROUND: NATURAL GAS USAGE IN BOILERS

The AFC does not provide detailed information on the percentage of the annual heat input from fossil fuel compared to that from the sun. Page 5.1-32 and 5.1-37 of the AFC indicates that the annual heat input of natural gas will be limited to be less than 10 percent of annual solar energy capture. The percentage of fossil fuel usage should account for not only the natural gas used in the boilers, but also fuel used to keep the system operating, including mirror washing.

DATA REQUEST

147. Please provide fuel use documentation in MMBTUs that demonstrates compliance with intent of Public Utilities Code 399.12(h)(3)(A), which states

> *(3) (A) An electricity generated by an eligible renewable energy resource attributable to the use of nonrenewable fuels, beyond a de minimis quantity used to generate electricity in the same process through which the facility converts renewable fuel to electricity, shall not result in the creation of a renewable energy credit. The Energy Commission shall set the de minimis quantity of nonrenewable fuels for each renewable energy technology at a level of no more than 2 percent of the total quantity of fuel used by the technology to generate electricity. The Energy Commission may adjust the de minimis quantity for an individual facility, up to a maximum of 5 percent*[1]

a. This documentation should allow computation of the percentage of annual heat input from fossil fuel use relative to total heat input.

b. Report mirror washing separately for mirror washing.

Response: Given that Public Utilities Code section 399.12(h)(3)(A) relates to renewable energy credits and the Energy Commission's power to establish the criteria for renewable energy resources to be eligible to create renewable energy credits, this provision is not an applicable LORS for which the Staff must evaluate compliance. These questions are not relevant to any analysis of environmental impacts, but instead relate to commercial issues.

Traffic & Transportation (148-151)

BACKGROUND

The applicant has provided a previous analysis with respect to the MPE (Maximum Permissible Energy) for retinal damage, and the equivalent apparent brightness of a 100W light bulb at viewing distance. Further, although the applicant states that the brightness levels of the Solar Receiver Steam Generator (SRSG) on the top segments of the solar power towers are a tiny fraction (53-68 W/m2) of the levels established for MPE (1,000 W/m2 for continuous exposure) it is well known that: a) perceived brightness and MPE are not systematically related, and b) perceived brightness and irradiance (w/m2) are not systematically related. For that matter, neither is perceived brightness and radiance (e.g., lm/m2). Disability glare has been shown to be quite prominent at source levels up to and in excess of 3 orders of magnitude less than MPE. In the applicant's example the SRSGs are 1.3 orders (i.e., log units, a factor of 10) less than CW (continuous wave) MPE.

Additionally, the impact of glare is not considered within the context of a spatially extended emissive source. The solar collector is bigger than the sun at a considerable range of viewing distances. For example at 12 meters in width the solar collector has a visual extent (angular subtense) exceeding that of the sun (32 min arc) for a viewing distance of approximately 1,288 meters (0.8 mile).

DATA REQUEST

148. Please address the impact of apparent glare and visual disruption in terms of observer incident luminous energy at nominal viewing distances for worker, the public and motorist populations.

Response: In normal operation, only the area of the SRSG (near the top of the tower) will receive concentrations of solar radiation. Locations on the ground, areas surrounding the footprint of the plant or airspace will not receive solar radiation concentrations above that of direct sunlight. Therefore, in normal plant operation, there is no potential for any solar radiation exposure hazard to motorists, residents, etc.

Glare will be apparent from the SRSG on top of the tower during operation. The impact on an observer, whether on- or off-site, is calculated as the retinal irradiance (Er).

The calculation of Er takes under consideration the size of the lighted object (SRSG), the intensity in W/m^2 (flux) at the observer location, and the parameter of the human eye. Residents and motorists outside the plant boundaries will not be exposed to Er levels beyond the Maximum Permitted Exposure (MPE); even personnel and others within the plant boundaries will not exceed the MPE. The intensity of light emitted from the SRSG is lower (by 3 orders of magnitude) than that of the sun (70 W/m^2 vs. 80,000 W/m^2). In fact, when we take the worst case scenario (all our calculations do so) we do not include the air attenuation; therefore, the Er emitted on the retina is constant with distance. We consider the minimum nominal viewing to be at least 5 times the size of the SRSG, but in reality it will exceed 250 m (the tower height). The Er emitted is about 70 W/m^2 while in comparison the Er emitted from the sun is 80,000 W/m^2. The irradiance to which an observer at 250 m from the SRSG is exposed is not greater than 50 W/m^2, and it decreases over distance (i.e., at 400 m it is less than 20 W/m^2.)

Flux (W/m^2) is the appropriate measurement to use. Luminance measurements calculate light radiant energy that differs from the natural spectrum (limited to the energy in the visual spectrum), while the human eye is affected by the full spectrum.

DATA REQUEST

149. Please address the impact of apparent glare and visual disruption for the baseline solar collector dimensions at nominal viewing distance for workers, the public and motorists given the predicted observer incident luminous energy.

Response: The impact from Applicant's heliostats is potential glint. For motorists and the public the glint was addressed in Data Response 37, Data Response Set 1A.

There is no safety impact from the heliostats on plant workers since the heliostats' reflection is always below the Safe Retinal Irradiance (Ers), as shown in Figure DR149- 1.

We use the same calculation for the Retinal Irradiance (Er) from heliostats as we did for the SRSG, using a ray tracing method to model the amount of light concentration at given distances from a given heliostat. In the vicinity of the heliostat the radiation is a single sun reflection; at mid-range distances, the image size is the heliostat reflector nominal size 6.34 m (the diagonal); and for longer distances the image size is the sun diameter 9.3 mrad. For a more accurate calculation we use the relative angle between the viewer and the heliostat, but for safety calculations we considered the worst case (DNR = 1000 W/m^2, relative angle is normal to the plane of the mirrors (cosine = 1), no blocking). This case is rare and the nominal impact is at least 30 to 50 percent lower than the described scenario for a single heliostat without blocking.

As can be seen from the ray tracing results in Figure DR149- 2, the beam intensity does not exceed the 4.8 kW/m^2 and decreases to less than 1 kW/m^2 after 500 m; the retinal irradiance (Er) decreases quickly. At all distances the Er is lower than the safe retinal irradiance (Ers) values (Figure DR149- 1).

In addition, the heliostats are designed to reflect sunlight toward the SRSG at the top of the tower and are programmed such that reflectivity would never be directed toward ground level viewers located outside of the project site. Under some infrequent circumstances, it could be possible that heliostats that are not in operation might reflect sunlight onto ground level areas within the project site. However, in cases in which this might occur, the level of light concentration and beam size will not be high because the heliostat surfaces will be blocked to some degree by surrounding heliostats, reducing the amount of light that is actually reflected.

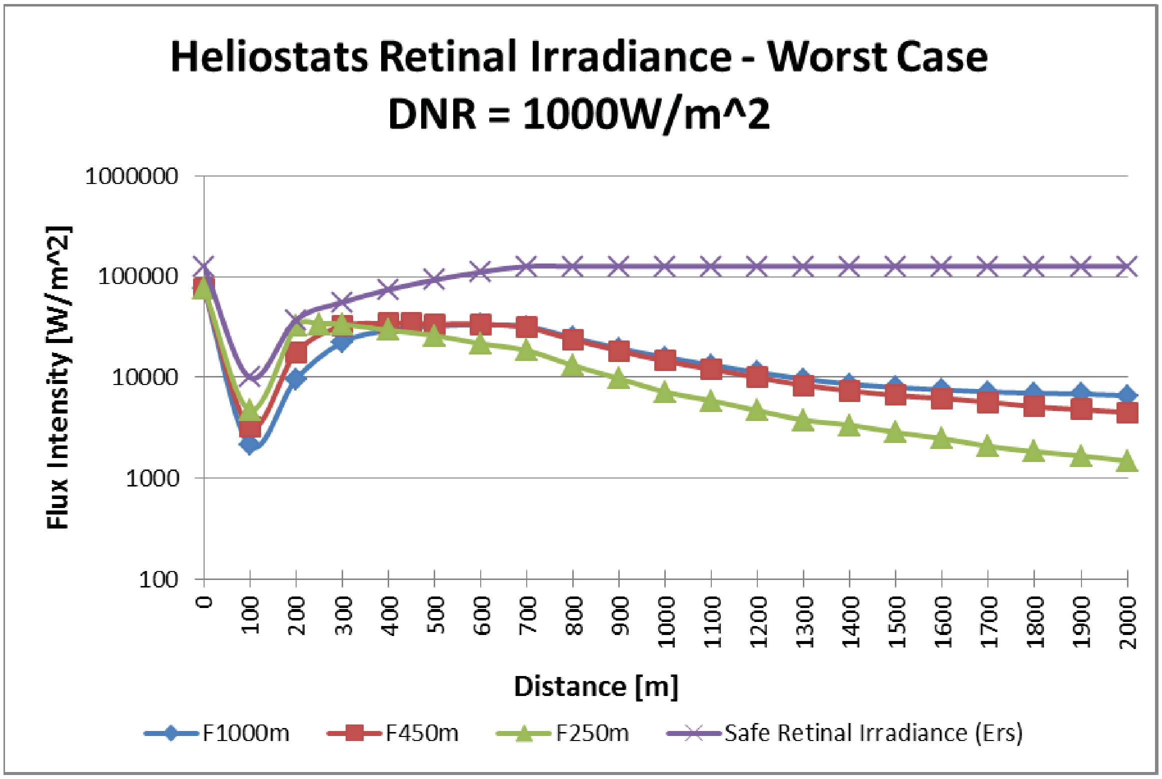


Figure DR149- 1: Heliostats retinal irradiance – worst case

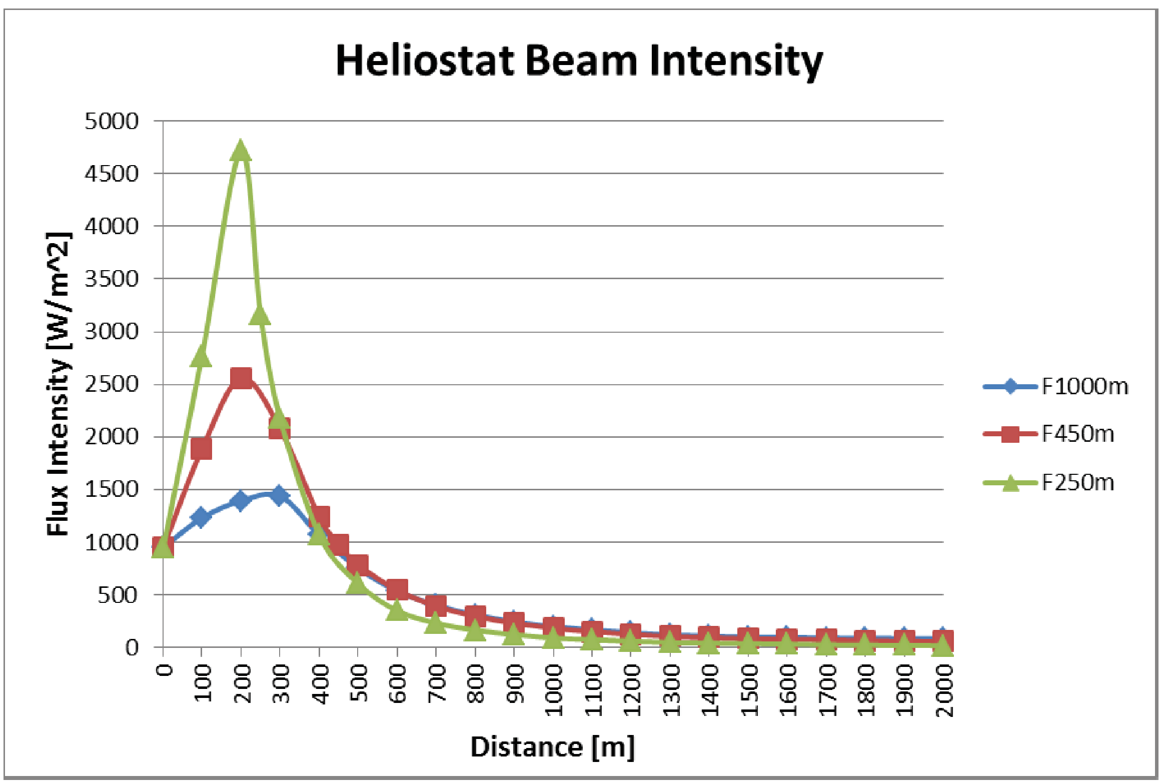


Figure DR149- 2: Heliostat beam intensity

BACKGROUND

The ability of light to cause injury to the retina has been shown both clinically and experimentally. Light can result in retinal damage through photothermal, photomechanical, and photochemical mechanisms. Photochemical damage is associated with long-duration exposure times as well as lower-wavelength (higher-energy) light exposure. While retina pigment epithelium (RPE) and the neurosensory retina are protected from light-induced exposure by the absorption profile of the surrounding ocular structures (e.g., cornea, crystalline lens, macular pigments) and through retinal photoreceptor outer segment regeneration, photic injury is still possible due to photochemical retinal light toxicity mechanisms.

Photochemical injury is both dose-dependent and cumulative in nature. The cumulative time-dependent nature is that daily exposures can build up and can last many weeks. For example, it has been estimated that the half-life (1/e, when an exposure effect has decayed to approximately 37%) of the cumulative dose exposure effect is on the order of 30 days. This has significant implications for observers (e.g., workers over many weeks) that spend a significant amount of time in proximity to the high luminance environment of a solar field in the presence of the additional high terrestrial ambient of the desert environment.

As retinal injury can be caused by exposure to otherwise innocuous visible light, there appears to be some critical dose or threshold at which exposure becomes injurious. The safe exposure times for common ophthalmic instruments (e.g., fundal photography) has been reported in the literature and supports the concept of a critical threshold dose necessary for injury.

DATA REQUESTS

150. Please address the potential for photochemical retinal damage to the public (workers, local residents) given the cumulative exposure effects of the combined terrestrial ambient and solar field/ tower exposure levels. Additionally, if found to be significant, please address any potential mitigating methodologies (e.g., worker sunglasses).

Response: Protective sunglasses have been developed for workers engaged in intense solar field work, tower work, and intense close viewing of the SRSG. For local residents (and others) outside the plant boundaries there is no long duration exposure, therefore no acute hazard. Usually, resident exposure will be limited to low intensity for short duration. Moreover, all submitted calculations of the glare and glint represent worst case scenarios: in calculating SRSG glare and heliostat glint, air attenuation was disregarded, so the actual exposure is even lower. The additional light emitted from the SRSG is less than one-tenth (0.1) of the natural radiation.

When evaluating the implications of these effects on the viewer of the tower or the heliostats, it must be noted that the effect is directly related to the ambient and background light conditions. The HHSEGS project is located in a bright desert environment thereby reducing the potential chance for photochemical retinal damage.

Workers within the plant boundaries may be exposed for long duration. The permanent or acute eye damage mechanism that could affect them is one of three types. Potential damage to the eye from electromagnetic radiation (solar radiation) is connected mainly to three mechanisms, each of which can individually lead to acute or chronic eye disease, which may result in temporary or permanent vision impairment or blindness. The first mechanism is photokeratitis (welder's arc disease), which is a result of excess UV radiation on the cornea and which leads to sloughing-off of the eye's surface cells a few hours after the exposure. This results in excruciating pain, preventing opening of the eyelid. This condition, which is akin to snow blindness, is generally temporary, because the damaged tissue regenerates.

Second, is potential damage to the retina due to over-exposure to blue light. This condition is a result of excessive exposure to short wavelength light interfering with biochemical processes in the photoreceptor cells. As the retina is not endowed with significant regeneration capacity, the damage may reduce vision permanently.

Third, is potential retinal burns from high flux intensity of visible light and infra-red (IR) (heat) radiation. This condition has the greatest potential to result in serious damage. When the energy is concentrated on the retina, it produces retinal burns which are permanent; if the burn occurs in the center of the retina, most of the useful vision is lost.

While both the UV range and the blue wavelength consist of lower energy intensities, the damage is cumulative. Prolonged exposure to the direct and reflected sunlight can cause acute damage to workers who spend long hours in the solar field or in prolonged viewing of the solar receiver. This is true even if at all times workers are exposed to lower momentary intensities than the acceptable MPE.

Therefore, to avoid these potential hazards, Applicant has designed and issued special safety glasses to the operators at Solar Energy Development Center (SEDC), and the Coalinga and Ivanpah plants. The potential photochemical retinal hazards are calculated according to IEC 62471 standard (same as CIE S 009: 2002), titled: “*Photobiological Safety of Lamps and Lamp Systems*”, where the spectral values were taken from “ASTM G173-03 Reference Spectra Derived from SMARTS v. 2.9.2 (AM1.5)” and are the same as the “ISO 9845-1-1992.”

Since the first standard is taken from laser safety it deals with 5 groups of wavelengths, 2 for far- and near-UV, (200-400nm, and 315-400nm, respectively), blue light hazard (300-700nm), and near- and far- infrared (380-1400nm and 780-3000nm, respectively).

In order to protect against injury of the eye (and skin) from radiation produced by the broadband spectrum of the sun, the effective integrated spectral irradiance, of the light source will not exceed the levels defined by the following equations.

$$\mathrm{Es}\cdot\mathrm{t} = \sum_{200}^{400}\sum_{\mathrm{t}} \mathrm{E}_{\lambda}(\lambda,\mathrm{t})\cdot\mathrm{Suv}\cdot\Delta\mathrm{t}\cdot\Delta\lambda \leq 30\ \mathrm{J/m^2}$$

Where Es is integrated spectral irradiance of the sun spectrum at this band; E_λ is the spectral irradiance in $W/m^2/nm$; $\Delta\lambda$ is the bandwidth in nm; Suv is the actinic ultraviolet hazard weighting function; and t is the exposure time in seconds.

$$\mathrm{E_{uva}} = \sum_{315}^{400} \mathrm{E}_{\lambda}\cdot\Delta\lambda \leq 10\mathrm{W/m^2}$$

Where E_{UVA} is the near UV exposure limit. The equation is valid for t > 1000 sec. Since we are calculating exposure greater than 1000 sec we did not add the time dependency (working day is ~30,000 sec).

$$E_B = \sum_{300}^{700} E_{\lambda}\cdot\mathrm{B}(\lambda)\cdot\Delta\lambda \leq 1\ W/m^2$$

Where E_B is the blue light exposure limit, B(λ) is the blue light hazard weighting function. This is not an accumulated function; therefore, time exposure should not exceed 100 seconds.

$$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq 50000/\alpha \cdot t^{0.25}\ W/m^2/sr$$

Where L_R is the retinal thermal hazard exposure limit, L_λ is the spectral radiance in $W/m^2/sr/nm$, R(λ) is the burn hazard weighting function, Δλ is the bandwidth in nm, t is the viewing duration at each friction, which is 10 seconds for our case, α is the angular subtends of the source. L_λ is achieved by dividing E_λ by the solid angle.

The infrared radiation hazard exposure limits (E_{IR}) are:

$$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 100\ W/m^2$$

After processing the results from the last five irradiance equations, we developed protective sunglasses for the workers engaged in intense solar field work, tower work, and intense close viewing of the SRSG.

BACKGROUND

In the Data Response to Set 1A, Data Request 29 the applicant discusses heliostat positioning and transition strategies. The discussions include positioning algorithms to optimize path selection for minimizing reflected sunrays on all unintended areas and the inclusion of forbidden areas within each heliostat's controller. An aviation concern with respect to Glint and Glare is unwanted aircraft exposure during heliostat transition. Further, since the heliostat field circumscribes a 360° field around the solar tower any spillage or leakage past the tower margins of reflected energy could potentially intercept aircraft and produce harmful Glint and or Glare visual impacts for pilots.

DATA REQUESTS

151. Please describe any strategy in the heliostat positioning algorithms to address the intermittent presence of aircraft for either known or unknown flight paths. Also, please address the amount of energy from the heliostats which spills beyond the tower and its potential for negative impacts on aviation safety.

Response: The operation modes of the heliostat are described in the following paragraphs:

The heliostats have two drives that allow them to rotate along two degrees of freedom (azimuth and elevation). The azimuthal range is the full rotation along the vertical axis. The elevation range is from 0 (vertical mirrors, heliostat pointing horizontally) to 90 degrees (horizontal mirrors, heliostat pointing to the zenith). Heliostat movements cannot stray from these.

The wind protection and default position, called the "safe" position, is the 90 degrees elevation - the mirrors being in horizontal position facing the sky. This position minimizes the risk of damage from large wind loads and is also the default orientation of the heliostats in case of loss of communication with the plant's control system or dysfunction of the plant's control system. With the solar field in "safe" position, no higher flux concentrations will be obtained than that caused by the reflection of the sun on a reflective horizontal surface. Also, the night stowage ("sleep") position is a vertical position.

As requested by Staff, Applicant is investigating whether the heliostat positions could be randomized in the safe position to look less like a water feature. It is important to note, however, that the solar fields have spaces between heliostats in the same row and access roads between rows of heliostats. Further, the heliostat fields tend to be denser closer to the tower and less dense moving out to the outer edges of the heliostat fields. Thus, given the breaks in heliostats in the same row, the breaks between heliostat rows, and the decreasing density moving from the power towers toward the outer edges of the heliostat fields, rather than being uniform and unbroken, the field will appear to be broken by such spacing and is unlikely to look like a large, continuous surface of a water body except from a distance.

For normal operation, the heliostats will orient themselves according to their position in the field, day of the year, and time of day, in order to reflect the sun rays either on the SRSG ("tracking" orientation) or on an area nearby (far enough from the tower and SRSG to free them from radiation but close enough to allow the heliostats to quickly enter tracking mode, called "standby" orientation).

All transitions from orientation to orientation are along a safe "path" that prevents reflected sunrays from reaching any forbidden area.

For morning startup, each heliostat will rotate along its two axes before sunrise in order to reach the "standby" position, which is specific to its position in the field and the day of the year. This can also be performed safely during daylight hours using a safe path as described in the previous paragraph.

In the evening, after sunset, the converse movement is performed, in which the heliostat rotates along its two axes from its last position (either a "standby" position or a "tracking" position) to its "sleep" position. The same remark applies: the field can be shut down before sunset if necessary, as its heliostats will use the safe path to reach their sleep position without reflecting sunrays on forbidden areas.

Reducing solar input to avoid overheating the receiver is performed by reorienting the heliostats from their "tracking" orientation to their "standby" orientation. This operation takes between a few seconds and a minute, depending on the position of the heliostat in the field, day of the year, and time of day.

Load reduction can be performed by the heliostats by reducing solar input as described in the previous paragraph (switching the appropriate number of heliostats from "tracking" to "standby").

The heliostats are powered by a super-capacitor connected to an individual photovoltaic panel and are therefore unaffected by loss of AC Station Power in their capacity to move and to power their individual controller. If the control system of the plant is affected by the loss of power despite its uninterruptible power supply, the heliostats will react as to any other control system failure, by moving to safe orientation.

Washing is performed at night with the heliostats in orientation within the range appropriate to the washing machine chosen for the project. Typically, in terms of elevation, the heliostat will either be in a vertical position (like in sleep orientation) or in a horizontal position (like in safe orientation) for washing. The azimuth of the heliostats will be dependent on the path of the washing machine within the solar field.

Each heliostat has autonomous power and controller, allowing it to respond to loss of communication with the plant's control system or failure of the plant's control system by moving autonomously to the appropriate safe orientation.

The size of the site according to the FAA regulations is the volume that encompasses the perimeter of the site and a height of 200 ft above the tower. This imaginary volumetric body is the control volume that the tracking system takes under consideration. In this volume the heliostats are programmed to concentrate flux in certain positions that will cause the flux leaving the imaginary control volume to scatter to a level that will cause no impact on aviation safety.

Visual Resources (152-155)

BACKGROUND

To independently evaluate visual and glare effects of the heliostat field, staff requires a better understanding of the physical components.

DATA REQUEST

152. Please provide scaled plans and elevations with dimensions in feet and inches of individual proposed heliostat units. Include surface treatment and materials for the rear and frame of the heliostat units.

Response: A heliostat drawing is attached as Figure DR152-1. Details regarding the heliostat's composition are provided below.

Dimensions:

1. Maximal height is 4.16m (13.6 feet); with some reasonable tolerance 4.5m (14.5 feet)
2. Gap between lower point of the mirror to the ground is 0.5 m (1.64 ft)
3. Maximal width is 5.23 m (17.16 ft)

Materials:

1. Steel parts are mainly zinc galvanized (hot dip galvanization).
2. The azimuth drive is coated.
3. The coating on the back of the heliostat mirrors is a standard white, semi-matte paint.

BACKGROUND

To facilitate preparation of the Staff Assessment, and to conduct its analysis, staff requires high-resolution image files of photographs in the AFC visual analysis.

DATA REQUEST

153. Please provide high-resolution image files of individual photos in the AFC Visual Resources Section, including simulations and character photos, in jpg or tif format. Please do not provide 'paired' before and after page layouts, but rather the individual photo image files at a resolution suitable for printing in ledger-size format.

Response: Attachment DR153-1 contains photo files for each of the existing condition photos and simulations for the views from six Key Observation Points included in the AFC's Visual Resources section. In addition, a courtesy, the files for the existing and simulated views from KOP 7, which was previously submitted in response to Data Request 32, are included. Because these are "raw" files, there are not figure numbers or borders. Five electronic copies of Attachment DR153-1 containing high-resolution "jpg" files will be provided to the CEC.

BACKGROUND

The content of the optical path from the heliostats to the solar collector is assumed to be air and generally free of aerosols, particulates and other airborne obscurants. However, under various meteorological conditions, airborne dust and particulates can be of sufficient density and reflectivity to produce a substantial scattering field and a pronounced "haloing" effect.

Such “haloing” can be relatively bright and visually prominent producing a “Tee Pee” shaped dome over the entire solar field. This effect can produce an extremely large and prominent visual stimulus.

DATA REQUEST

154. Please address the expected frequency and deleterious visual impact of visual scattering effects for visual resources, visual disruption, distraction and glare.

Response: An observer will see the so-called “tee pee effect” (similar to that seen on some cloudy days, of sun rays descending through a hole between clouds—more commonly referred to as the Tyndall effect) at either high relative humidity (RH), e.g., above 40 percent, or during hazy (i.e., dusty) conditions.

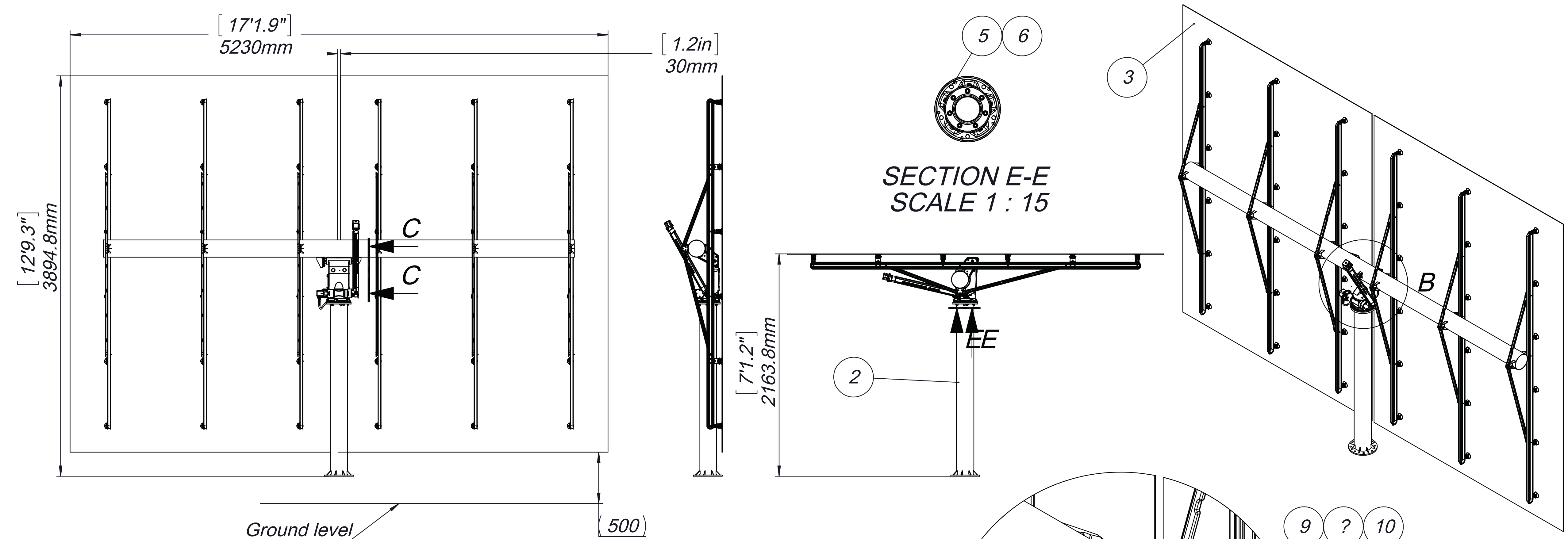
What is perceived as converging/diverging light rays is caused by scattering of the sun's light. It occurs when the size of the suspended particulates (generally between 40 and 900 nanometers) is somewhat less than or near the wavelength of the visible light (400 to 750 nanometers).

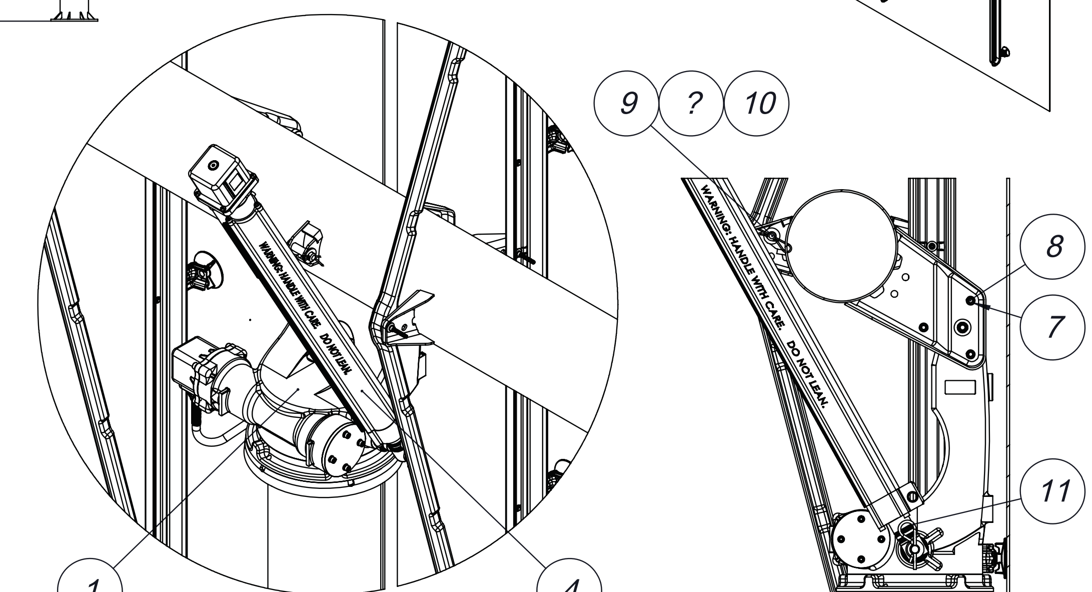
The RH definitely affects the size of the water particulates, which enlarge at higher RH. Higher values of RH are normally expected during the cool hours of the day (and more in the early morning than late afternoon). In addition, the tee pee effect may be more pronounced when the sun is low over the horizon. When the scattering angles are relatively small (in relation to the observer), more attenuation by scattering is likely.

DATA REQUEST

155. Please add the visual effect of the airborne dust and particulates to the simulation provided in KOP-3.

Response: Figure DR155-1 is a simulation of the view from KOP 3 as it would appear under the dust/humidity conditions that permit the creation of the Tyndall effect, as described in the response to DR 154 above.





DETAIL B

SECTION C-C

NO.	Part Number	Description	Vertical Heliostat/QTY.	Notes
12	09-00070S09	FLAT WASHER M12; DIN 125A; BN 715	1	
11	09-02560S02	R-Pin - Spring Cotter 4mm wire diameter DIN 11024; FABORY No. 030.001	1	
10	09-02560S01	R-Pin - Spring Cotter 2mm wire diameter DIN 11024; FABORY No. 030.001	1	
9	08-23587A01	Clevis-pin-M12x45 - F9	1	
8	09-02230S02	1/4" [6.4mm] AVDELOK FASTENER - Pin	6	
7	09-02240S02	1/4" [6.4mm] AVDELOK FASTENER - Collar	6	
6	09-00310S02	Hex cap bolt M8x25 ISO4017/DIN933/BN56	5	
5	09-00900S02	NORD LOCK washer metric NL8	5	
4	01-23101A01	ELEVATION DRIVE	1	
3	01-23129A01	Heliostat Reflector Assy	1	
2	05-23417A01	Test site Pylon	1	
1	01-23260A01	AD Main assembly	1	

TOLERANCES

0..120 = ±0.1

Angles = ±0.5°

Between Holes = ±0.1

Holes <Φ 8 = +0.2 -0.05

Drawing REV 00C

NAME

CHECK-IN: SElany

CHECK-IN Date: 8/21/2011

DESIGN: SElany

APPROVED: S.Huss

QA: A.Keiser

Reviewer:

DESIGN STATUS: In Design

MATERIAL: See BOM

TREATMENT

FINISH

WEIGHT 339.48

DIMENSIONS ARE INmm

BrightSource
Har Hotzvim, Kiryat Mada # 11
Amot Bldg # 6
Jerusalem 91450, ISRAEL
Tel: 972-(0)77-202-5000
Fax: 972-(0) 2-571-1059

TITLE: LH2.3 Mock-up Top Assy

SIZE: A3

DOCUMENT NO. 01-22951A01

REV 00Q

SCALE: 1:10

SHEET: 1 of 1

FIGURE DR152-1
Heliostat Drawing
Hidden Hills Solar Electric Generating System

FIGURE DR155-1
Visual Effect of Dust/Particulates on KOP 3 Simulation
Hidden Hills Solar Electric Generating System

CH2MHILL

IS061411043744SAC Figure_DR155-1.ai tdaus 03.01.2012

Attachment DR153-1
KOP Photo Files

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION FOR THE *HIDDEN HILLS SOLAR ELECTRIC GENERATING SYSTEM*

DOCKET NO. 11-AFC-2

PROOF OF SERVICE
(Revised 2/1/2012)

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DECLARATION OF SERVICE

I, Mary Finn, declare that on March 5, 2012, I served and filed copies of the attached Hidden Hills SEGS Data Response , Set 2C dated March 5, 2012. This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: [www.energy.ca.gov/sitingcases/hiddenhills/index.html].

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 or Chief Counsel, as appropriate, in the following manner:

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For service to all other parties:

x Served electronically to all e-mail addresses on the Proof of Service list;

Served by delivering on this date, either personally, or for mailing with the U.S. Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses NOT marked "e-mail preferred."

AND

For filing with the Docket Unit at the Energy Commission:

x by sending an electronic copy to the e-mail address below (preferred method); *OR*

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CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
Attn: Docket No. 11-AFC-2
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
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OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:

Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

California Energy Commission
Michael J. Levy, Chief Counsel
1516 Ninth Street MS-14
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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Mary Finn
CH2M Hill