Introduction to HelioScope

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Paul Grana

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HelioScope 101

Similar to Typical Performance Models:

- Use standard weather inputs (TMY3, etc.)
- Hourly 8760 production analysis
- Return system AC energy (inverter AC out)

Different from Typical Performance Models:

- Component-Driven
- Design-Integrated
- Cloud-Based

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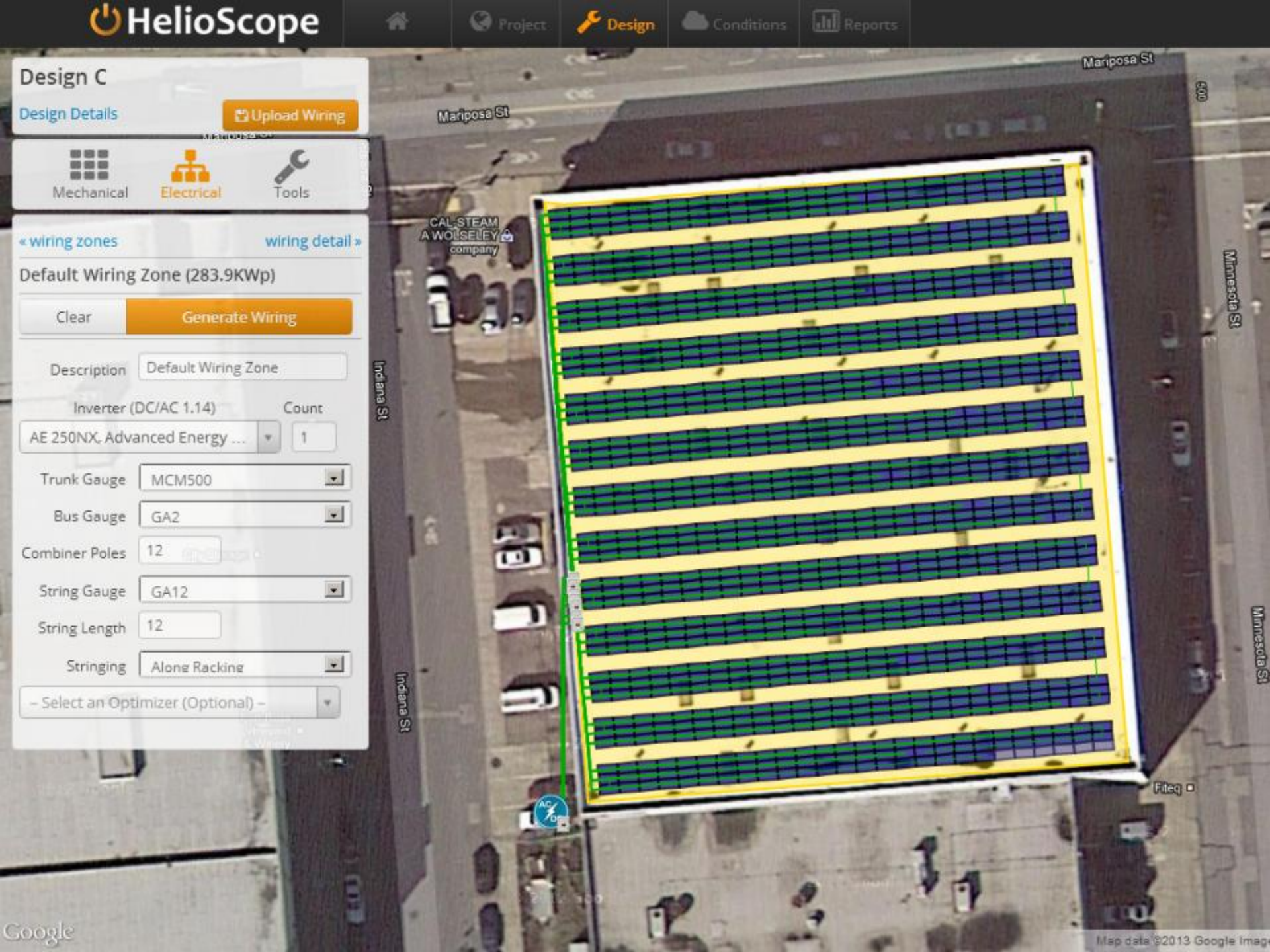
HelioScope
Project
Design
Conditions
Reports
Design C
Design Details
Upload Wiring
Mechanical
Electrical
Tools
« wiring zones
wiring detail »
Default Wiring Zone (283.9KWp)
Clear
Generate Wiring
Description
Default Wiring Zone
Inverter (DC/AC 1.14)
Count
AE 250NX, Advanced Energy ...
1
Trunk Gauge
MCM500
Bus Gauge
GA2
Combiner Poles
12
String Gauge
GA12
String Length
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Along Racking
– Select an Optimizer (Optional) –
Mariposa St
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Structure of the Model

Condition Set Parameters:

- Weather
- Shade patterns (if applicable)
- Soiling assumptions
- Mismatch assumptions
- Cell-temp model
- Transposition model

Design Parameters:

- Module specifications
- Inverter specifications
- Module orientation
- Electrical design

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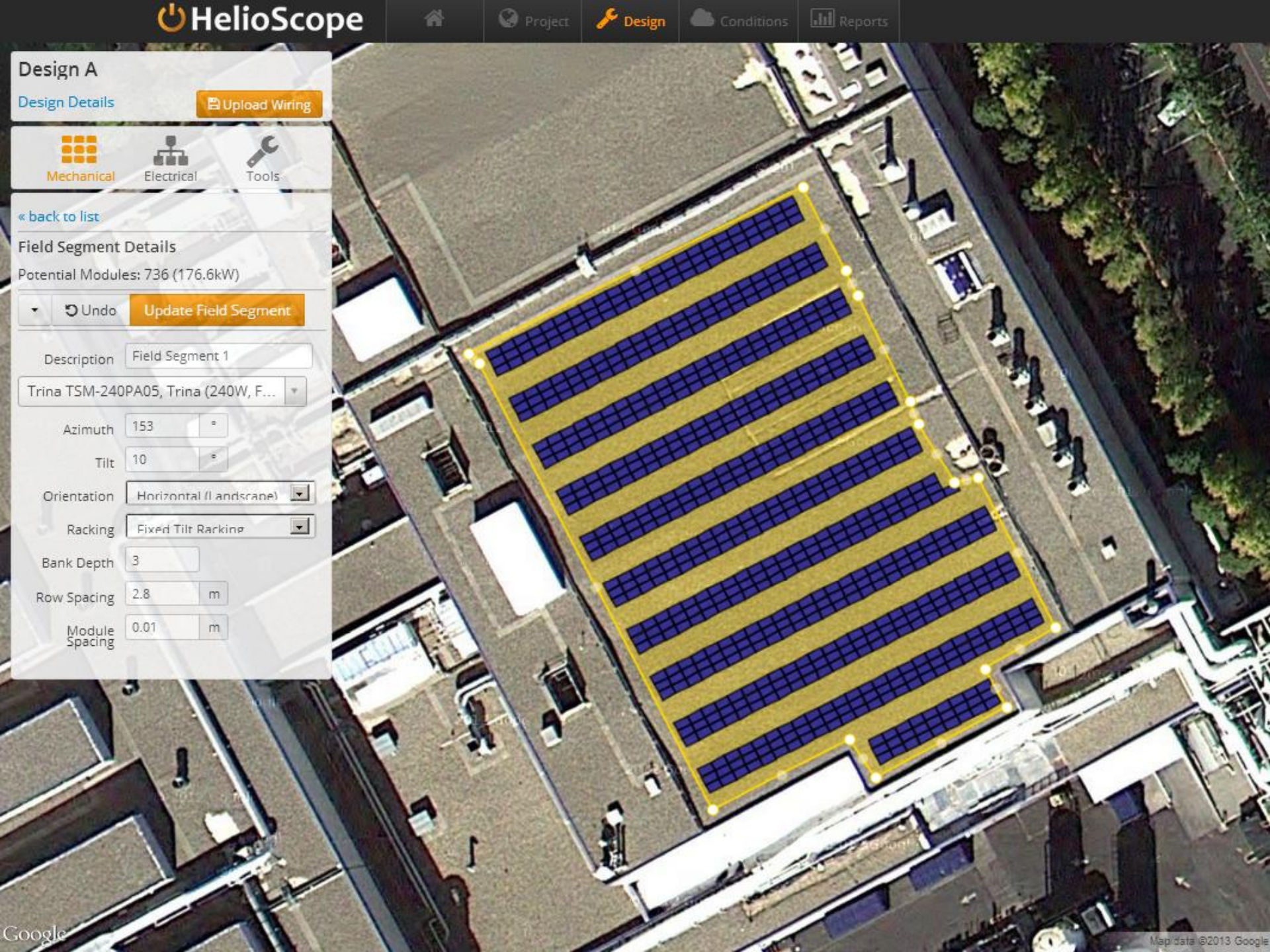
HelioScope
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Electrical
Tools
« back to list
Field Segment Details
Potential Modules: 736 (176.6kW)
Undo
Update Field Segment
Description
Field Segment 1
Trina TSM-240PA05, Trina (240W, F...
Azimuth
153
°
Tilt
10
°
Orientation
Horizontal (Landscape)
Racking
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Row Spacing
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Module Spacing
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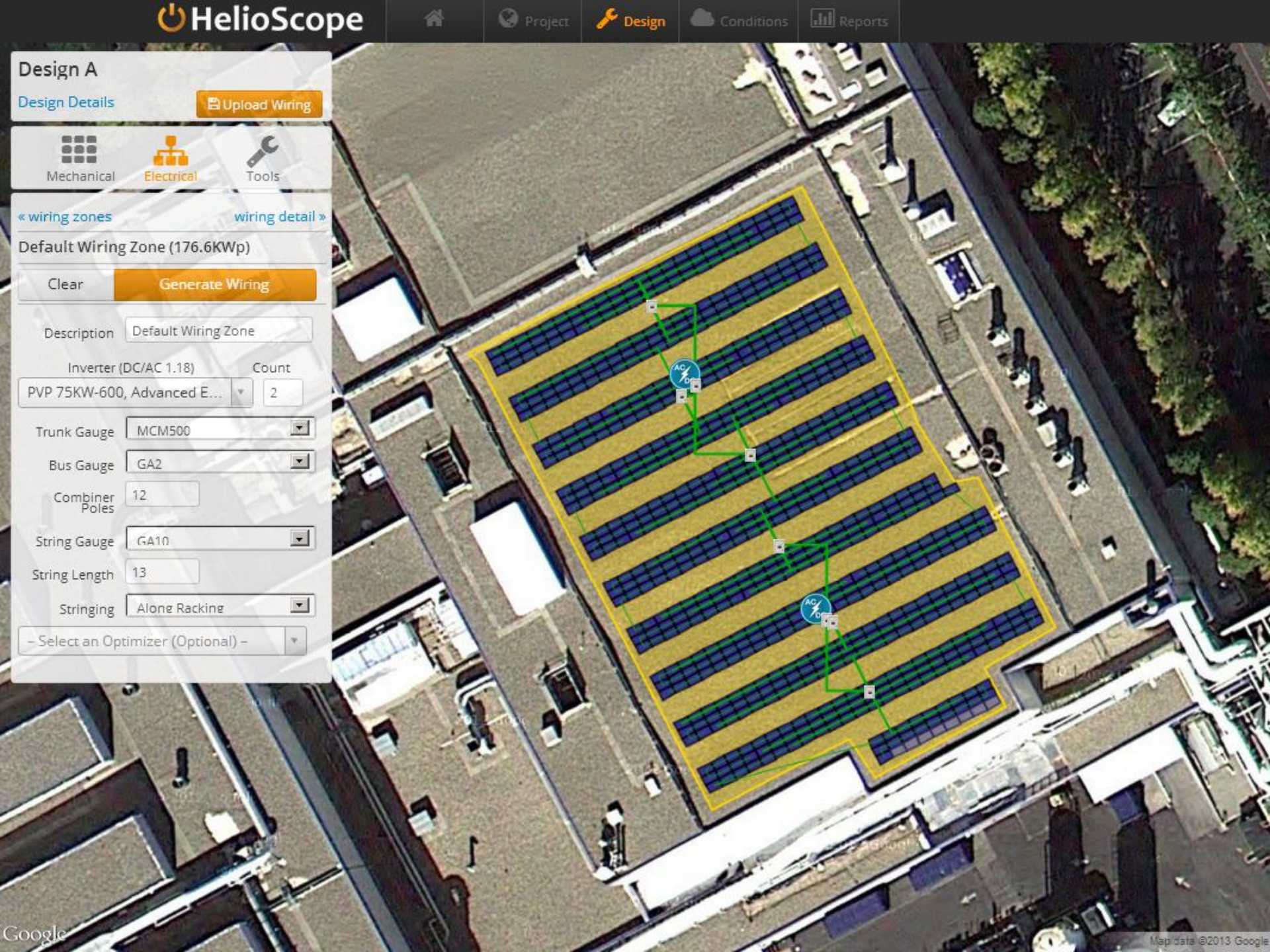
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wiring detail »
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Generate Wiring
Description
Default Wiring Zone
Inverter (DC/AC 1.18)
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PVP 75KW-600, Advanced E...
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MCM500
Bus Gauge
GA2
Combiner Poles
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String Gauge
GA10
String Length
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Stringing
Along Racking
– Select an Optimizer (Optional) –
Google
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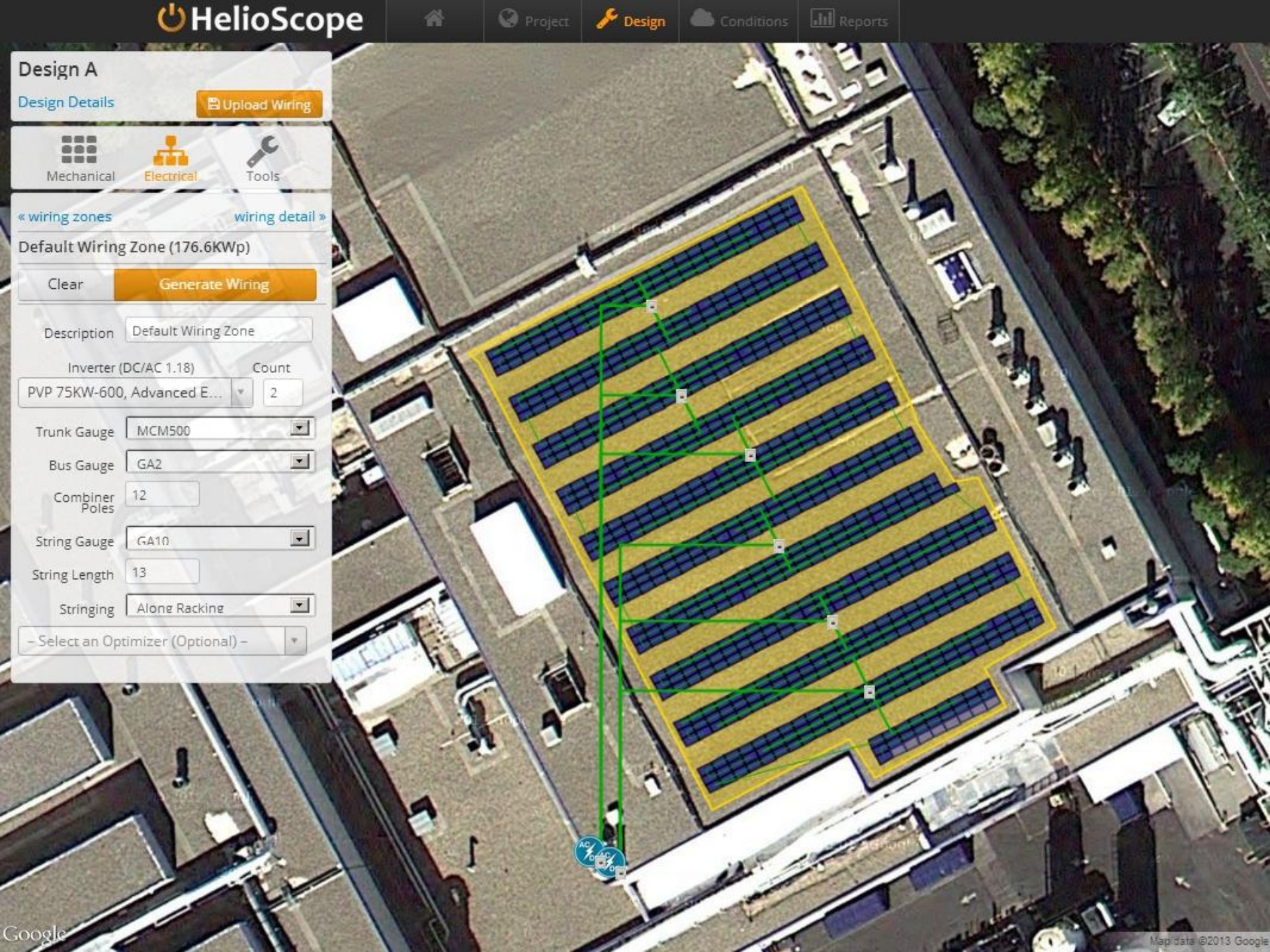
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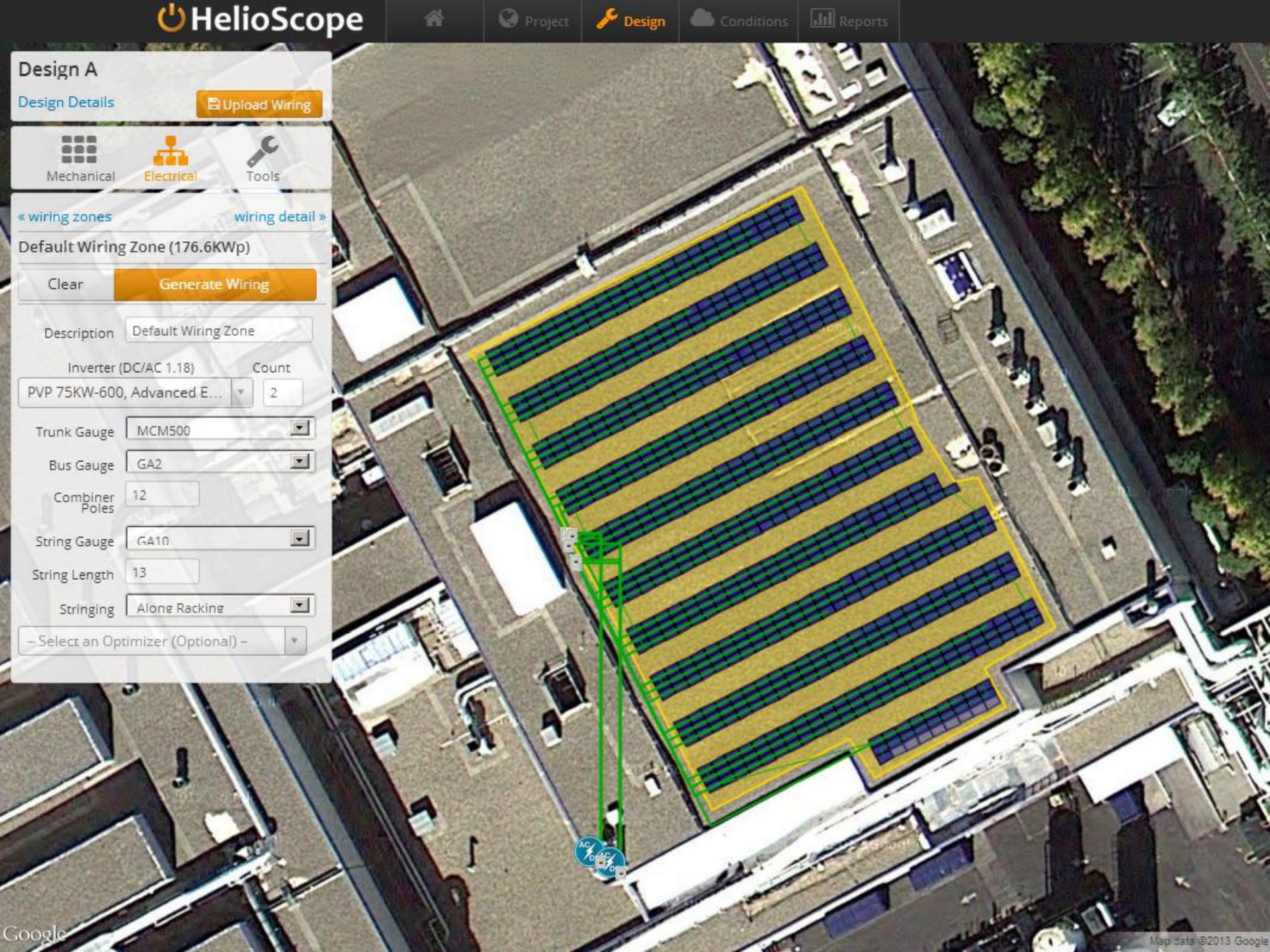
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Cross-bank Shade Is Done Based On The Three-Dimensional Geometry Of The Module Bank

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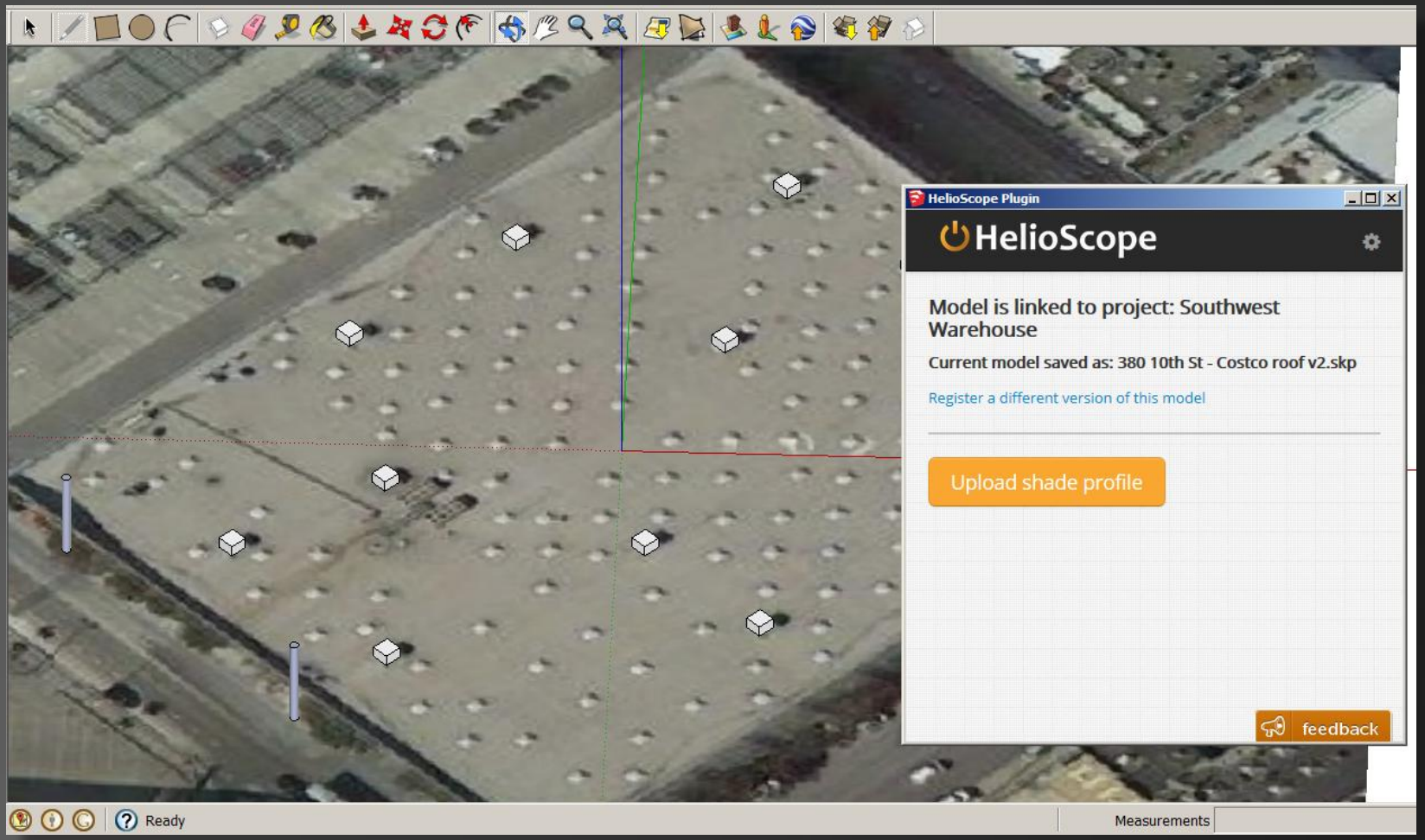
Shade Patterns are Generated from SketchUp



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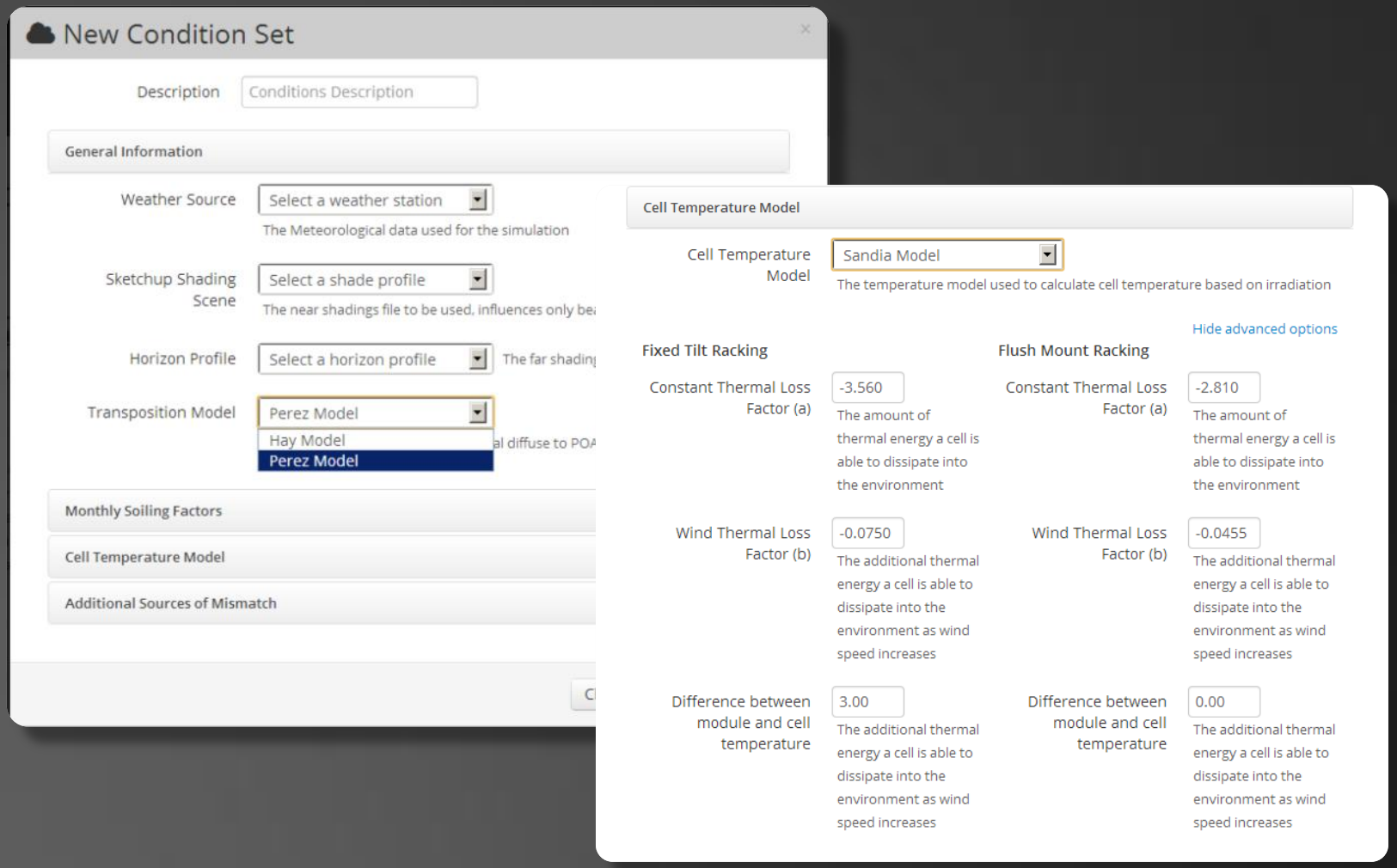
Advanced Users can Choose between Perez or Hay Models for Transposition, and between Sandia or Linear Diffusion for Cell Temperature



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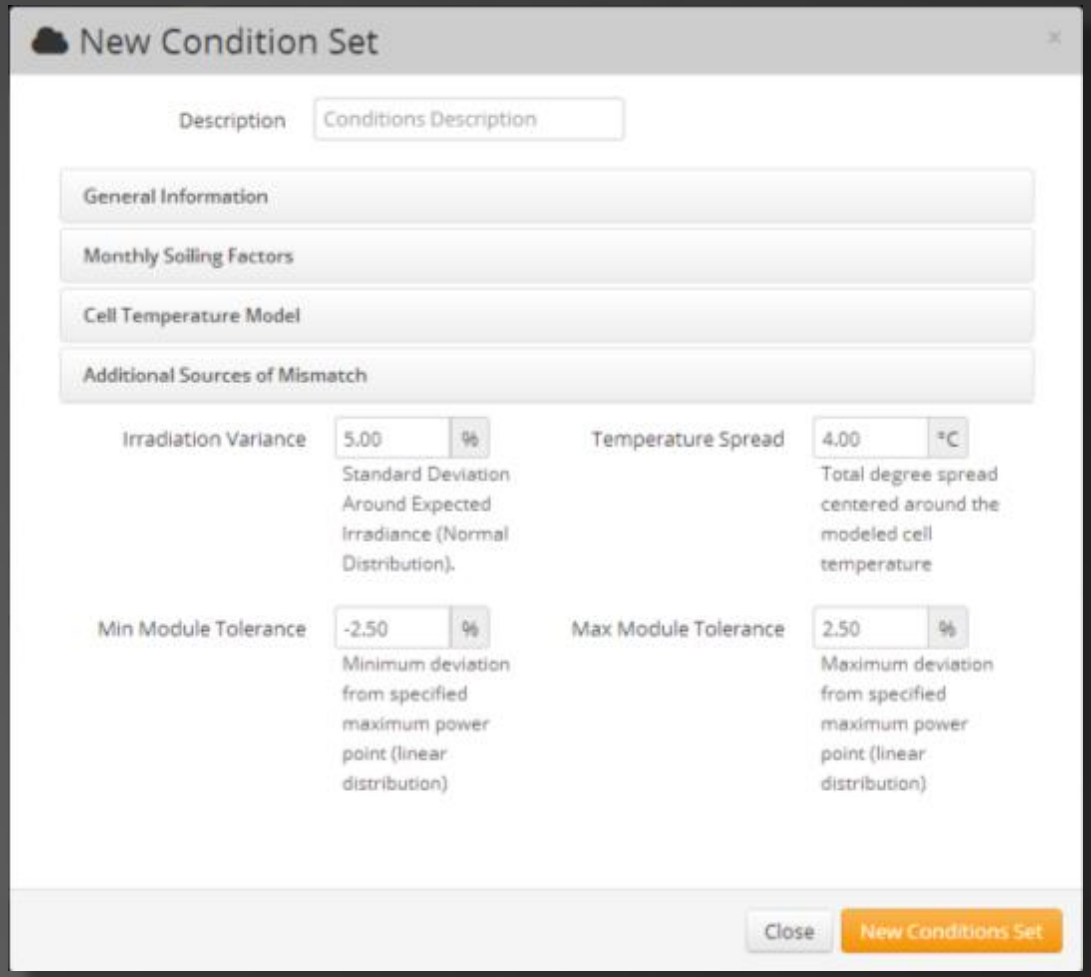
Mismatch is Handled as a Statistical Property Rather than a Loss Assumption



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Reports

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Module-Level Results

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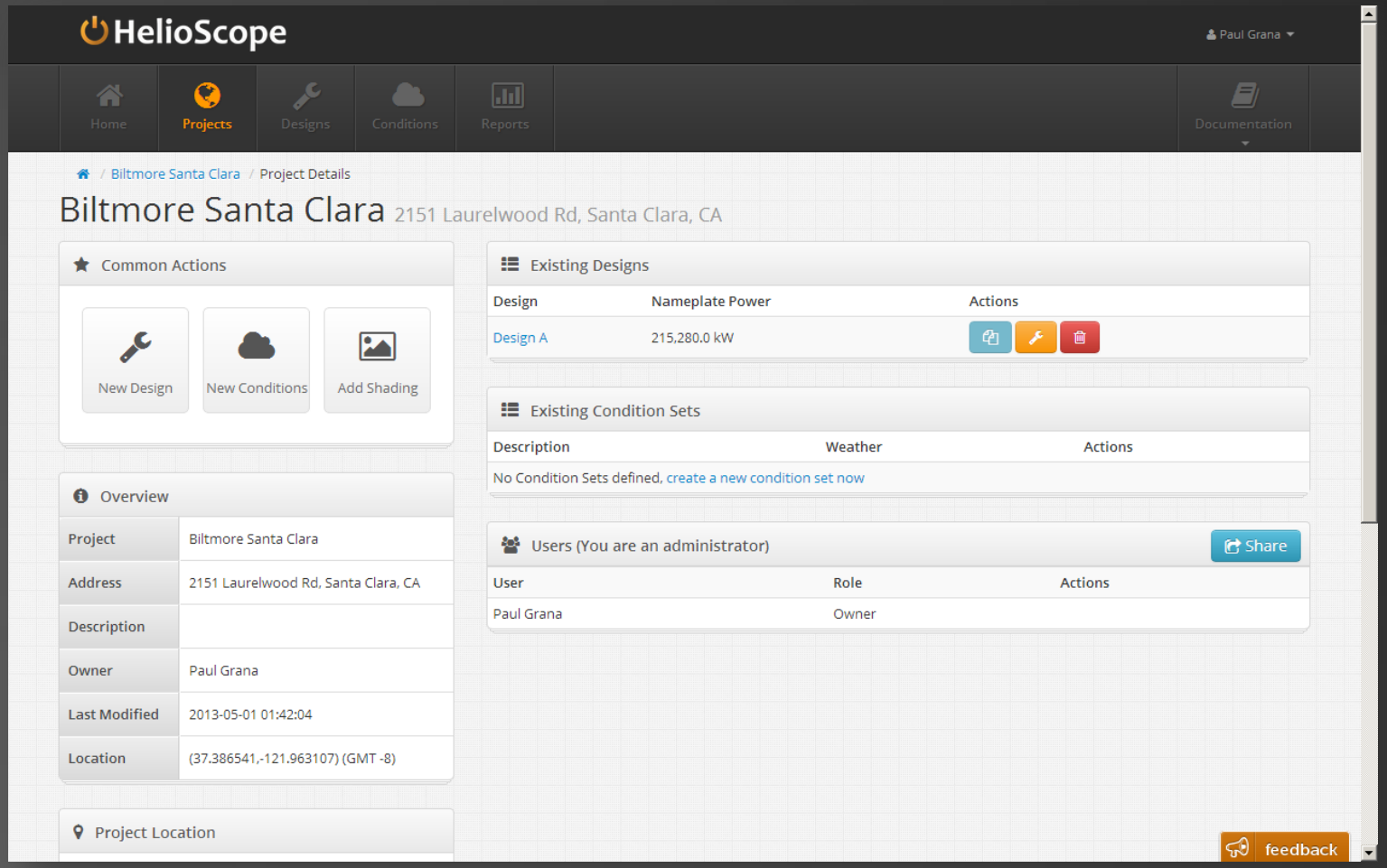
Sharing is Native



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We Fully Document All Equations Used in HelioScope

HelioScope

Paul Grana

Home | Projects | Designs | Conditions | Reports | Documentation

OVERVIEW

SYSTEM MODEL
- Inverters
- Combiners
- Wires
- Distributed Electronics

MODULE MODEL
- Single-Diode Model
- PVSyst Diode Model
- Temperature Model

ENVIRONMENT MODEL
- Meteorological Data
- Irradiance Calculations
- Irradiance Adjustments
- Near Shading
- Other Mismatch

CONCLUSIONS

Near Shading

When modules are arranged in multiple rows, each row limits the share of the sky available to the row behind it; this limits the available diffuse light throughout the year. Using the angle from the collector to the top edge of the collector in front of it (γ), the formula becomes:

$$D^0_{iso} = \frac{1}{2\pi}\int_{\gamma}^{\pi-\Sigma_C}\int_0^{\pi} sin^2(\phi)\cdot sin(\theta+\Sigma_C)\mathrm{d}\phi\mathrm{d}\theta = \frac{1+\cos(\Sigma_C+\gamma)}{2}$$

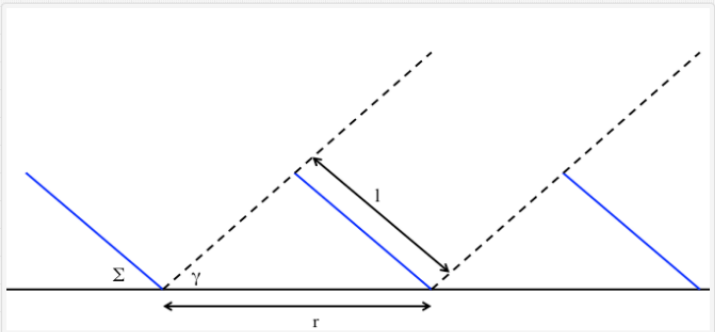

Diagram of Angles for Shed Calculations

This is used for any commercial or utility system with rows of racked modules, without specific geometric data. However, as a result of using detailed design data for the system, the exact module locations are known, which allows us to add back in additional irradiation for modules on the edge of the array:

$$D_{iso} = \frac{1+\cos(\Sigma_C+\gamma)}{2} + \frac{1}{2\pi}\int_0^{\gamma}\left(\int_0^{\phi_{west}} sin^2(\phi)\cdot sin(\theta+\Sigma_C)\mathrm{d}\phi + \int_{\phi_{east}}^{\pi} sin^2(\phi)\cdot sin(\theta+\Sigma_C)\mathrm{d}\phi\right)$$

Similarly, for the reflected factor, the only portion of the ground available for reflected light is the ground between the rows of panels. If the angle from the module to the ground beneath the top edge of the collector in front of it is ϵ, then the reflected radiation adjustment becomes:

$$R_{iso} = \frac{1}{2\pi}\int_{-\Sigma_C}^{\epsilon}\int_0^{\pi} sin^2(\phi)\cdot sin(\theta+\Sigma_C)\mathrm{d}\phi\mathrm{d}\theta$$

feedback

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Our Path Forward

- HelioScope is currently in beta
- Commercial launch planned this summer
- We have many next steps – Paul Gibbs will discuss tomorrow

Thank You

paul.grana@folsomlabs.com

C: (773) 425-1944

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