TETRA TECH

MEMO

To:	Kahana Solar LLC c/o Julia Mancinelli, Director - Environment, Innergex Renewable Energy, Inc. (Innergex)
Cc:	Jamie Horner, Senior Director – Storage and Innovation, Innergex
From:	Dr. Bob Pearson, Senior Project Manager, Tetra Tech
Date:	May 14, 2021
Subject:	Heat Island Effect in Context to the Proposed Kahana Solar Project, Maui County, Hawaiʻi

Kahana Solar LLC (Kahana Solar) proposes to construct and operate the Kahana Solar Project (Project) on privately owned land near Napili-Honokōwai, on the island of Maui, Hawaiʻi. The Project will consist of a 20-megawatt (MW_{AC}[1]) solar photovoltaic system coupled with an 80-megawatt-hour battery energy storage system as well as ancillary support infrastructure. The Project will primarily be located on tax map key (TMK) 4-3-001:017, owned by Maui Land & Pineapple Company, approximately 1.2-miles mauka of the Kapalua Airport (Figure 1).

Photovoltaics (PV) is the conversion of sunlight into electricity. The sun's rays transmit light energy, in the form of photons, which can be converted to electricity using certain materials that naturally release electrons when exposed to light. These materials are contained within the PV solar panels. Kahana Solar plans to install conventional crystalline-silicone solar panels at the Project, which have the capability to convert approximately 20 percent of the incoming sunlight to electricity. Another roughly 10 percent of the sunlight will be reflected from the transparent covers on the photovoltaic solar panels.[2] The remaining approximately 70 percent of the solar energy will be absorbed by the panels and converted to heat. The PV solar panels will be installed on a racking system which will rotate the panels to keep them looking directly at the sun as it moves across the sky from east to west during the day.

As the Project is located within the Maui County Agricultural District and is a solar energy facility greater than 15 acres, it is considered a special use per Maui County Code (MCC) §19.30A.060(A)(12). Therefore, Kahana Solar is seeking a County Special Use Permit (CUP), as provided in MCC §19.510.070, to construct and operate the proposed Project. The Project also requires a State Special Permit (SUP) as provided in Hawaiʻi Revised Statutes (HRS) Chapter 205. Early in the Project's community outreach process, Kahana Solar received comments from a few community stakeholders expressing concern that heat produced by the Project's solar panels may warm the surrounding area, thereby potentially

[1] A 20-MW_{AC} project means the Project has a generation capacity of up to 20 megawatts of alternating current (AC) electricity at one moment in time.

[2] It is possible this reflected light could produce glare at specific receptor locations at certain times of the day and year under certain atmospheric conditions. Kahana Solar has conducted a glare analysis to identify these areas. Using this information, Kahana Solar will site the panels to minimize glare impacts.

affecting native plant and bird species. The purpose of this memorandum is to discuss the Project's potential to cause a "heat island" effect that warms the surrounding area and if so, to what extent the area would be warmed and impact native flora and fauna and/or nearby residential areas. A detailed description of the Project and Project Area are provided below (Section 1) followed by a definition of heat island effect and a discussion of recent studies on heat island effect from solar facilities (Section 2), a discussion of meteorological conditions in the Napili-Honokōwai area (Section 3), and a discussion on whether the Project's potential for creating a heat island effect may impact native flora and fauna and/or nearby residential areas (Section 4).

1.0 Description of the Project and Project Area

Project Description

The Project's solar PV system and associated infrastructure will be sited within a 380-acre Project Area (Figure 2)[3]. The Project Area is located on and surrounded by mostly vacant, fallow agricultural land, previously used for commercial pineapple and sugar cane cultivation. Pineapple operations ceased in 2009, and the land is currently undeveloped (Munekiyo Hiraga 2019; Pacific Legacy 2021). The former agricultural fields in the Project Area are separated into four areas by the gulches that run east-west alongside and in between the Project Area boundaries. More information on the gulches is provided below in the *Project Area Description*. The solar PV system will consist of a series of photovoltaic panels mounted on a solar tracker racking system, as well as related electrical equipment. The panels will be arranged in north-south oriented rows within four solar array areas, each surrounded by security fencing set back a minimum of 100 feet from the top of the gulches. Each solar array area is labeled on Figure 2 as follows (south to north): Area 1, Area 2, Area 3, Area 4. The total area within the four fenced areas is 220 acres. For purposes of evaluating impacts and demonstrating compliance with the applicable county and state review criteria, Tetra Tech has analyzed a proposed Project layout, as shown in Figure 2. However, the final design is anticipated to have a smaller footprint. Kahana Solar anticipates that the maximum total acreage covered with solar panels in the final design will include approximately 65 acres. Therefore, for purposes of evaluating the potential for heat island effect, Kahana Solar assumes the Project solar panels will cover a maximum of 65 acres, will be located within the four solar array areas identified in Figure 2, and will be sited no closer than 100 feet from the top of the gulches. The closest residential areas include the Ala Hoku Place neighborhood and Kahana Ridge neighborhood,

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[3] The Project Study Area used for resource surveys (i.e. archaeological, biological, waters, etc.) encompasses approximately 412 acres. The Project Study Area includes the 380-acre Project Area referred to in this memorandum plus an additional 32 acres associated with the Project's main access road which will follow an existing agricultural road extending from the intersection of Honoapiʻilani Highway and Akahele Street, south of the Kapalua Airport, then mauka to the Project Area. This memorandum focuses on the portion of the Project where solar panels will be sited and therefore refers to the 380-acre Project Area.

located approximately 1.4 miles makai of the Project Area and the Kaʻanapali Coffee Farms agricultural community, located approximately 1 mile southwest of the Project Area.

The PV solar panels will be installed on single-axis tracker racking systems and will rotate their orientation throughout the day to track the sun, facing east in the morning, facing straight up at solar noon, and facing west in the afternoon. The spacing between the solar trackers will be approximately 21 feet and the entire area below and around the solar panels will be revegetated after construction to reduce dust and sediment and erosion issues.

Project Area Description

The climate in the Project Area ranges from arid and very dry near the western edges to seasonally mesic in the upper elevations (Price et al. 2012). According to the Online Rainfall Atlas of Hawaiʻi (Giambelluca et al. 2013), the Kapalua Airport receives a mean annual rainfall of approximately 29.3 inches and the upper elevations of the Project Area receives 72.1 inches. Rainfall is typically highest in December/January and lowest in June through September (Giambelluca et al. 2013).

In general, the Project Area's terrain slopes northwest toward the Pacific Ocean and is bisected by several gulches. The elevation of the Project Area ranges from approximately 700 feet above mean sea level (amsl) in the western portion to approximately 1,350 feet amsl near the eastern boundary. The fallow agricultural fields where the solar arrays will be sited have an average slope of 10%. The slopes within the four gulches in the study area are over 15% and, in some places, reach close to 50% slope.

The gulches that run east-west through the study area separate the agricultural fields into four areas. Kahana Stream flows north of the Project Area, Pulepule Gulch flows between Areas 3 and 4, Kahanaiki Gulch flows between Areas 2 and 3, an unnamed gulch flows between Areas 1 and 2, and Māhinahina Gulch flows to the south of Area 1 (Figure 2). None of these gulches are associated with perennial streams and are likely ephemeral under the Navigable Waters Protection Rule (NWPR) because they only have surface flow in direct response to rainfall. Additional details can be found in the Project's Waters of the U.S. determination and delineation report (Tetra Tech, 2021a). The solar panels will be setback from the top of the gulches by a minimum of 100 feet.

A general biological survey was conducted by Tetra Tech and LeGrande Biological Surveys Inc. on June 16-20, 2020 and July 2-3, 2020. Biologists conducted a pedestrian survey and recorded all plant species, dominant vegetation types, and any listed or rare plant species within the Project Area. During the survey, biologists examined areas more likely to support native plants (e.g., rocky outcrops, gulches, and shady areas) more intensely. The biologists also documented all bird species seen or heard while walking or driving within the study area and conducted 2-minute point count surveys to document listed waterbirds that could occur within or near the study area. Habitat of listed animals, if observed, was also documented. Additional details regarding survey methodology can be found in the Project's Biological Resources Survey Report (Tetra Tech 2021b).

The biological surveys found no listed plant species in the study area and found low concentrations of native plants, located mostly in the gulches and along the upper elevations of the Project Area. The fallow, overgrown pineapple fields are dominated by non-native plant species. Biological surveys documented 141 plant species within the study area: 18 of the observed plant species are native to the Hawaiian Islands and the remaining 123 plant species are non-native to the Hawaiian Islands. Nineteen bird species were recorded within the study area, most of which are non-native to the Hawaiian Islands, and are species commonly found in rural or agricultural areas. Three native (endemic) birds were detected in the study area: the ʻapapane (*Himatione sanguinea*), Hawaiʻi ʻamakihi (*Chlorodrepanis virens*), and aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*). Hawaiʻi ʻamakihi and ʻapapane were heard along the forested edges of Kahanaiki Gulch and Māhinahina Stream on the eastern edge of the study area. Additionally, the threatened Hawaiian goose or nēnē (*Branta sandwichensis*) was recorded in the immediate vicinity of the study area. Additional details regarding survey results can be found in the Project's Biological Resources Survey Report (Tetra Tech 2021b).

Surrounding Land Uses

Immediately surrounding the Project Area is mostly vacant fallow agricultural land to the north and south and west. There are six existing reservoirs located within 0.3 miles (or less of the Project Area, and one reservoir located within the Project Area, but outside the development footprint. West of the Project Area is the Kapalua Airport. East of the Project Area are mostly vacant forested lands including the Puʻu Kukui Watershed Preserve located approximately 0.75 miles mauka of the Project Area and a portion of the West Maui Forest Reserve approximately 650 feet southeast of the Project Area.

South of the Project Area is the Maui County Department of Water Supply Māhinahina Water Treatment facility, located on land owned by the Department of Hawaiian Homelands (DHHL). DHHL also owns land makai of the DWS Water Treatment facility down to Honoapiʻilani Road where DHHL is proposing to develop the Honokōwai Homestead Community, an agricultural/residential community on approximately 800 acres of land. There is no set timeline when this development will be constructed. The closest area of the DHHL parcel envisioned for future housing is approximately 1,300 feet from the closest Project fence line. The closest existing residential area to the Project is the Kaʻanapali Coffee Farms agricultural community, located approximately 1 mile southwest of the Project Area. There is also the Kahana Ridge neighborhood and houses off Ala Hoku Place, located approximately 1.4 miles makai of the Project Area. The area between Honoapiʻilani Highway and Kapalua Airport is currently vacant land; however, the Pulelehua residential community is proposed in this area. The Napili-Honokōwai resort area is located 1.6 miles west of the Project Area.

2.0 Definition of Heat Island Effect

The term "heat island" is typically associated with areas that have higher average temperatures compared to surrounding areas due to greater absorption and retention of heat from hard surfaces such as buildings and pavement. The University Corporation for Atmospheric Research (UCAR), based in Boulder, Colorado describes heat islands forming "as vegetation is replaced by asphalt and concrete for roads, buildings, and other structures necessary to accommodate growing populations (UCAR 2011)." By this definition the urbanized area of Napili-Honokōwai, including the Kapalua Airport, forms a heat island effect along the northwest coastline of Maui compared to the vegetated hillsides mauka of the urbanized coastal areas. All urbanized areas form a heat island due to the replacement of natural vegetation with asphalt and concrete for roads, buildings, and other structures.

Very little empirical research has been conducted to investigate the potential for utility scale PV arrays to impact air temperature in surrounding areas or to have a “heat island” effect. PV solar arrays would not have the same mechanisms for heat island effect as urban areas. PV panels are thin and have low heat capacity and high thermal conductivity compared to hardscaped area (e.g. pavement, etc.) or bare soils. The temperature of PV panels changes more rapidly, and the panels cool quickly once the sun goes down. In contrast, urban heat islands release heat through much of the night. However, other characteristics of PV arrays and PV array site conditions complicate the hypothesis and testing of PV array caused heat island effect. These characteristics and conditions include, but are not limited to:

1) PV panels emit thermal radiation[4] above and below the panels.
2) PV arrays shade a portion of the ground and therefore could reduce heat absorption in surface soils (Barron-Gafford et al. 2016).
3) Electricity conversion in PV panels contributes to effective albedo[5] higher than panel surface albedo (Xhang and Xu 2020).
4) The surface conditions below and near the panel arrays including the extent of vegetation growth below and around the arrays.

Currently, there is no consistent conclusion for whether utility scale PV arrays may have cooling or warming effects. Some studies have shown air temperatures to be warmer above panels than above nearby non-PV sites, both during the day and at night (Barron-Gafford et al. 2016). While other studies have shown PV facilities to have a cooling effect on the average surface temperatures during the day and night (Xhang and Xu 2020). Studies can be seen as contradictory because they are so site and project specific.

Overall, the effects of PV arrays on surface climate are likely to vary across different climates, regions, and individual PV array characteristics (Broadbent et al. 2019). For instance, in areas where the color of the native soil is a light color, the surface albedo is high. The black color and low albedo of the solar panels will cause the solar panels to absorb more sunlight than the lighter color native soil and result in warmer temperatures over the panels compared to over the soil. Alternately if the native soil is relatively dark and has similar albedo value as the solar panels, then the panels will be somewhat cooler than the soil since the solar panels absorb and convert 15 to 20% of the sunlight energy as electricity

[4] Thermal radiation is emitted by the agitation associated with the temperature of matter and is commonly called “heat”.

[5] Albedo is a measure of how much light that hits a surface is reflected without being absorbed. High albedo has high light reflectance (e.g. white surfaces such as snow) and low albedo has low light reflectance and absorbs most of the light that hits it (e.g. black surfaces such as asphalt roads). “Effective albedo” is surface albedo plus electricity conversion.

leaving less energy to be converted to heat. In this case, the solar panels will have a cooler temperature over them compared to the surrounding soil.

The Barron-Gafford et al. (2016) study, conducted in Tucson, Arizona, an area with light colored desert soils, observed higher air temperatures within the tested PV solar farm compared to the temperatures in the nearby natural setting. However, the difference in temperature during the day was much less significant than the effects observed at night. The study also found that the land beneath the solar panels was heated by the panels during the day and retained heat and stayed warmer (+3 to 4 degrees Celsius) than the natural (non-PV) desert at night, especially during the spring and summer months. The findings from this study are specific to a solar facility constructed in the Tucson desert, where the ground under and adjacent to the solar panels is flat, devoid of vegetation, consisted of a light-colored soil, and nowhere near a major surface waterbody such as the Pacific Ocean. The Tucson solar site differs from the proposed Project site in several ways resulting in entirely different microclimates:

- First, the entire Project Area will not be mass graded and will have vegetation within the solar array blocks and outside the location of other Project infrastructure. Therefore, much of the natural heat gain and storage characteristics of the darker colored ground within the Project Area will be preserved, which would be similar to the natural conditions outside of the Project Area.
- Second, the Kahana Solar Project is located on the northwest sloped side of the West Maui mountains near the Pacific Ocean, and subject to natural offshore and onshore winds (see Section 3 for more details regarding the local meteorological patterns). The Tucson solar site is flat and located in a broad desert valley with no slope or surface waterbodies nearby. Therefore, the flat Tucson desert has no terrain induced upslope and downslope wind patterns to move warmed air away from the project site as happens in Napili-Honokōwai. The Project solar array area will comprise a relatively small area (less than 0.3%) of the northwest facing slope of the West Maui Mountain range. Even if the solar panels warm the underlying soil to a temperature higher than the natural ground (i.e., ground with no panels) during the day, and the assumed warmer soils release the heat during and after sunset, any warm air released by the soils below the panels would be cooled by the naturally occurring offshore winds. The volume of cool air flowing towards the ocean from the northwest facing slopes of the West Maui Mountains will overwhelm any solar panel-caused heat released in the evening as the ground cools.

Although not discussed in the Barron-Gafford et al. (2016) paper, Barron-Gafford (2018) provided additional results regarding the radius of the measured heat effect in the 2016 study in his Statement of Evidence (SoE) to the Victorian Planning Panel regarding a proposed solar project in Lemnos, Victoria, Australia. In the SoE, Barron-Gafford testified that the observed PV heat island effect was indistinguishable from air temperature over native vegetation when measured at a distance of 30 meters (98.5 feet) from the edge of the PV array. Furthermore, he states that “this pattern held true for both daytime and night-time conditions. Because the PV panels themselves trap the energy from diffuse sunlight that was able to reach the ground underneath them, air temperatures remain elevated within a

PV array. As you leave this "overstory" of PV panels, energy is able to radiate back towards the atmosphere, as it does in a natural setting, and the [PV Heat Island] quickly dissipates" (Barron-Gafford 2018). In other words, the heat island effect observed and reported in the Baron-Gafford et al. (2016) paper is localized to the immediate solar facility itself and will dissipate within 100 feet.

Barron-Gafford (2018) concludes in his SoE that PV related heat island effect is "largely driven by the absence of vegetation and the vegetation's potential to cool the atmosphere through transpirational water loss." He goes on to conclude the following:

> "Bolstering the presence of vegetation through co-location…or having landscaping around the solar farm will mitigate the PVHI effect. My own research on adding grasses back into a solar farm showed the impacts of grasses on reducing the PVHI effect within a solar array. To date, no study has published research on these patterns at such large scales, but I have no reason to believe that there will be a different outcome when extrapolated in scale" (Barron-Gafford 2018).

The Project proposes to revegetate below the solar arrays after construction is completed, thereby cooling the air above ground and below the panels thought traspirational water loss (Baron-Gafford 2018). Although the phenomena observed in the Baron-Gafford et al. paper is not applicable to the Project, as the local microclimate, soil substrate, and vegetation cover is different, if we were to assume the heat island effect reported in the Baron-Gafford et al. paper is applicable to the Project Area, we would also assume the heat island effect would dissipate within 100 feet. Since the Project solar arrays will be sited 100 feet from the top of the gulches and more than 300 feet from the nearest forest reserve to the east of the Project, any effect of a heat island from the solar arrays will dissipate well away from concentrations of native flora. Similarly, since the Project solar arrays will be sited over 1 mile away from the closest residential neighborhood, any effect of a heat island from the solar farm will dissipate well away from the homes in the Ka'anapali Coffee Farms agricultural community, along Ala Hoku Place, and within the Kahana Ridge neighborhood.

3.0 Meteorological Patterns in the Napili-Honokōwai Area

The meteorological patterns in the Napili-Honokōwai Area are subject to the formation of sea breezes due to the proximity of the Pacific Ocean and its ability to absorb and store energy from the sun (NWS 2018). When the sun is shining, the Project Area and the surrounding hillside will heat up and warm the air above, decreasing the air's density and creating a weak low-pressure area called a thermal low (see Figure 3, label #1). As the air above the ground will be warmer than the surrounding air, a chimney effect will occur (see Figure 3, label #3), and the warm air near the ground will rise into the atmosphere until it cools enough to reach the temperature of the surrounding ambient air (NWS 2018). By cooling, the density of the air increases again forming a small area of high pressure (see Figure 3, label #4). This typically occurs from 3,000 to 5,000 feet in elevation; at this level, the air pressure and density, being greater than the air at the same elevation over the water, causes the air to flow back over the water (see Figure 3, label #5). Once over water again, the air cools, increases in density and sinks toward the ocean surface (see Figure 3, label #6). This enhances high pressure near the ocean's surface (see Figure 3 label #7) and the cooler air over the ocean (to the west of the Napili-Honokōwai area) will replace the warm air that rises from the land surface during the day and the cooler ocean air will flow onshore toward the Project (see Figure 3, label #2) and the surrounding hillside (NWS 2018).

This chimney effect over the warmer land surface occurs naturally in the existing conditions of the Project Area. This situation is typical during the day in ocean beach environments, where cooler ocean air blows onshore from the water to replace the rising air over the warmer land surface (NWS 2018). The same meteorological patterns and chimney effect would apply with the construction and operation of the Project as the panels will heat during the day, similar to the surrounding ground, and will create the thermal low that causes the warm air to rise and the cool ocean breezes to blow mauka to replace the displaced heated air.

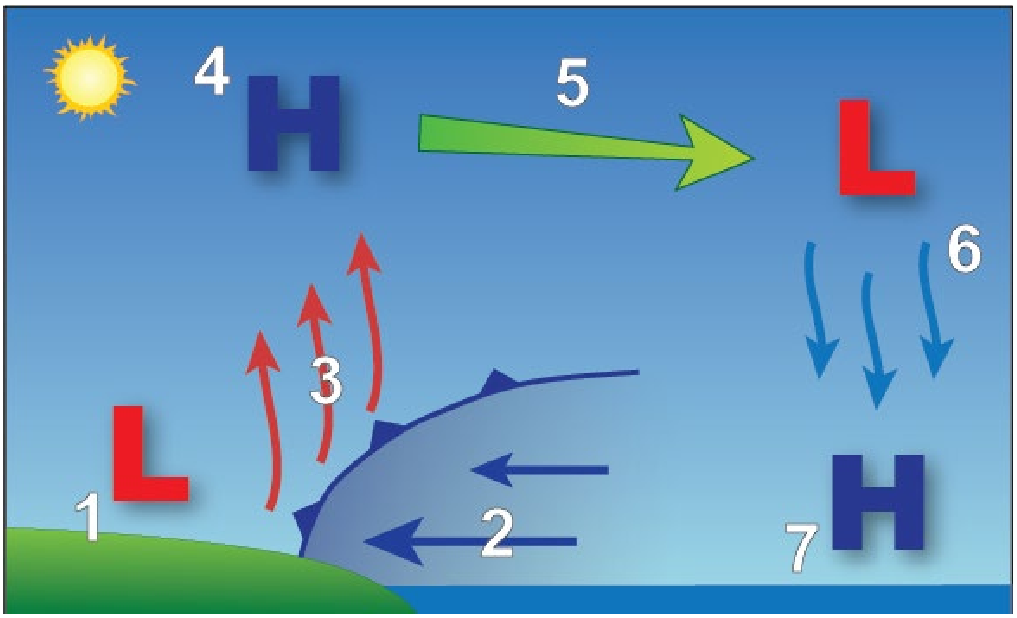

Figure 3. Daytime Air Movement in a Coastal Region (NWS 2018)

In the evening, a similar but opposite effect can result in the formation of land breezes. During and after sundown, the soil surface will cool to the temperature of the surrounding air. The air over the land surface will cool and will become denser forming a small area of high pressure (Figure 4, label #1). When the land surface is cooler than the ocean water surface, the cool, dense air will flow makai to the beach and out over the water (Figure 4, label #2). The ocean water will create a chimney effect as the ocean water will warm the air near the water surface, thus decreasing the air's density, and cause the warmed air to rise into the cooler air above (Figure 4, label #3). The rising air forms a weak low-pressure area above the ocean surface (Figure 4, label #4) and a higher pressure area where the warmed air accumulates (Figure 4, label #5), typically occurring from 3,000 to 5,000 feet in elevation. At this elevation the air pressure and density, being greater than the air at the same elevation over the land, causes the air to flow back toward land from high pressure to low pressure (Figure 4, label #6). Once back over land, the air cools, increases in density and then sinks causing an increase in density and high pressure above ground (Figure 4, labels #7 and #1). Gravity pulls the dense air offshore again completing the circulation. This makai offshore flowing wind during the night is a natural occurrence on beaches around the world.

The same meteorological patterns and chimney effect would apply with the construction and operation of the Project as the panels will cool after sundown, similar to the surrounding ground, and likely more quickly as the panels are relatively thin. This cooling will create the thermal high that causes the cool air to flow offshore at night.

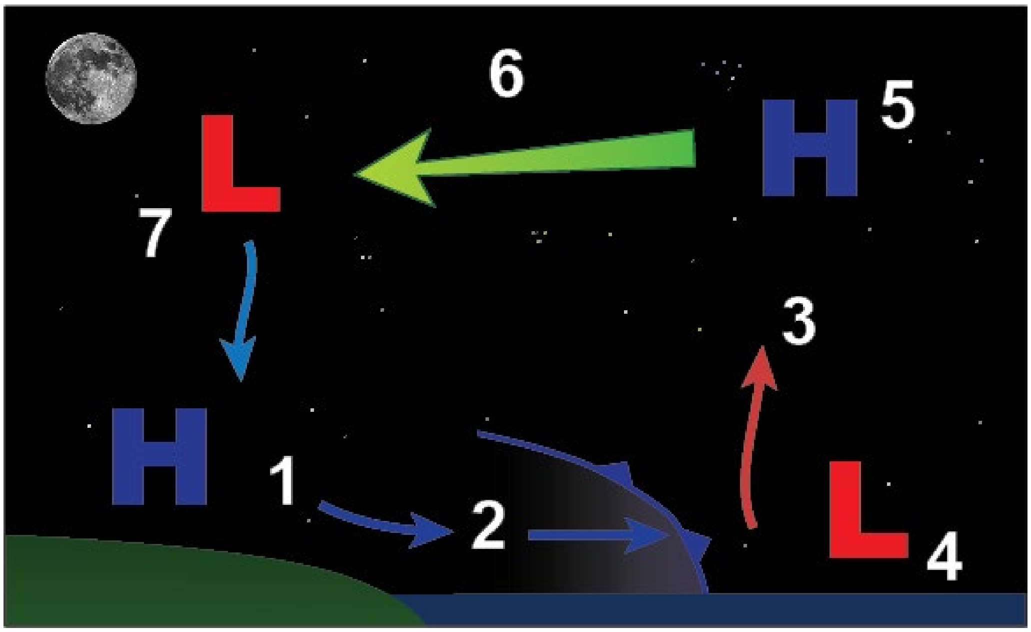

Figure 4. Nighttime Air Movement in a Coastal Region (NWS 2018)

During the day the ground beneath the solar panels will be shaded keeping the soil surface cooler than if the sun was shining directly on the soil. The cool onshore winds from the Pacific Ocean during the day and the cool makai downslope winds from the West Maui Mountains at night will keep the soil surface beneath the panels about the same temperature as the ambient air.

It is possible that the daytime heating of the Project panels could slightly warm the soil beneath the panels by reradiating the heat from the panels to the soil surface below. However, this radiative heating effect will be small, particularly in the morning and afternoon when the panels will be tilted at an angle to face the sun, and will be offset by the cooling effect of the daytime upslope and nighttime downslope winds. The area beneath the panels will be relatively small (65 acres or less) and the Project is situated on the northwest-facing slope of the West Maui Mountains, which climb to an elevation of over 5,700 feet and encompasses approximately 31 square miles in area. Due to the Project's solar array area being a fraction (less than 0.3%) of the area of the northwest slope of the West Maui Mountains, the nighttime makai downslope winds that naturally occur in this area (see Figure 4, labels #1 and #2) would mix with and cool any remnant warm air beneath the solar panels.

Thus, even if there was a small heat island effect at the area immediately surrounding the solar panels, the upslope and downslope winds that naturally occur on the northwestern side of west Maui (off the northwest-facing slopes of the West Maui Mountains) would overwhelm any small heat island associated with the solar panels. This would result in cool air crossing the Ala Hoku Place and Kahana Ridge neighborhood both in the daytime and in the evening, as it does now and would result in cool air crossing the hillsides surrounding the Project Area and the forests located mauka of the Project Area both in the daytime and in evening, as it does now. The area of the Project's solar panels is simply too small in relation to the area of the northwestern slope of the West Maui Mountains to have a significant impact on the natural mauka upslope and makai downslope air movement in the Napili-Honokōwai area and nearby forest reserves.

4.0 Conclusion

Currently, there is no consistent conclusion for whether utility scale PV arrays may have cooling or warming effects to the surrounding areas. Although the Baron-Gafford et al. (2016) study concluded that heat island effect was observed at an Arizona desert PV facility, Baron-Gafford (2018) anticipates that this heat effect would dissipate within 100 feet. Although we do not anticipate the results from the Baron-Gafford et al. (2016) study to be applicable to the Project due to differences in microclimate and soil substrate, the dissipation of heat island effect within 100 feet would limit any potential temperature impacts to the Project Area, which is dominated by non-native plant species.

Furthermore, construction and operation of the Project will not significantly change the natural diurnal flow of air back and forth across the Project Area. Even if the solar panels slightly warm the underlying soil beneath the solar panels more than the natural ground during the day, this radiative heating effect will be small and will be offset by the cooling effect of the daytime mauka upslope and nighttime makai downslope winds, which would overwhelm any small heat island beneath the solar panels. This would result in cool air crossing the Ala Hoku Place and Kahana Ridge neighborhood, the hillsides surrounding the Project Area and the forests located mauka of the Project Area both in the daytime and in evening, as it does now. The area of the Project is simply too small (less than 0.3%) in relation to the area of the northwestern slope of the West Maui mountains and too far away to have a significant impact on the natural upslope and downslope air movement in the Napili-Honokōwai area. Therefore, the Project will not create a significant heat island effect that would impact the existing microclimate of the surrounding area.

Native waterbird species are known to occur at the reservoirs near the Project Area. Therefore, native waterbirds may fly over the solar facility and may even stop to forage within the solar facility. However, as the Project is not anticipated to impact the existing microclimate, no native birds are anticipated to be harmed by potential heating effects.

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