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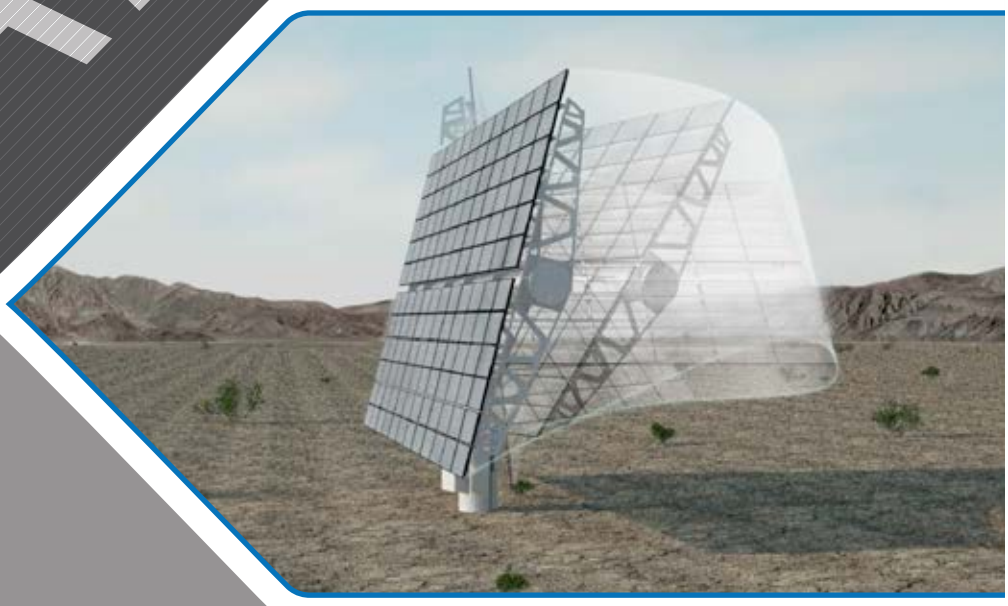

SOITEC SOLAR DEVELOPMENT

BOULEVARD GLARE STUDY

August 23, 2013 | Prepared by POWER Engineers for Soitec Solar Development

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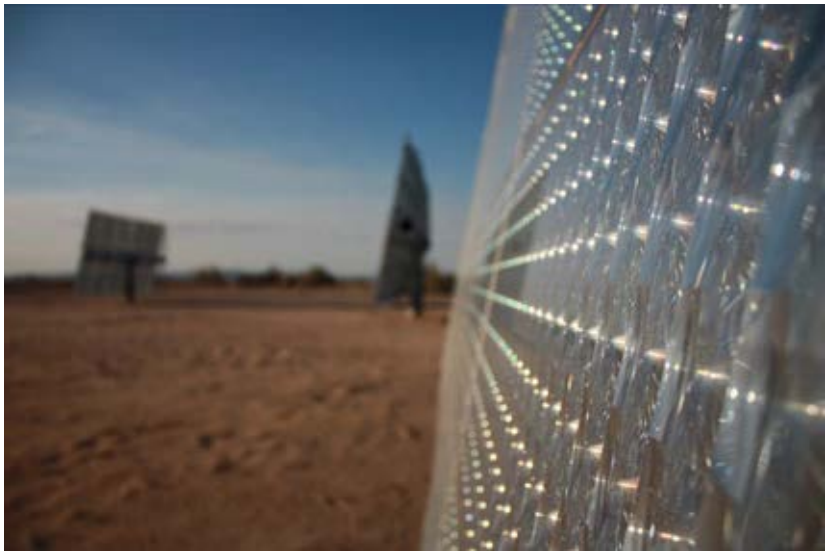
SOITEC SOLAR DEVELOPMENT LLC

Boulevard Project Solar Glare Study: San Diego County, CA



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Boulevard Project Solar Glare Study

PREPARED FOR: *SOITEC SOLAR DEVELOPMENT LLC*
PREPARED BY: *POWER ENGINEERS, INC.*

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ACRONYMS AND ABBREVIATIONS

3D	Three-dimensional
CAD	Computer-aided design
CPV	Concentrating Photovoltaic
KOP	Key Observation Point
NOAA	National Oceanic and Atmospheric Administration
POWER	POWER Engineers, Inc.
Project	Boulevard Project
PV	Photovoltaic
Soitec	Soitec Solar Development LLC

1.0 INTRODUCTION

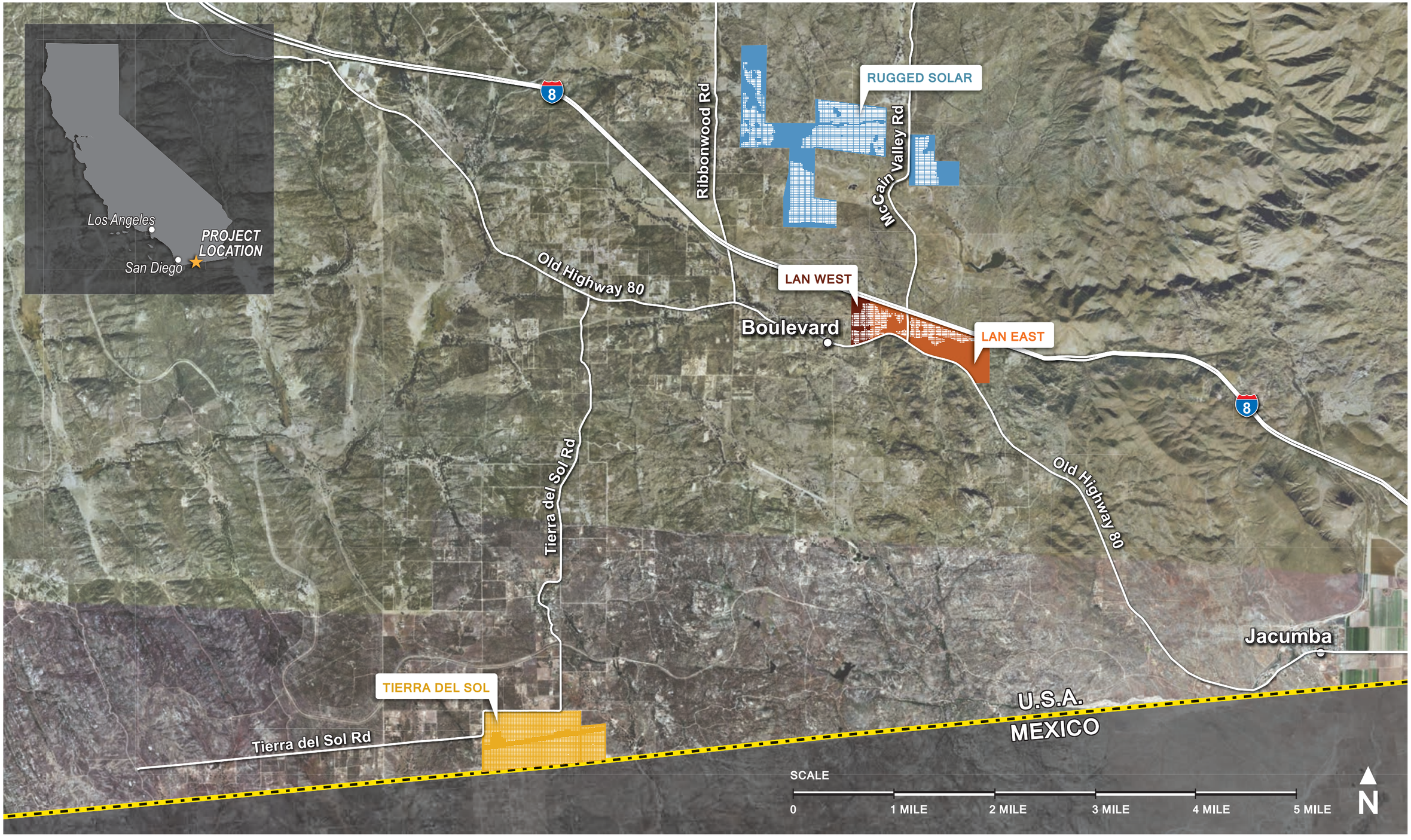
POWER Engineers, Inc. (POWER) has prepared the Boulevard Project Glare Study for Soitec Solar Development LLC (Soitec) on behalf of the following applicants: Tierra del Sol Solar LLC, Rugged Solar LLC, LanWest Solar LLC, LanEast Solar LLC, and Soitec Solar Development LLC. The applicants propose to develop, finance, construct, and operate five renewable energy solar projects collectively referred to as the Boulevard Project (Project). The Project site is located in southeastern San Diego County in the Mountain Empire Subregional Plan Area and the Boulevard Subregional Group Area (see Figure 1). The Glare Study was required by San Diego County as a condition of approval. Specifically, this study:

- Identifies the Key Observation Points (KOPs) within one mile of the Project site that may potentially experience glare;
- Characterizes typical glare behavior resulting from the construction and operation of Concentrating Photovoltaic (CPV) technology; and
- Evaluates where, when, and how long glare may be visible to KOPs.

Table 1 lists each solar farm with the corresponding acreage, approximate number of associated CPV trackers, and estimated electrical generation capacity.

Table 1 Project Overview

PROPOSED SOLAR SITE	ACRES	APPROXIMATE NUMBER OF CPV TRACKERS	ESTIMATED ELECTRICAL GENERATION CAPACITY (MEGAWATTS)
Tierra Del Sol	420	2,538	60.0
Rugged	794	3,588	80.0
Lan East	233	900	22.0
Lan West	55	264	6.5
TOTAL	**1,502**	**7,290**	**168.5**



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GLARE BEHAVIORAL ANALYSIS

Figure 1 - Project Location Map

2.0 DEFINITIONS AND DESCRIPTIONS

The following definitions and descriptions are important for understanding the methodology and results of the study:

Concentrating Photovoltaic (CPV) Module: CPV Modules are designed to absorb solar energy to produce electricity. Unlike a standard photovoltaic module, CPV modules use a Fresnel lens to concentrate large amounts of sunlight onto a solar collector or solar cell in order to produce electricity.

Through the use of Fresnel lenses, CPV modules have achieved a concentrated sunlight equal to 500 suns. The sunlight is focused onto small, highly efficient multi-junction solar cells and converted to electricity (see Figures 2 and 3). CPV modules are mounted to a two-axis solar tracker to track the sun and remain in focus with the sun throughout the day.

Two-Axis Solar Tracker: A two-axis solar tracker uses solar algorithms to track the sun throughout the day. The two-axis rotations enable the CPV modules to maintain a perpendicular relationship to the sun's rays (see Figure 4). Concentrated sunlight will remain focused on the solar cells with a high degree of precision throughout the day, maximizing power output.

Glare: A continuous source of brightness. For purposes of this study, glare is caused by the sun's reflection. Glare is common in both the man-made and natural environments. All materials have varying degrees of reflective properties. Glass, metal, high-gloss paint, and water all have reflective properties similar to photovoltaic (PV) panel glass (see Figure 5).

3D Geometric Analysis: A computer simulation incorporating a three-dimensional (3D) terrain model, 3D solar equipment, and a sun solar algorithm to determine the date, time, and duration of reflected glare that may be visible to local residents and motorists.

Key Observation Points (KOPS): KOPs refer to viewers with potential sensitivity or concern for glare. POWER performed an inventory of KOPs within one mile of each Project area.

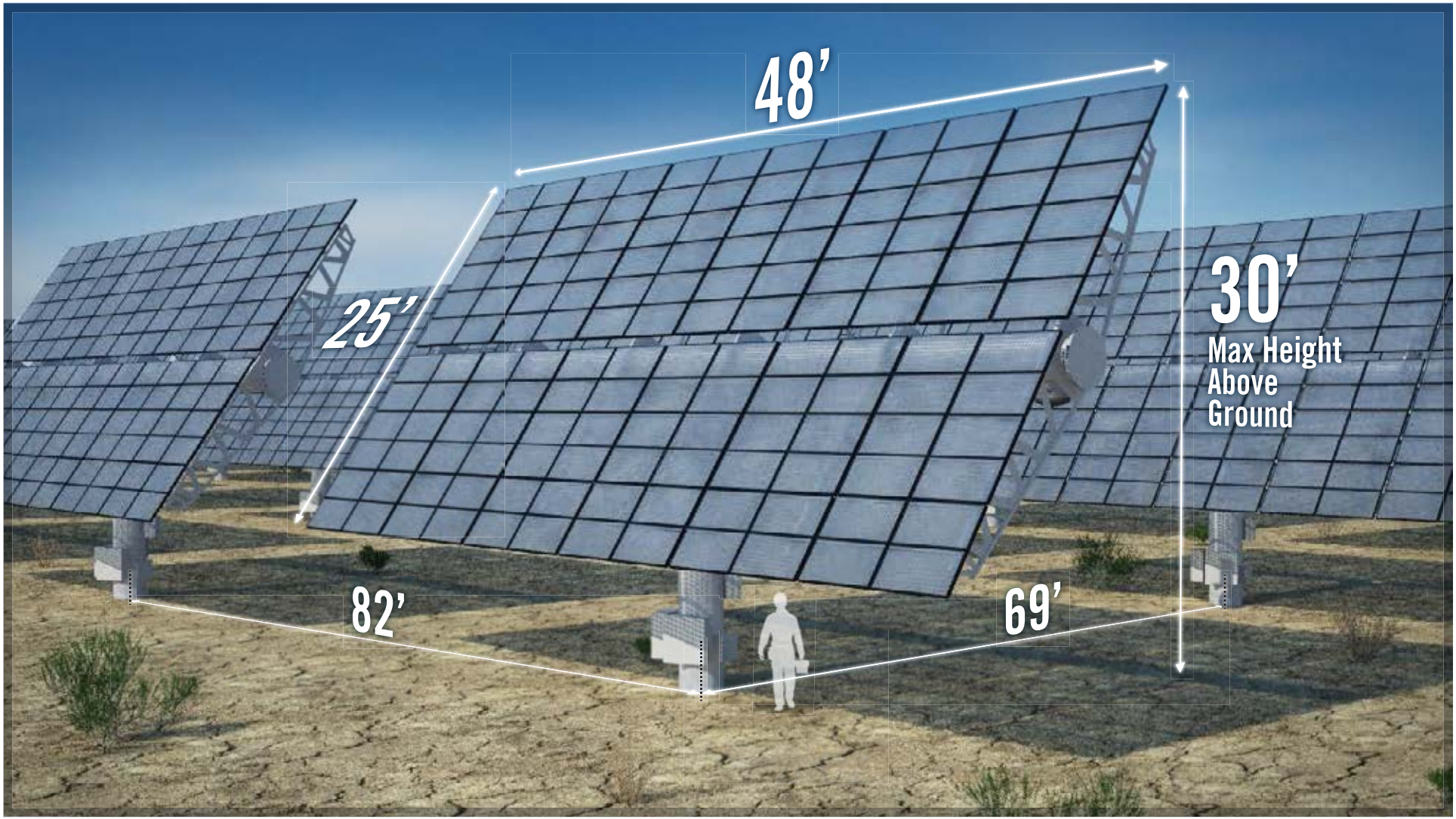


Figure 2 - CPV Technology

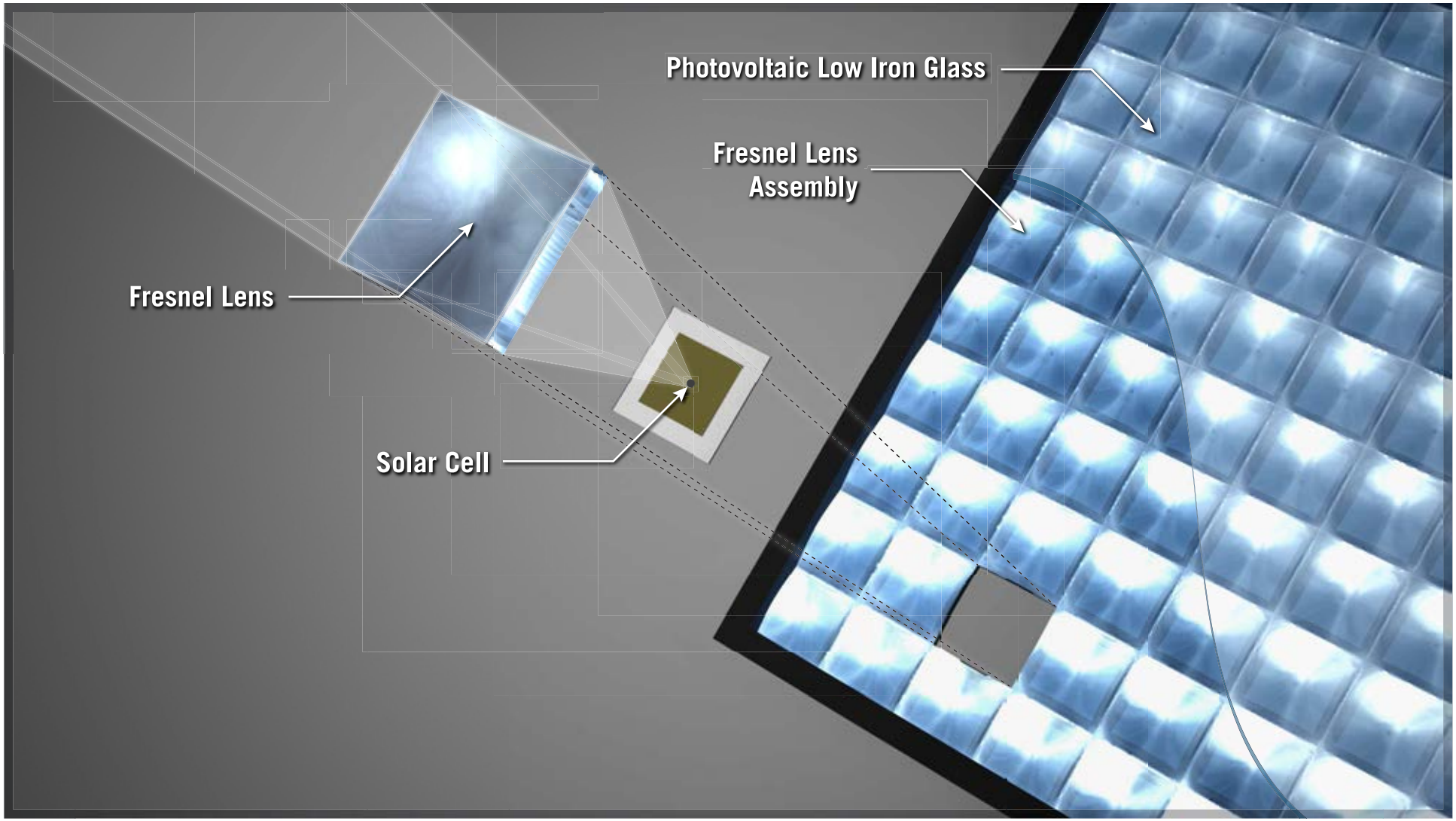
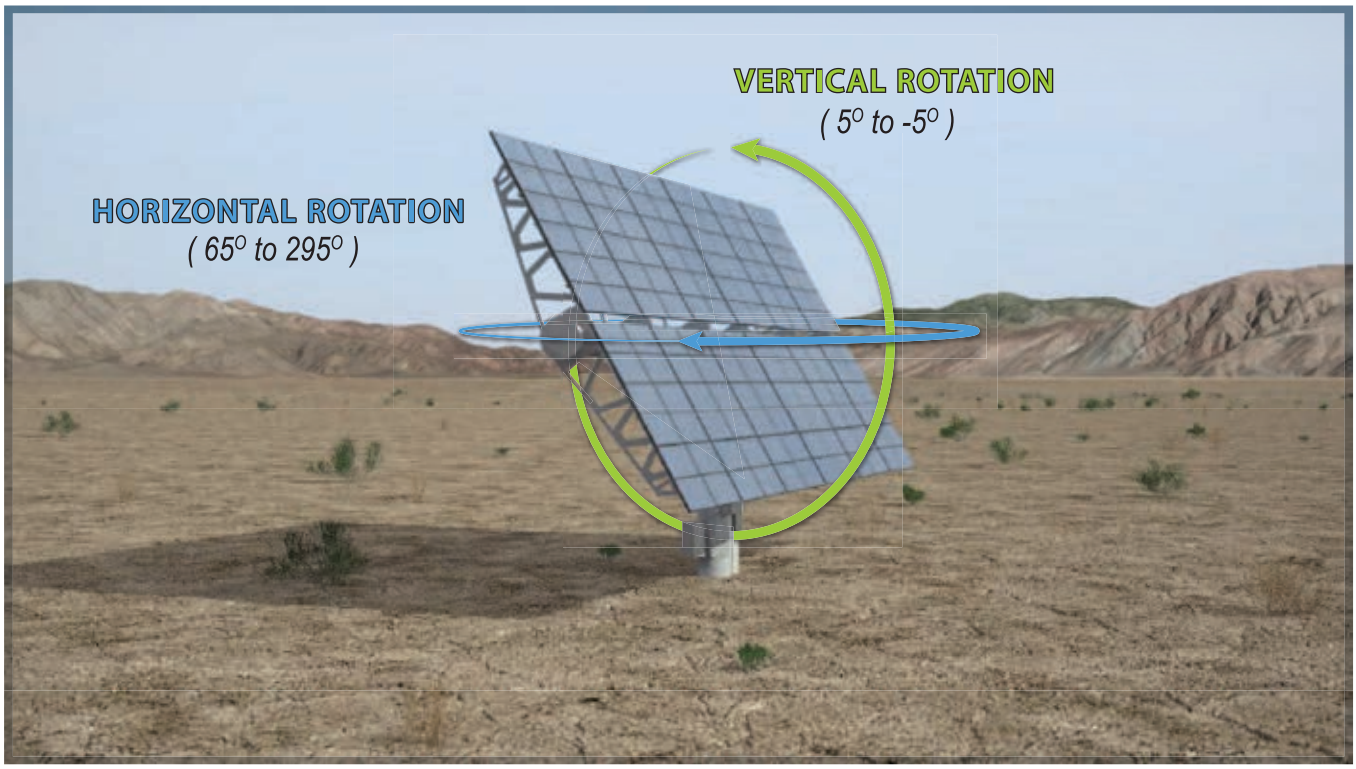
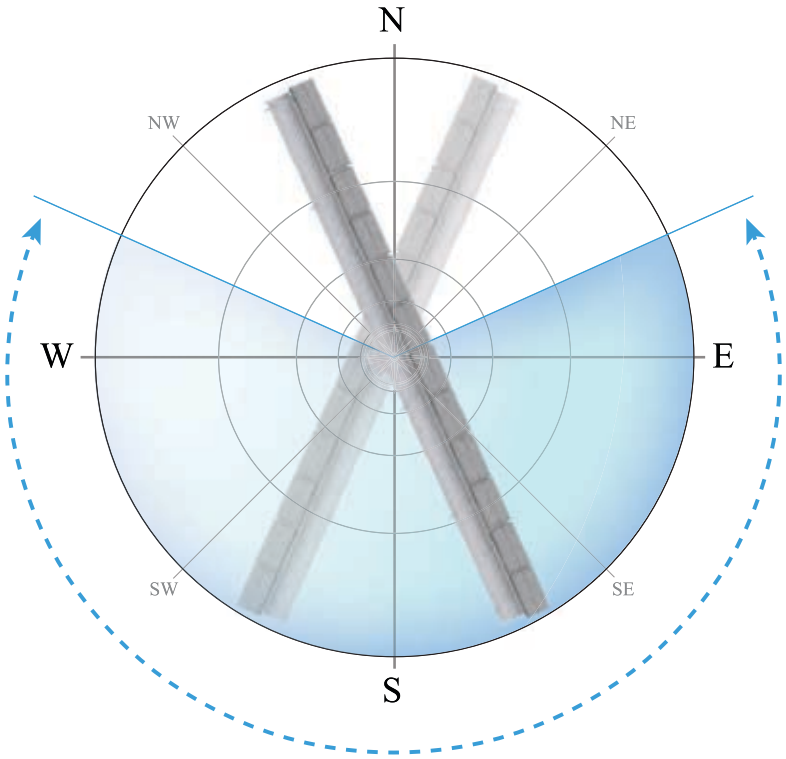


Figure 3 - CPV Module





HORIZONTAL ROTATION LIMITS *(TOP VIEW)*

(65° Facing East - 295° Facing West)