Overcoming Design Challenges in Commercial PV

Gal Roter, Product Manager

January 30th, 2020

solaredge

Meet SolarEdge

Who we are

SolarEdge is a global leader in high-performance smart energy technology. By leveraging world-class engineering capabilities and with a relentless focus on innovation, we create smart energy products and solutions that power our lives and drive future progress

Mission

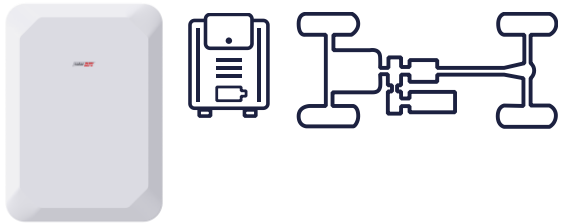
Through engineering excellence and relentless innovation, we drive progress by creating the smart energy solutions that power the future

One-Stop-Shop for Smart Energy Solutions

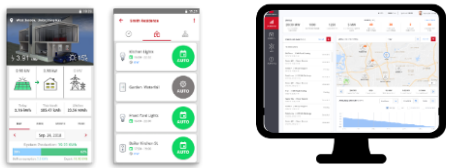
Smart Modules

EV Charging

Batteries, UPS, and EV Powertrains

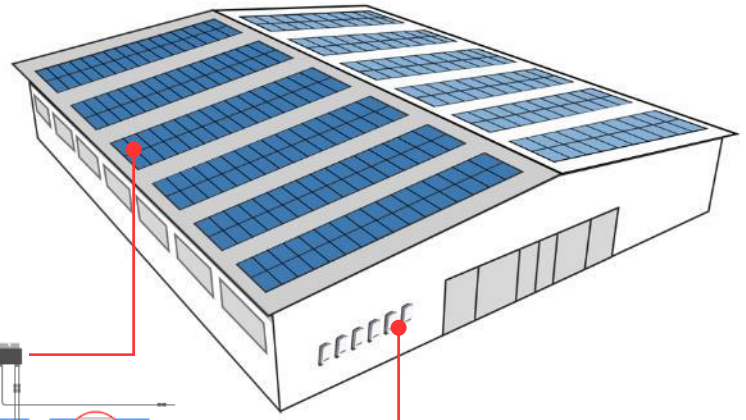


Monitoring Platform and Grid Services



solaredge

The SolarEdge Commercial Solution



25 YEAR WARRANTY

Power Optimizers
2-to-1 configuration with P600–P850

12-20 YEAR WARRANTY

Inverters
15kVA – 100kVA

FREE FOR 25 YEARS

Monitoring Platform

Commercial Gateway

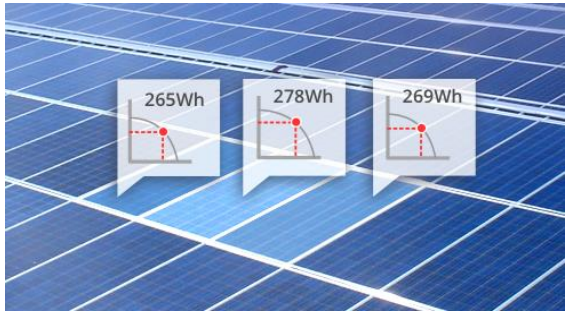
Environmental Sensors

Grid Interaction

solaredge

SolarEdge Offers Four Key Benefits

More Energy



Increased energy yield & faster return on investment through module-level MPPT

Lower O&M Costs

Full visibility of system performance & remote troubleshooting

Enhanced Safety

Safety during installation, maintenance, firefighting, & other emergencies

Flexible Design

Maximum space utilization with minimum design time

solaredge

Commercial Design Challenges

solaredge

Complexity of Commercial PV System Design

- Time consuming and resource intensive
- Error prone
  - Invalid design: Costs money, loss to installer profit margins
  - Sub-optimal design: Decreased system performance, longer payback time
- Complexity due to
  - Growing number of factors to consider to ensure optimal lifetime performance and payback
  - Design tradeoffs require customized optimizations per project
- Multiple software tools
  - Modeling and yield calculations, ordering, and installation process

Top 10 PV Design Challenges

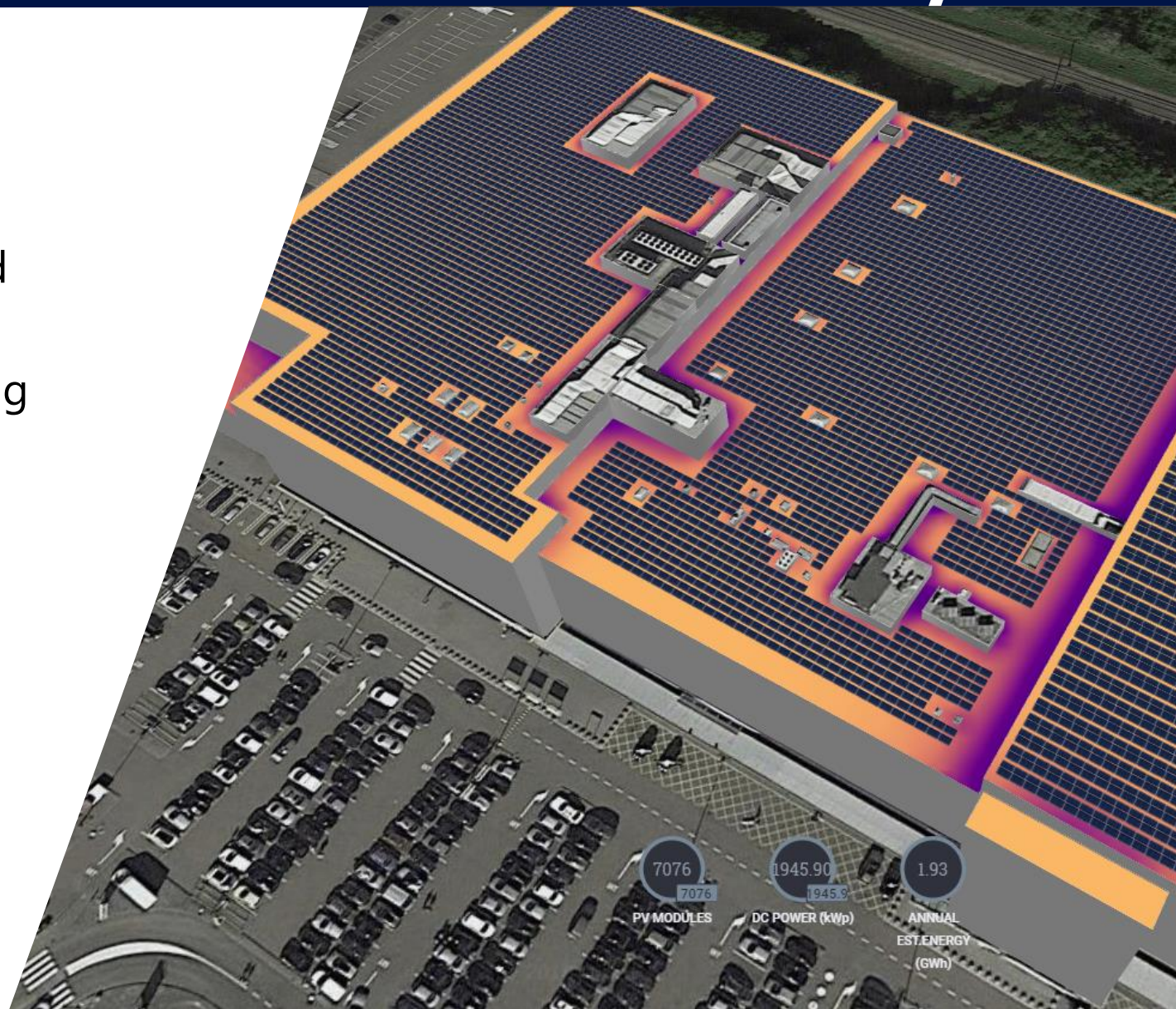
1. Product selection and compatibility
2. Accuracy of PV system area and physical constraints and limitations
3. Creating an optimal string design to reduce BoS costs
4. Balancing module spacing versus tilt (energy density versus power density)
5. Tradeoffs of module layout orientation
6. Acceptable shade tolerance
7. Energy yield prediction
8. Sizing of system based on customer needs and subsidies
9. Considerations of accessibility and safety regulations
10. Maximizing oversizing, while limiting clipping

Overcoming PV Design Challenges

solaredge

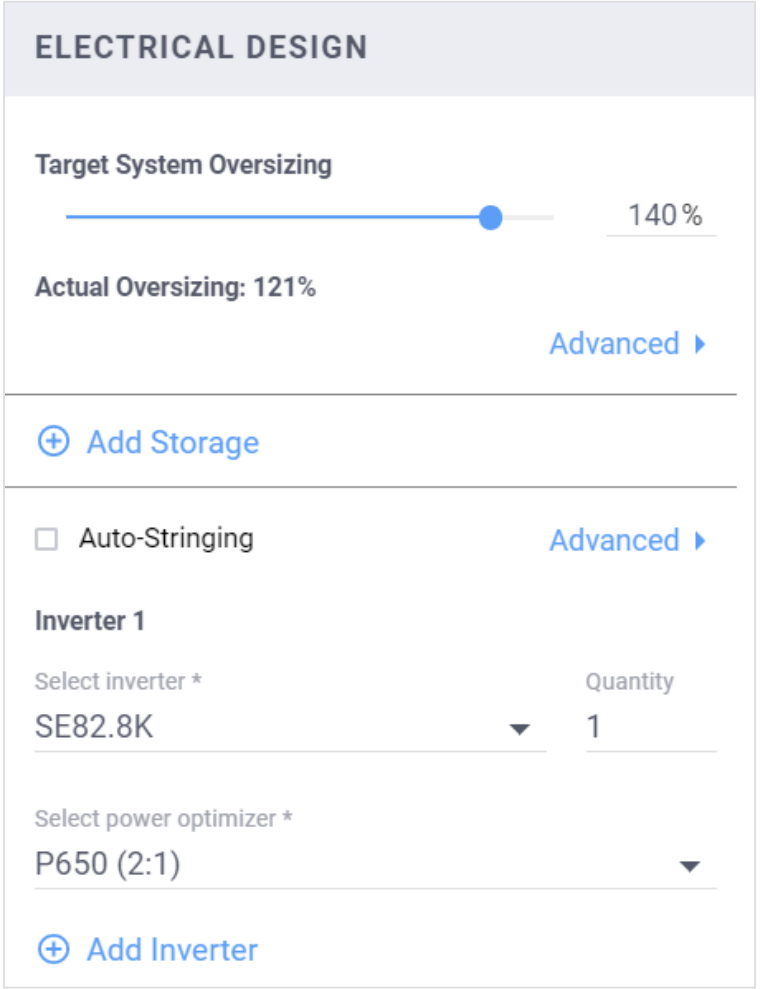
Importance of Design Software

- Design optimization can improve system performance without increasing cost
- Support fast pace of PV market growth
- Improve efficiency of sales, planning, and design process
- Critical for competitiveness and increasing profitability
- Reduce both soft and hard costs with improved accuracy



#1 Product Selection and Compatibility

- Guaranteed product compatibility
- Automatic system configuration suggestion based on:
  - System location
  - Grid voltage
  - DC power
  - Cost optimization
  - Power optimizer selection based on inverter and module compatibility
- User Customization
  - Target system oversizing (balance clipping vs higher oversizing)
  - Alternative components

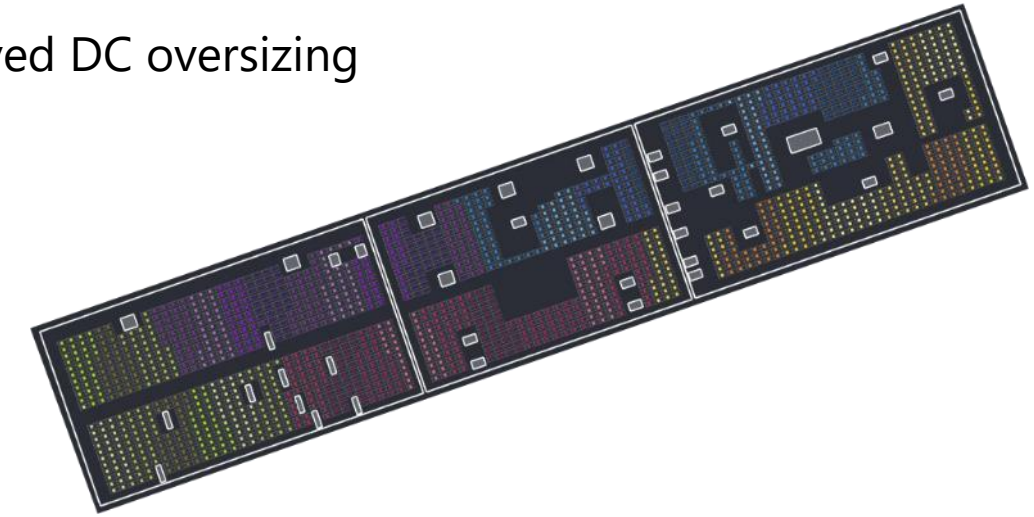


#2 Accuracy of PV System Area

- Visual design based on satellite/aerial images
- Upload, scale, and draw on top of user images
  - Use technical drawings (roof plans) as base
  - Use drone imagery or hi-res imagery
- Simple definition of obstructions
- Visual near shading and sun access analysis
- Drag or type in measurements

#3 Optimal String Design

- Auto-string automatically creates a string design
  - Designing with longer strings for fewer strings, resulting in less wiring, fewer combiner boxes, fuses, and other BoS components
  - Using the actual achieved DC power as opposed to STC power may allow connecting even more modules in a string
  - Considering multiple module orientations actual achieved DC oversizing
  - Leveraging SolarEdge design flexibility
    - Strings of different lengths
    - Multiple module orientation in a single string
    - String oversizing
  - Connecting multiple modules to 1 power optimizer
- Easy manual editing of strings



solaredge

#4 Balancing Module Spacing versus Tilt

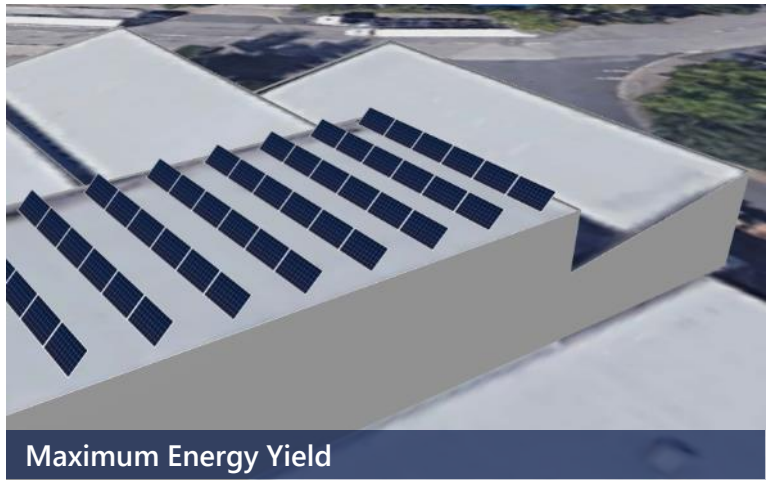
- Run energy simulation with several variants to assess system cost-benefit
  - Optimize row spacing by using the shading analysis in the system loss chart
  - Lower module tilt to reduce spacing until you can fit more modules
  - Evaluate east/west racking for increased power density

Maximum Energy Yield

Greater tilt, increased spacing

Increased Power Density

Reduced tilt, closer spacing



Maximum Energy Yield

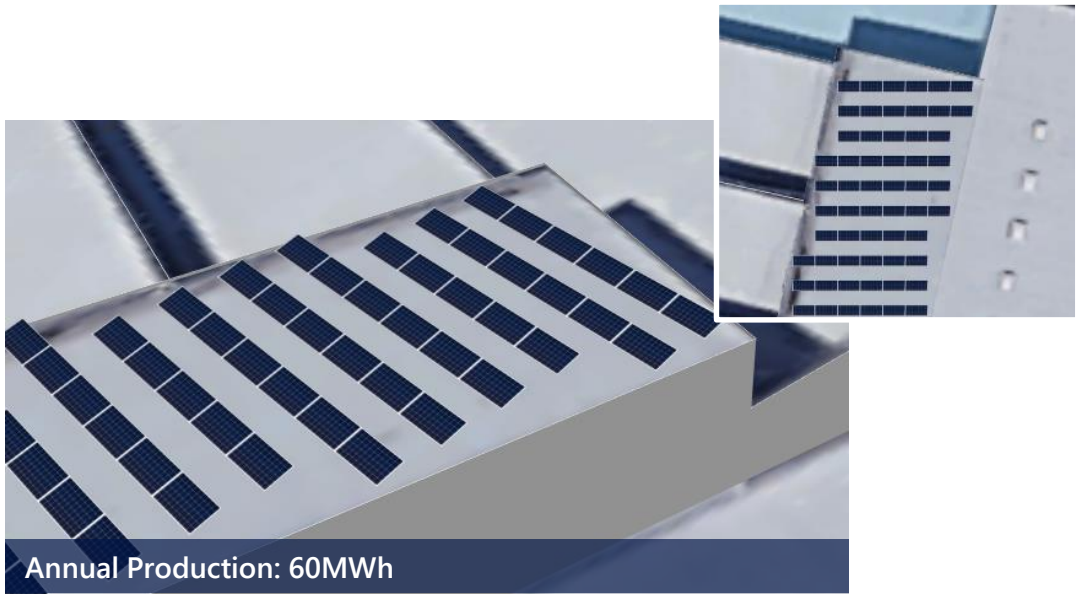
Increased Power Density (tilted racking)

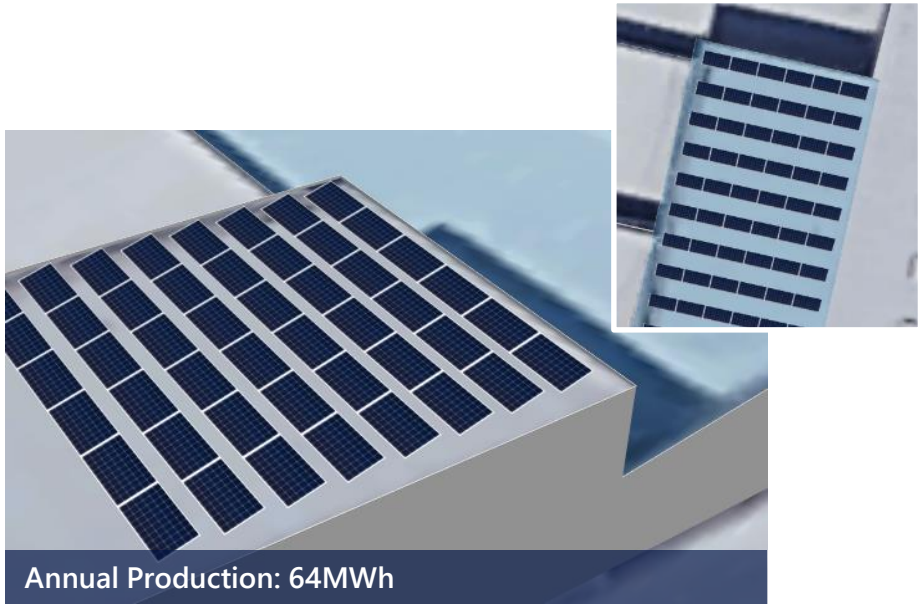
Maximum Power Density (Dual-tilted racking)

solaredge

#5 Tradeoffs of Module Layout Orientation

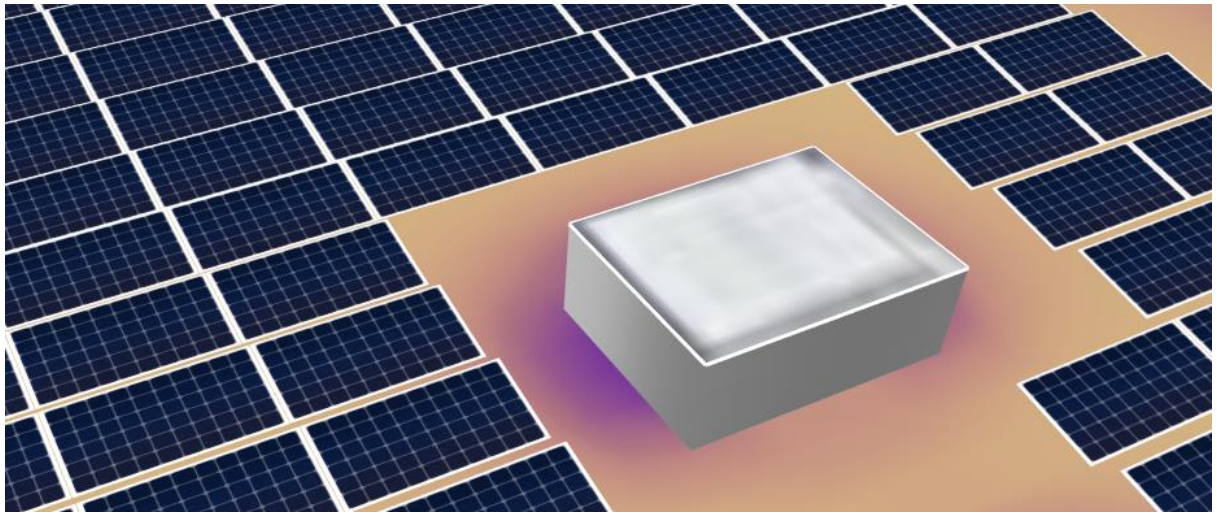
- Run energy simulation against several variants to maximize system production
  - Align modules to optimal azimuth
  - Align modules to roof edges

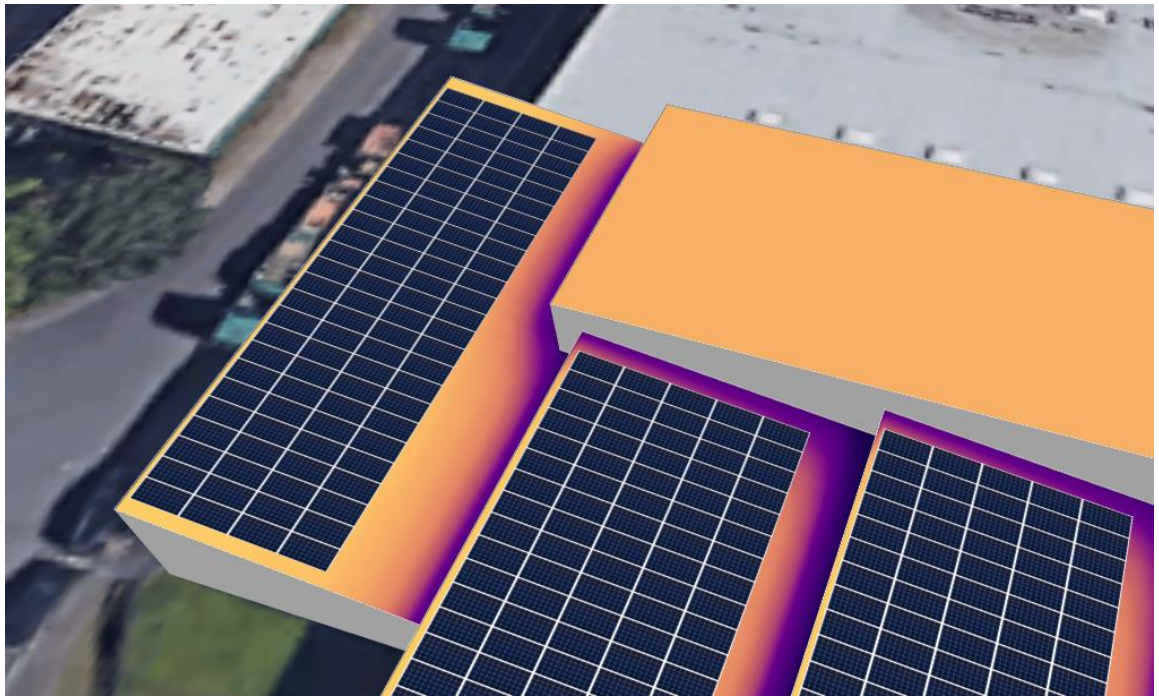




#6 Acceptable Shade Tolerance

- MLPE allows systems to be designed within partially shaded areas
- Use irradiance map for sun access values
- Run the energy simulation against several variants



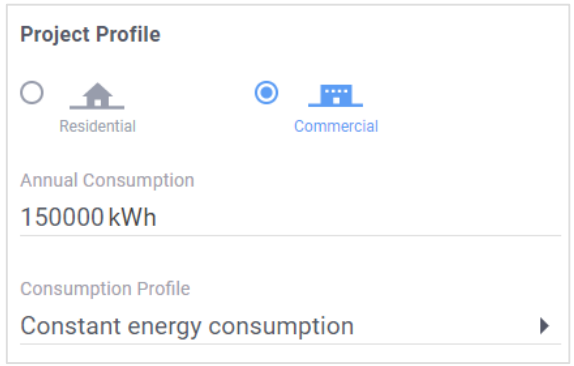


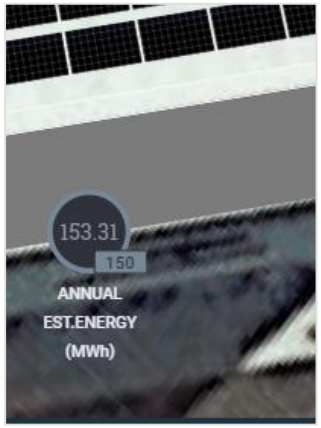
#7 Energy Yield Prediction

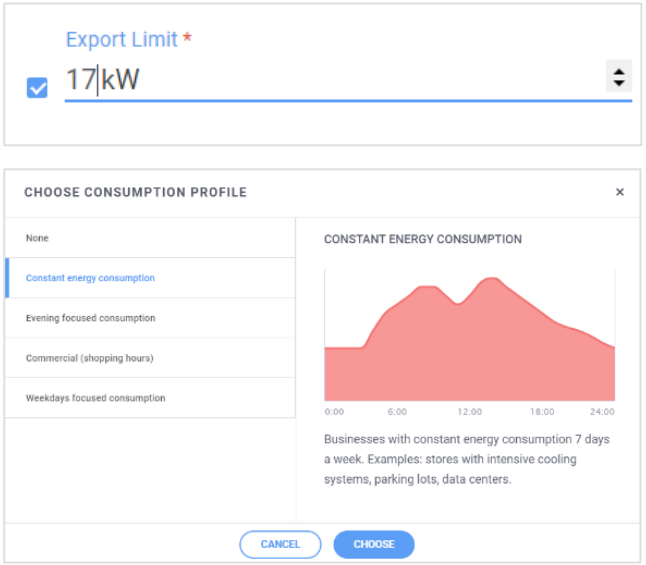
- Bankable estimation that can be used in project financing
- The accuracy of SolarEdge Designer simulations were validated by DNV GL compared to the industry benchmark for common installation types
- SolarEdge Designer was capable of estimating system energy on an annual basis and along intermediate energy estimation steps of a comparable PVsyst model on all test cases examined

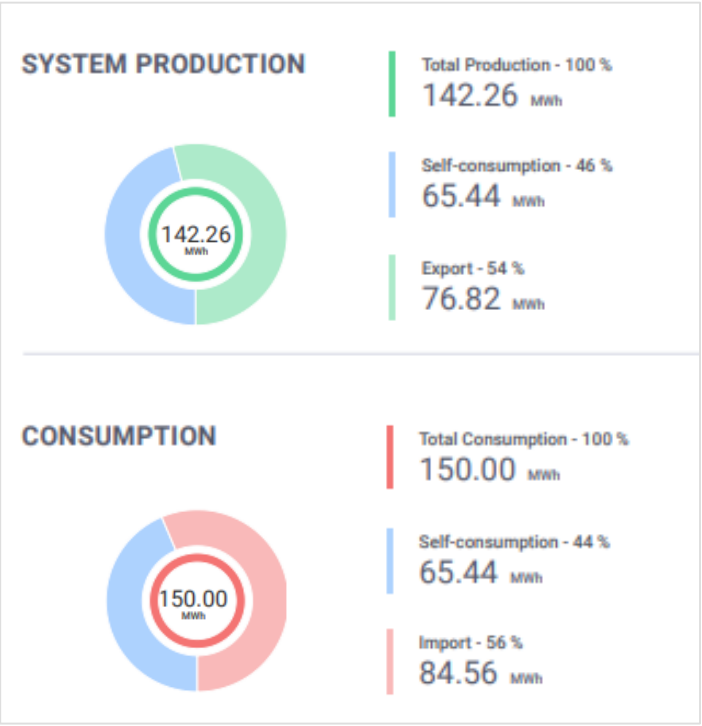
#8 Considering Customer Needs and Subsidies

- DC pre-sizing based on annual consumption
- Design to maximize self-consumption based on typical consumption profiles
- Upload interval data
  - Obtained from the utility or Green Button (US)
- Define export limit when needed







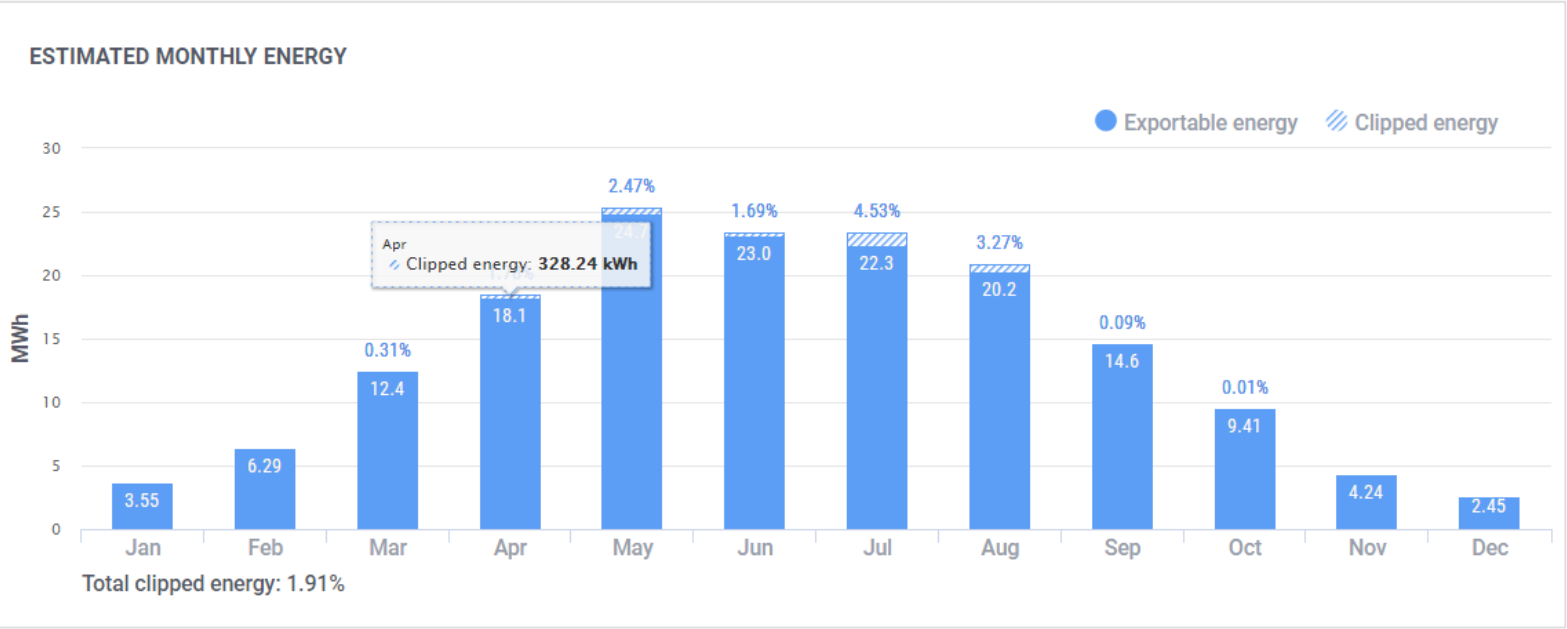


#9 Accessibility and Safety Regulations

- Mark distance required from edges for safety regulations
- Mark walkways for accessibility and maintenance

#10 Maximizing Oversizing, Limiting Clipping

- Simulation software is required to:
  - Calculate inverter clipping
  - Quantify the effects of oversizing
- Lower cost modules make it cost-effective to add more modules to the array and benefit from the gains in energy production during peak hours - even with clipping losses



solaredge

Case Study by Commercial PV Installer

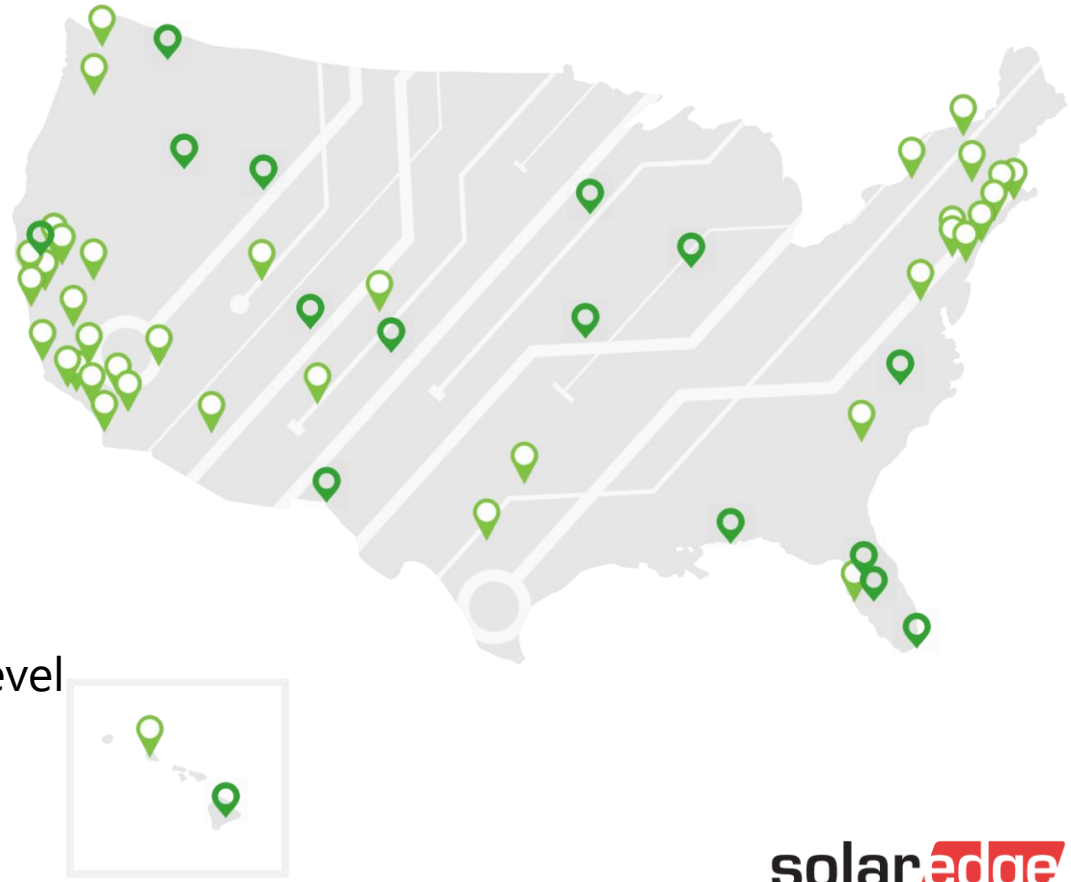
CED Greentech

CED Overview

A collective of passionate solar professionals committed to superior service and support

- Largest solar distributor in North America, supplying solar, electrical, and renewable energy products
- Network of 57 locations across the country
- Comprehensive distribution and logistics support
- Unmatched product selection and pricing

- CED Greentech Boston
  - Supporting commercial solar projects on a national level
  - Design, engineering, and distribution support

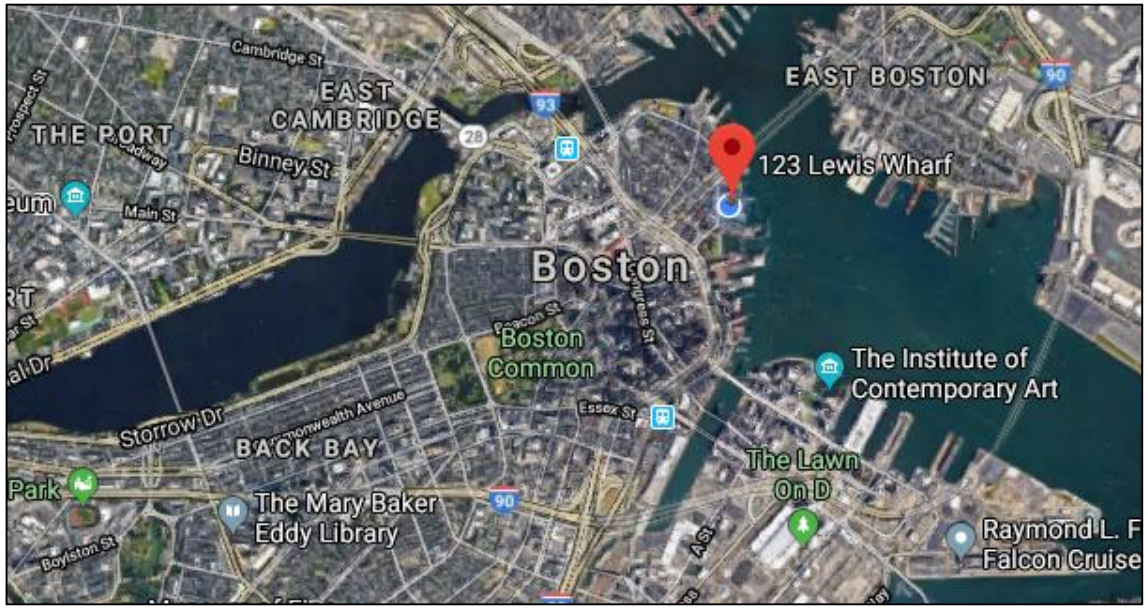


Case Study

- Hypothetical project developed as a case study to showcase our daily interactions with the SolarEdge Designer
- Location: 123 Lewis Wharf, Boston, Massachusetts 02110
- System size: 265.28 kW DC

CED GREENTECH

Site Location



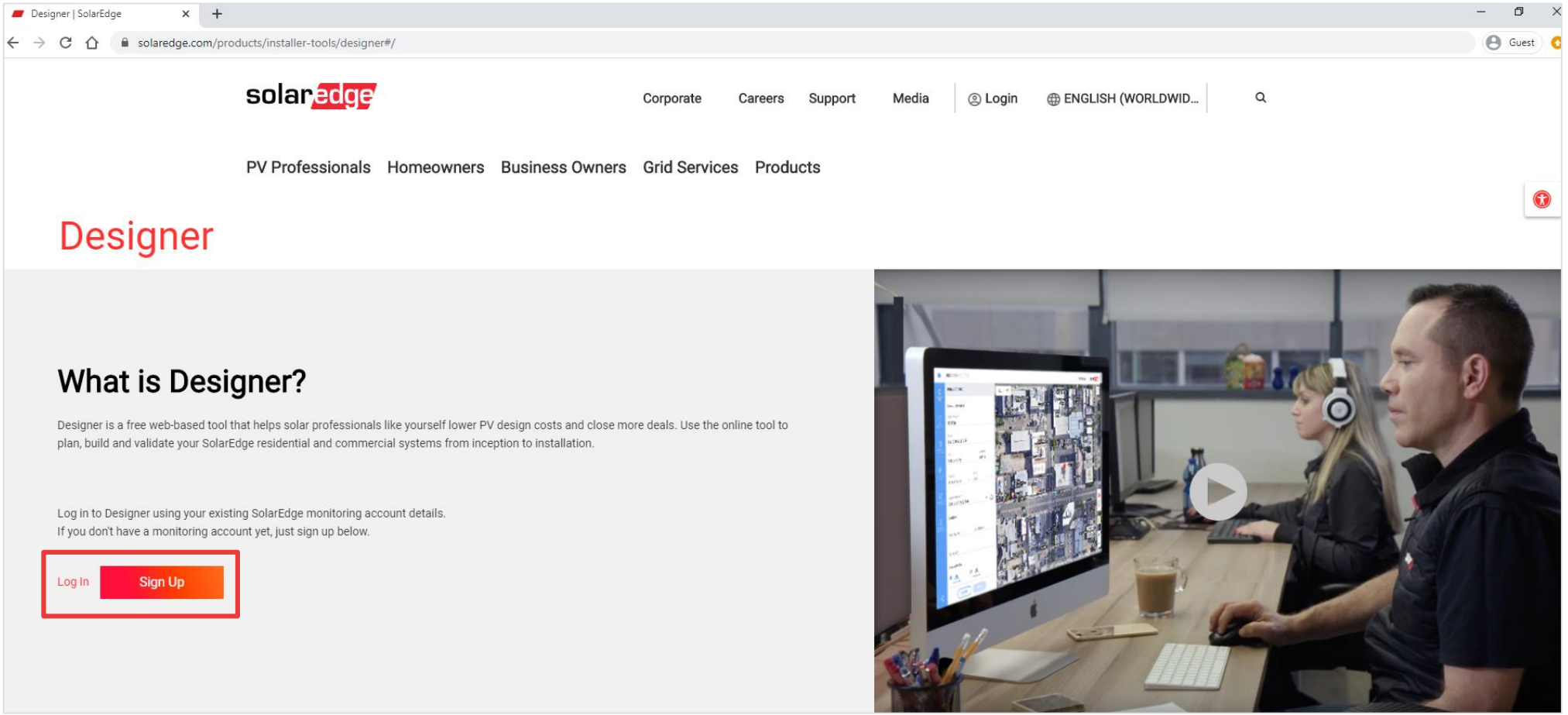
solaredge

Project Objectives

- Three primary goals of the designs:
  - Efficient use of roof surface area to maximize the amount of PV on the property and gain resulting maximized energy output
  - Minimize the material and labor costs incurred by the system owner
  - Accurately model expected PV productions and yields

Full Site View

Live Demo

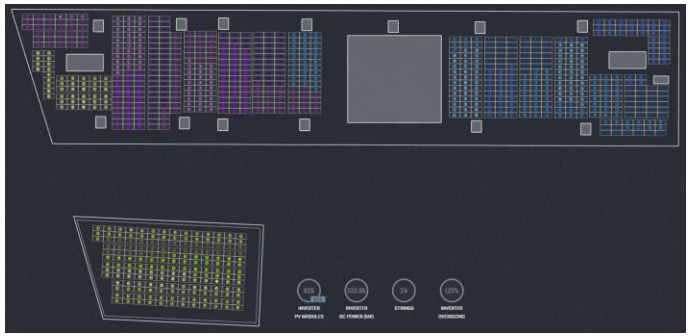

Designer | SolarEdge
solaredge.com/products/installer-tools/designer#/
Guest
solaredge
Corporate
Careers
Support
Media
Login
ENGLISH (WORLDWID...
PV Professionals
Homeowners
Business Owners
Grid Services
Products
Designer
What is Designer?
Designer is a free web-based tool that helps solar professionals like yourself lower PV design costs and close more deals. Use the online tool to plan, build and validate your SolarEdge residential and commercial systems from inception to installation.
Log in to Designer using your existing SolarEdge monitoring account details.
If you don't have a monitoring account yet, just sign up below.
Log In
Sign Up

Final Project Scope

- System size: 265.28 kW DC
- Products:
  - Modules: Jinko Solar 405W [825]
  - Inverters: SE 100kW [2], SE 30kW [1]
  - MLPE: SE P860 [329]
- Specifications:
  - Azimuth: 197°
  - Tilt: 10°, landscape
  - Grid: 480V L-L, 277V L-N
  - Oversizing: 115%

Irradiance

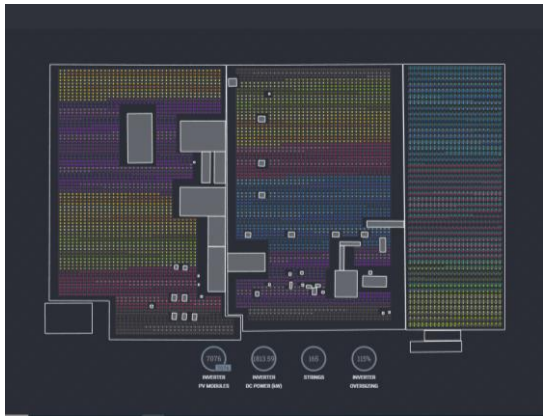
String Layout

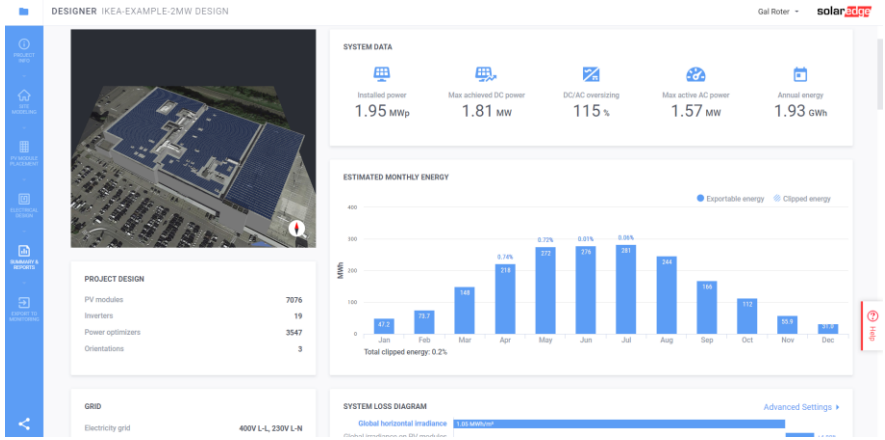


SolarEdge Designer

SolarEdge Designer

- Powerful and innovative PV design and sales tool
- Design, validate, and estimate production of PV systems of all sizes
- Visualize an installation for system owners
- Streamlined design process, automatic stringing, and instant design validation
- Seamless export of the site layout to the SolarEdge monitoring platform
- Extended feature set that specifically supports commercial PV systems
- Free for use - no license or subscription fees required



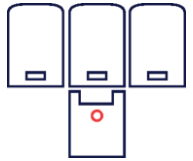


Faster and Easier Commercial Solar Design

New Features for Commercial PV

Site Modeling Tools

PV Layout Tools



Automatic Electrical Design

Automatic String Design

Duplicate Wired Blocks

Enhanced Features for Commercial PV

Max Self-Consumption

Shading Analysis

Configurable System Loses

Easy Collaboration

Export to Monitoring

solaredge

Q&A

Thank You!

Cautionary Note Regarding Market Data & Industry Forecasts

This power point presentation contains market data and industry forecasts from certain third-party sources. This information is based on industry surveys and the preparer's expertise in the industry and there can be no assurance that any such market data is accurate or that any such industry forecasts will be achieved. Although we have not independently verified the accuracy of such market data and industry forecasts, we believe that the market data is reliable and that the industry forecasts are reasonable.

Version #: 12/2018/ENG NAM