SunShot
U.S. Department of Energy

Incubator Awardee Showcase

Quick Pitches from Solar Companies

March 4, 2015

Monica Andrews and Garrett Nilsen
Solar Energy Technologies Office

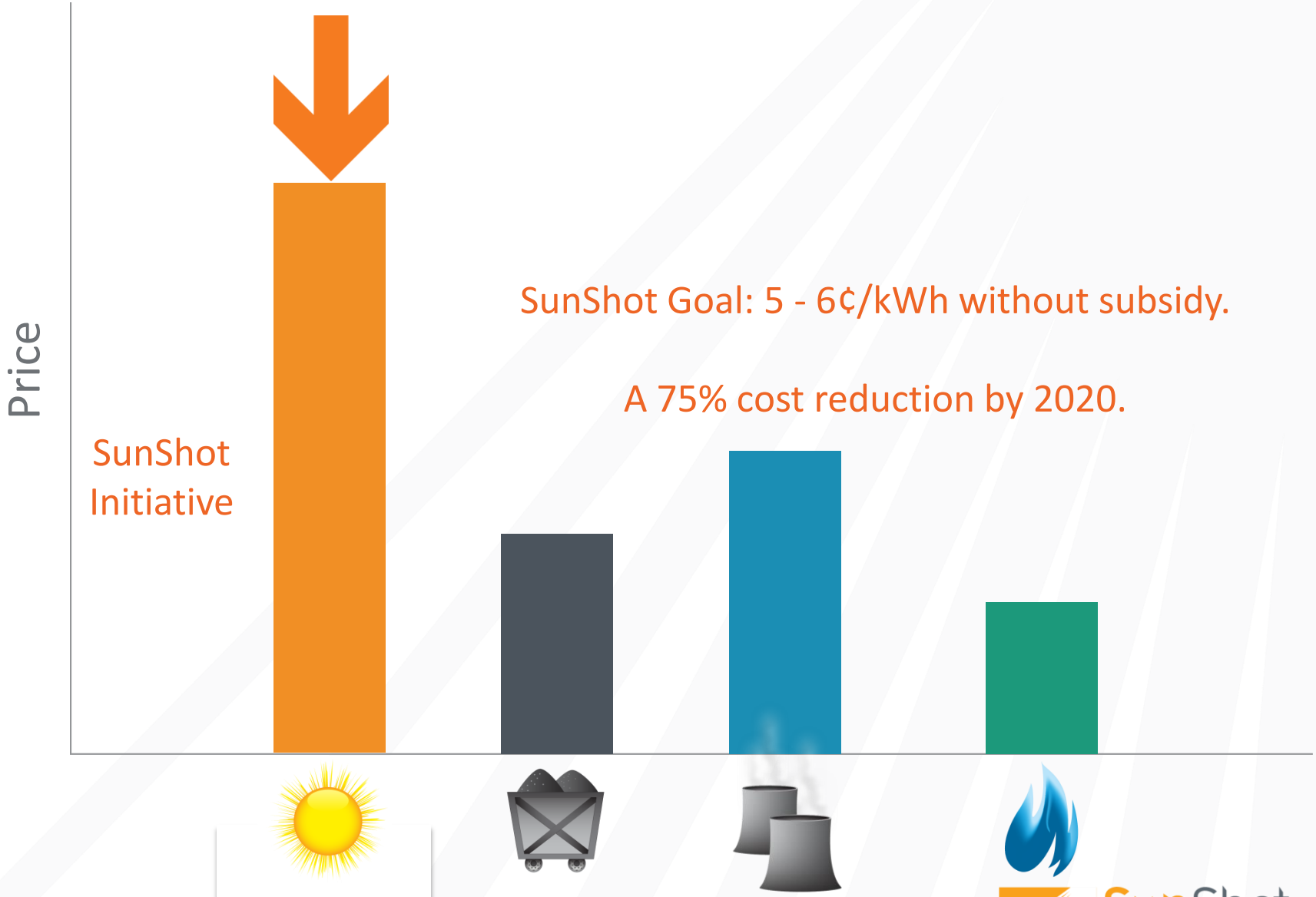
Before we begin:

- If you are a presenter, click on the “raise hand” feature in the webinar
- All attendees will be muted
- Please enter questions into the chat box or email SunShot.Incubator@ee.doe.gov to request more information

SunShot Incubator Awardee Showcase

- Learn about the industry trends, SunShot Initiative and the Incubator program (5 minutes)
- Hear pitches from some of the best ideas in the industry (40 minutes)
- Make connections via email!

SunShot

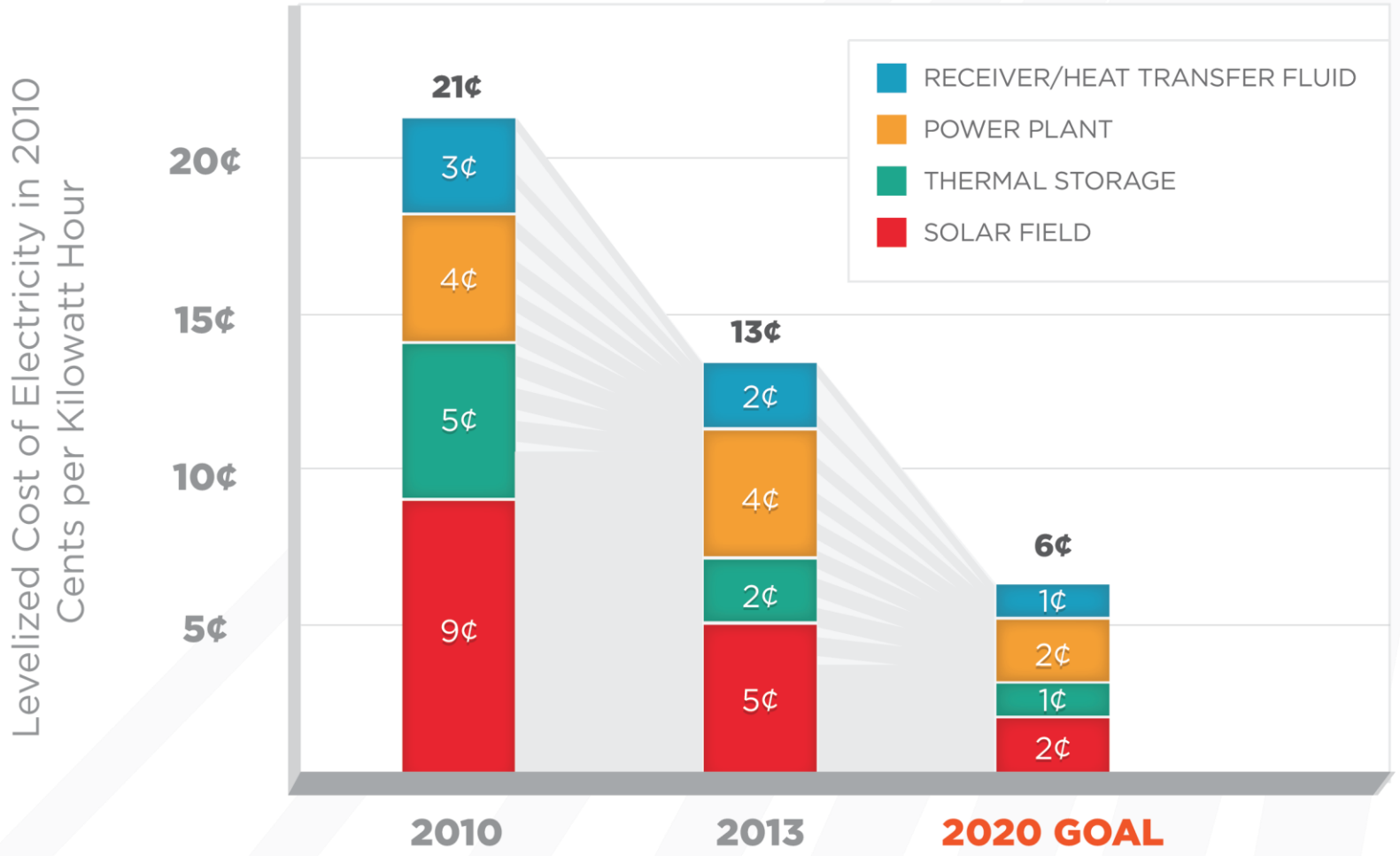


SunShot Goal: 5 - 6¢/kWh without subsidy.

A 75% cost reduction by 2020.

SunShot
U.S. Department of Energy

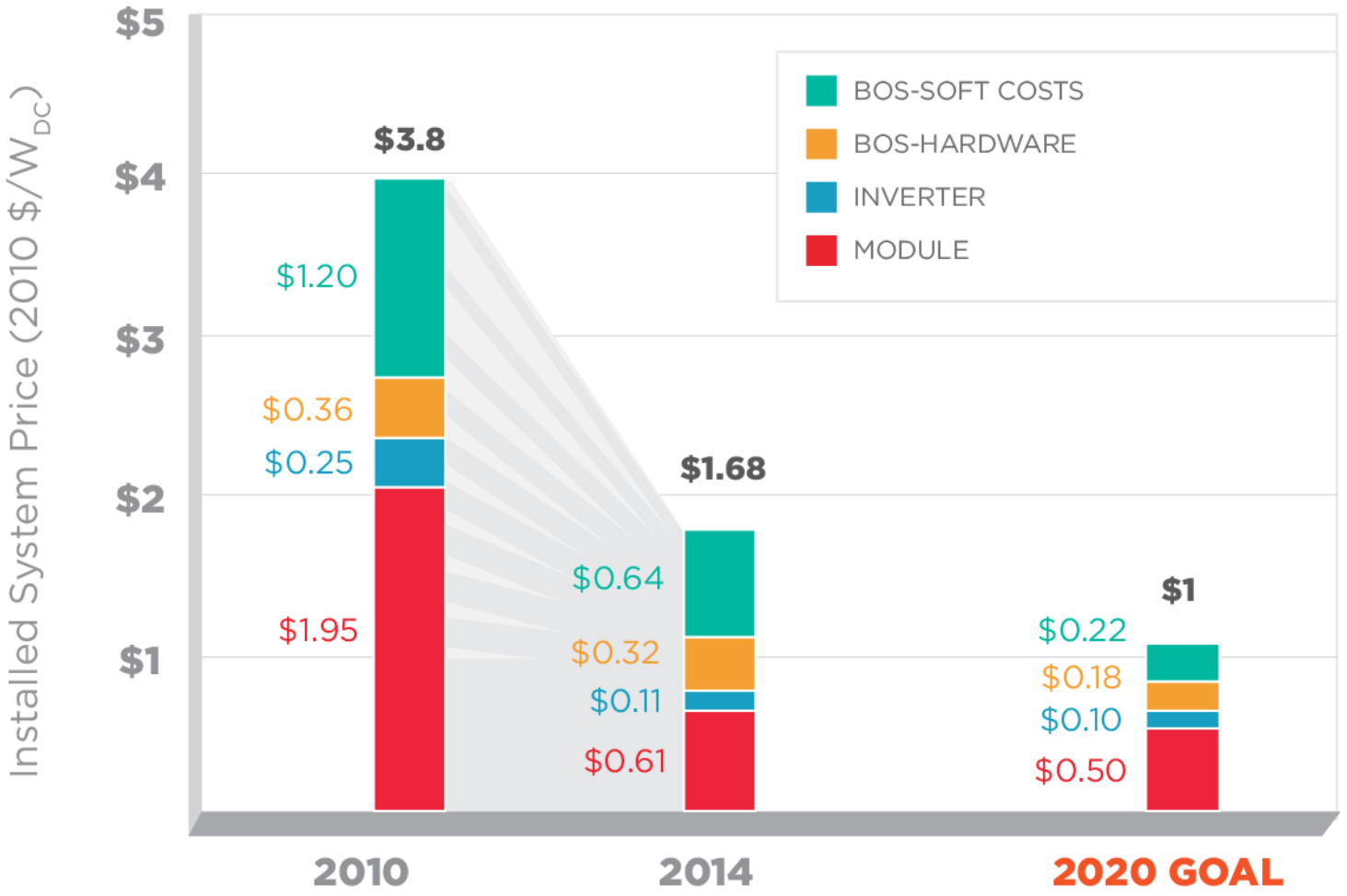
The Falling Cost of Concentrating Solar Power



energy.gov/sunshot

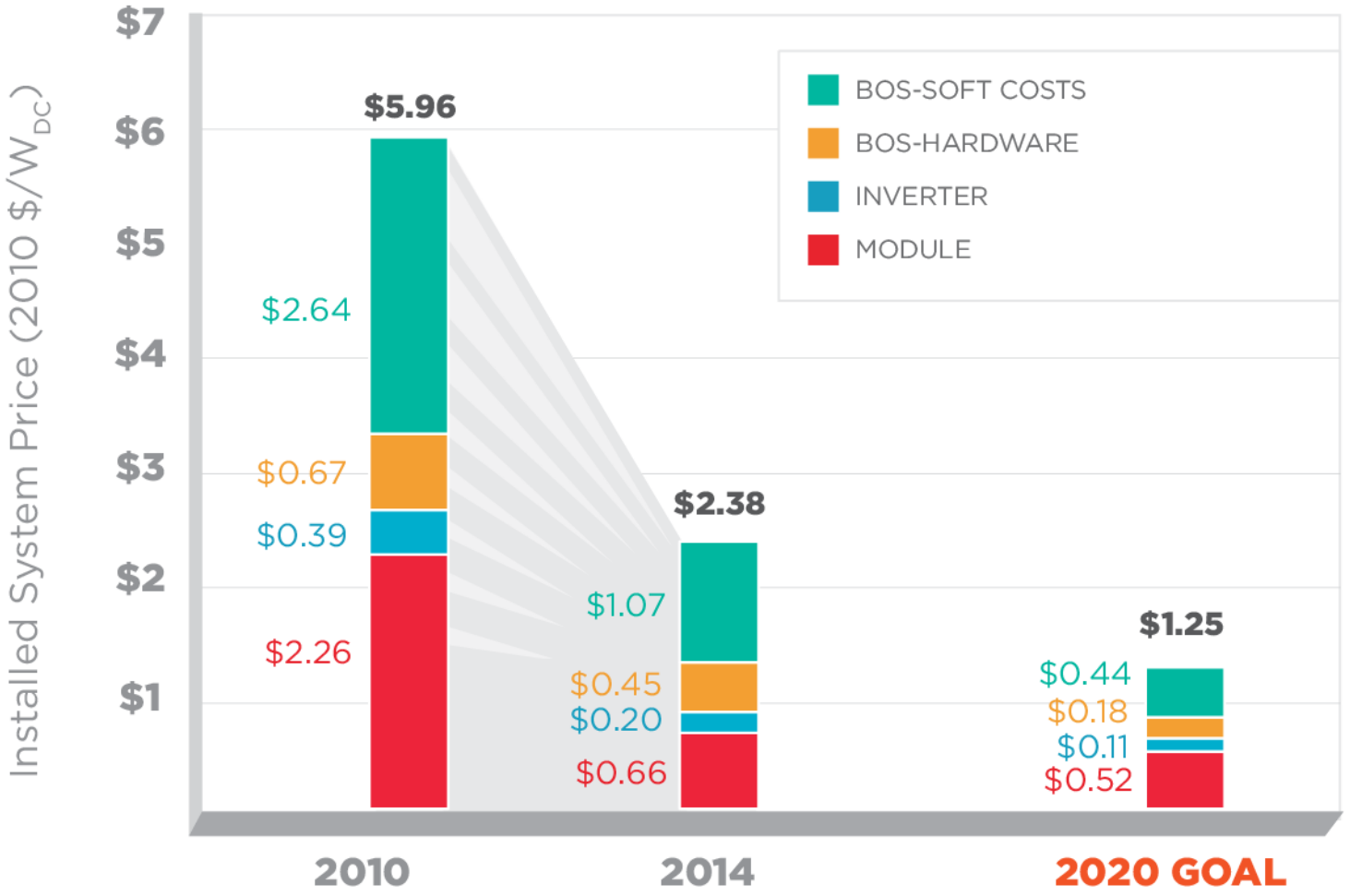
SunShot U.S. Department of Energy

PV Utility-Scale System Pathway to SunShot



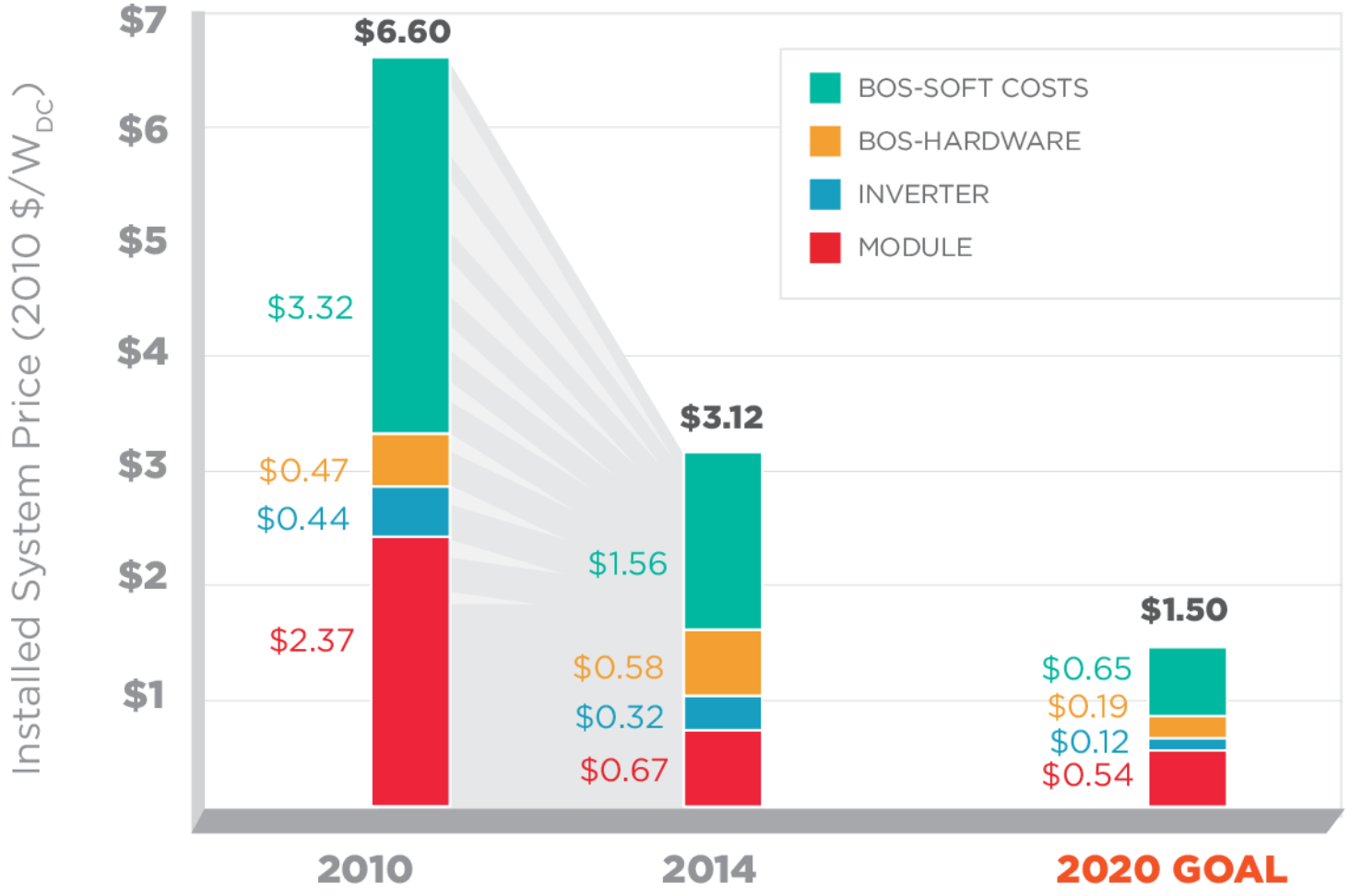
SunShot U.S. Department of Energy

PV Commercial-Scale System Pathway to SunShot



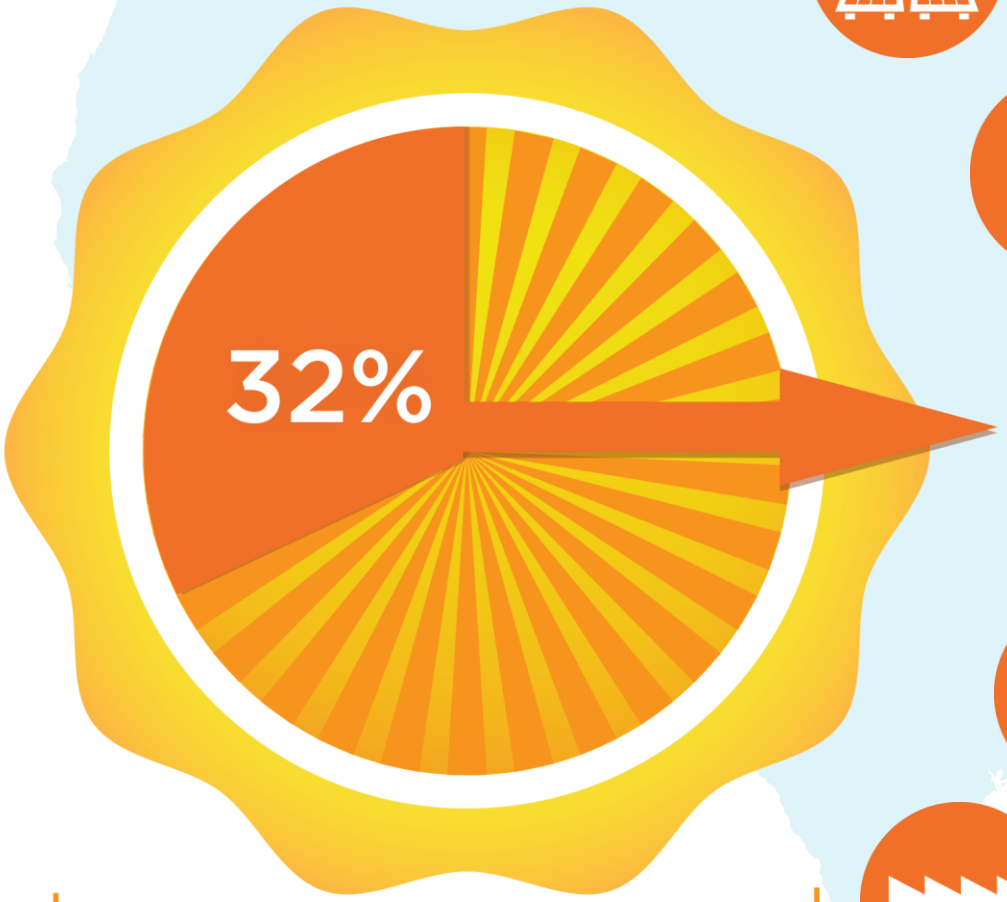
SunShot U.S. Department of Energy

PV Residential-Scale System Pathway to SunShot



SunShot U.S. Department of Energy

SUNSHOT GOAL: THE FINAL PUSH



STREAMLINED GRID INTEGRATION

AFFORDABLE STORAGE

ACCESS TO CAPITAL

A WELL-TRAINED WORKFORCE

ROBUST DOMESTIC MANUFACTURING

Technology to Market

SunShot U.S. Department of Energy

What is the goal of the SunShot Incubator Program?

- Goals
  - Rigorously de-risk technology and market risk
  - Make companies more attractive to private capital
  - Inform private capital of our awardees efforts and market trends
  - Protect tax payer dollars through deliverables

- Failure is defined as:
  - Creating a product to spec, on time and on budget that no one wants
  - Bring to market a product that is viewed to have potential show stopping technical risks

Project Management

- Monthly Phone Calls
- Deliverables
  - Quarterly quantifiable project measurement
    - 3rd party verified
  - Every deliverable a go/no-go
- Use of National lab resources

SunShot Incubator Events

- Anticipate yearly releases
  - Appropriations pending
- In-person showcase this summer
  - Summer 2015, location TBD

Incubator Quick Pitch Schedule

Company	Presenter
Aurora Solar Inc.	Samuel Dele Adeyemo
Clean Energy Collective	Tom Hunt
Faraday	Robbie Adler
Intrinsiq Materials	Michael Carmody
Mosaic	Colin Walsh
Norwich Technologies	Joel Stettenheim
SafeConnect	Zachary McNish
Sighten	Conlan O'Leary
Solar Grid Storage	Daniel Dobbs
Stem	Margaret Hodes
Sundog Solar Technology	Randy Gee
Sungage Financial	Sylvain Mansier
Sunlayar, Inc.	Anne Wright, Robbie Lemos
Sunvestment Group	Matthew Rankin
Village Power Finance	Ty Jagerson
Brittmore Group	Bram Britcher
Clean Power Research	Mark Liffman
Demeter Power Group	Michael Wallander

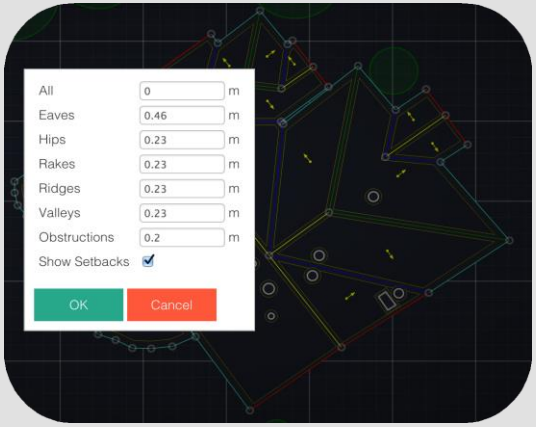
Incubator Quick Pitch Schedule, Continued

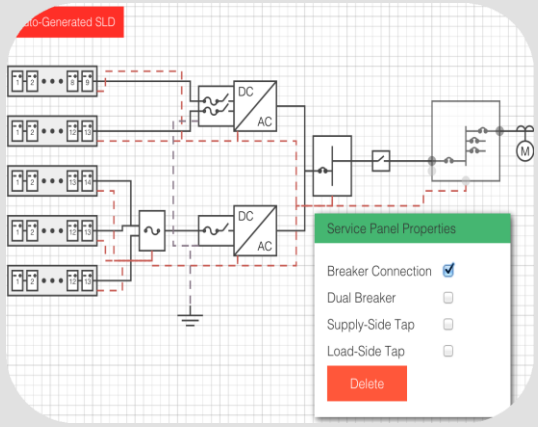
Company	Presenter
Energy Sage	Vikram Aggarwal
Folsom Labs	Paul Grana
Genability	Eric Danziger
Geostellar	Mike Rhodes
ConnectDER	Whit Fulton
kWh Analytics	Jason Kaminsky
Renewable Power Conversion	Rick West
Picasolar	Douglas Hutchings
Simply Civic	Brian Henderson
SineWatts	Shiba Bhowmik
Smash Solar	Troy Tyler
Solar Census	Aaron Woro
SolarNexus	Michael Palmquist
Sun Number	David Hermann
Sunrun Inc.	Gary Wayne
Qado	Brian Fitzsimons
Solaflect	Bill Bender

“Aurora is a cloud-based platform that makes it easy to perform optimized solar PV engineering design, operations and customer acquisition for solar installers of any scale.

Easier, faster and more accurate solar design

- Optimized solar PV designs ➡ Code compliant installations
- Beautiful customer visualizations ➡ Higher customer closing rates
- Remote shading analysis ➡ Fewer truck rolls
- Auto-generated single-line diagrams ➡ Time and cost savings

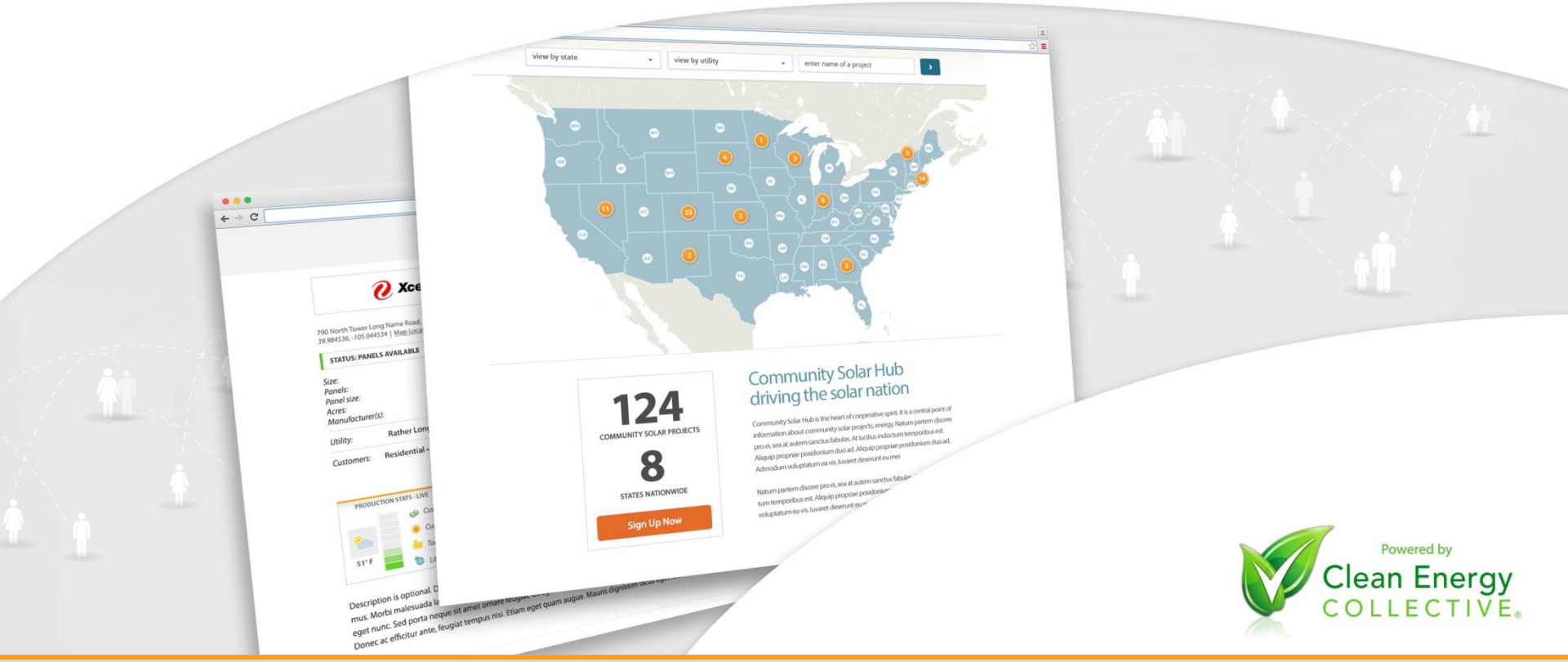




Over 3,500 installations have been designed using Aurora since 12/2014

CommunitySolarHub.com

- Centralized portal for all community solar projects
- Project tools for EPCs, utilities, and individuals
- Now anyone can create a community solar project

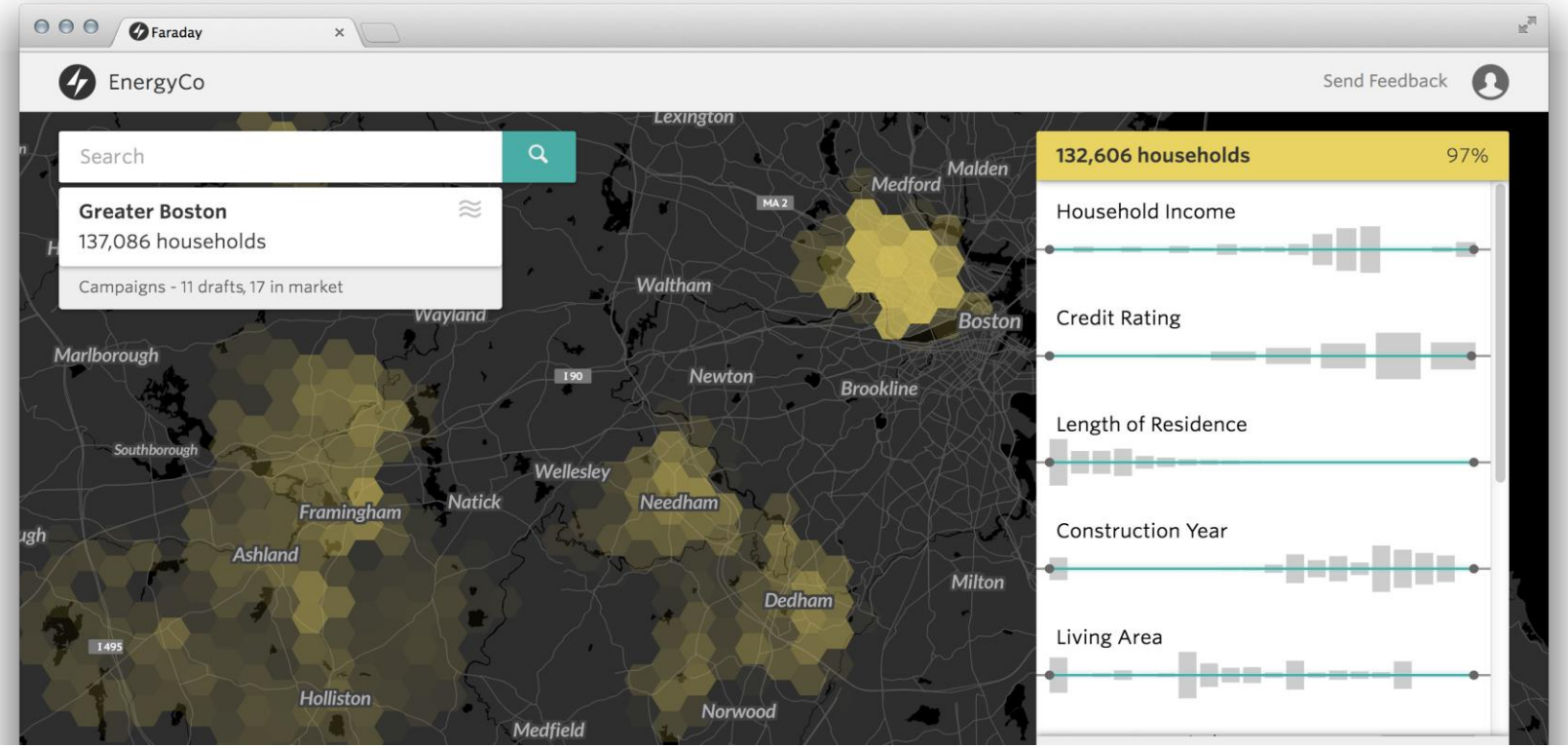


Powered by Clean Energy COLLECTIVE

Faraday

Superpowers for marketing professionals

Find new customers using data



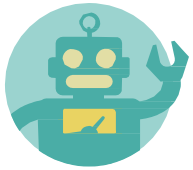
Faraday

Solution

Faraday makes sophisticated
data-driven outreach fun, easy, and affordable

Explore markets large and small with built-in nationwide data coverage

Segment the population into audiences using dozens of criteria



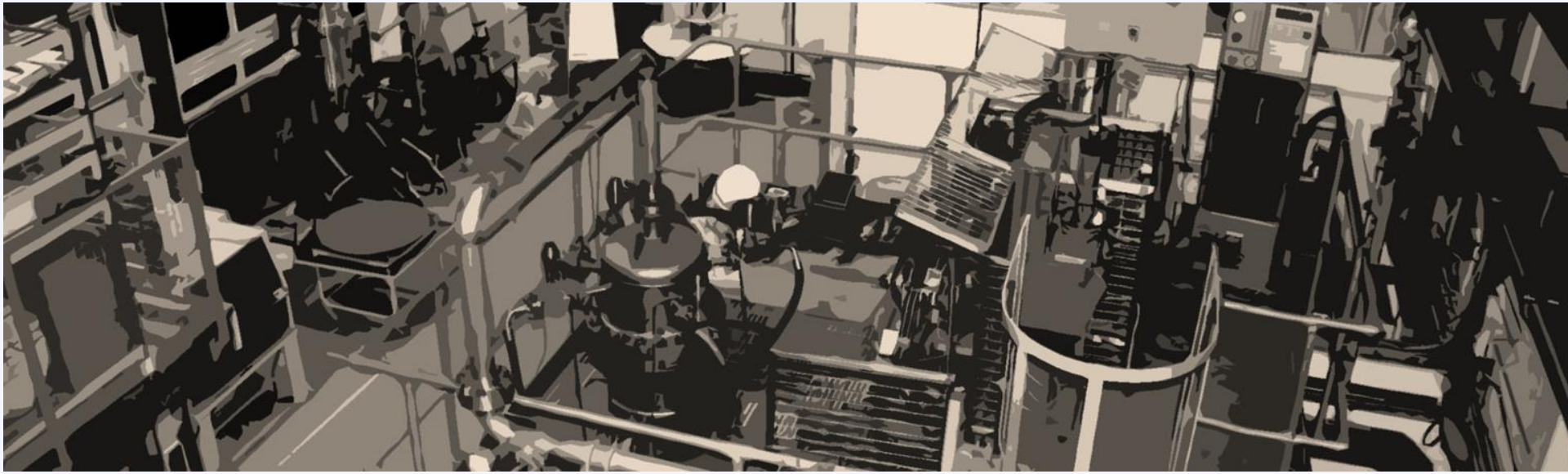
Target the most likely candidates with Faraday predictive technology

Launch campaigns in seconds with multichannel marketing automation

Track responses in real time at the household level for immediate insight

Nanoparticle Electronic Ink

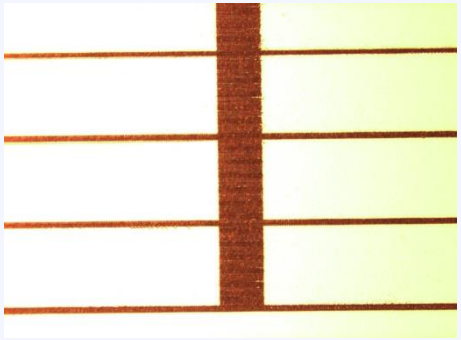
- Replacing Fired Through Silver Paste with Printed and Sintered Nickel Silicide and Copper
- Saving the Industry Billions
- Introducing Greener and Lead Free Processes

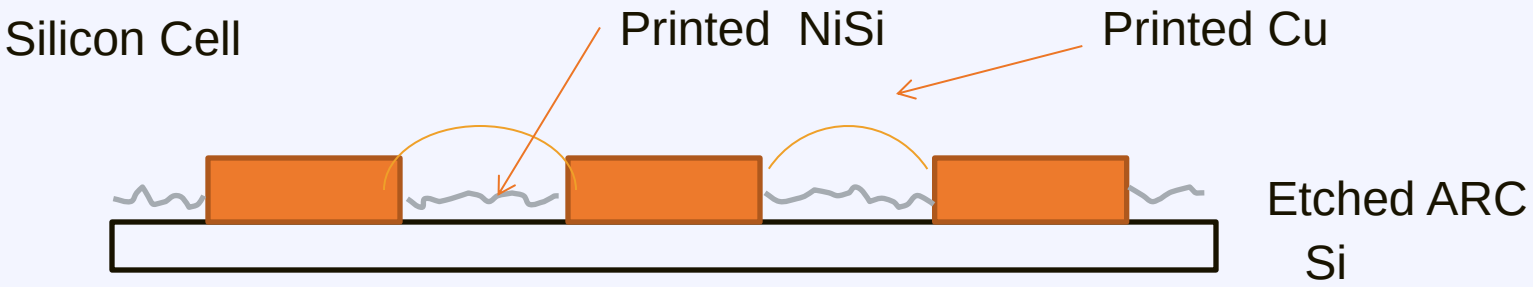


The Process

Printing Modalities: Inkjet, Aerosol Jet, Sonic, or Screen Paste

Sintering: The copper materials can be sintered photonically (laser) or with a reducing atmosphere in a low temperature furnace.





Gridline resistivity, TLM, lifetime by pFF

MOSAIC

PROBLEM

People need financing to pay for solar and other home energy improvements.

Banks aren't cutting it.

SOLUTION

Mosaic's online marketplace seamlessly connects homeowners, installers, investors and an engaged community to deploy home energy solutions.

MOSAIC

Marketplace

- Homeowners access home energy installers and low-cost, hassle-free financing.
- Installers grow through best in class tools, financing products and leads.
- Investors get a range of energy investments with strong financial and environmental returns.
- Community members earn money generating home energy customer leads.

High-Efficiency, Low-Cost Parabolic Trough CSP

NORWICH TECHNOLOGIES

- Novel receiver increases plant efficiency at temperatures up to 650°C
- Trough mirror redesign replaces heavy structural members with cables
- Cost savings by reducing materials and increasing power plant output

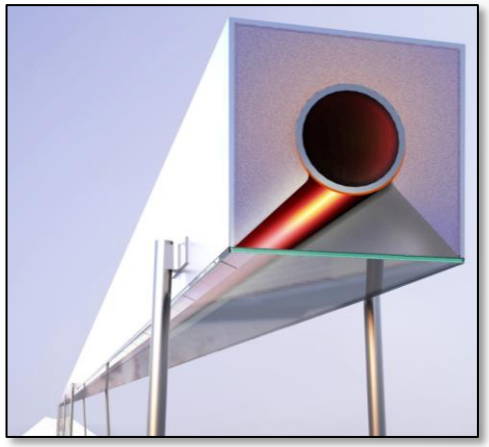
Parabolic trough power plant - Photo credit: Sandia National Lab

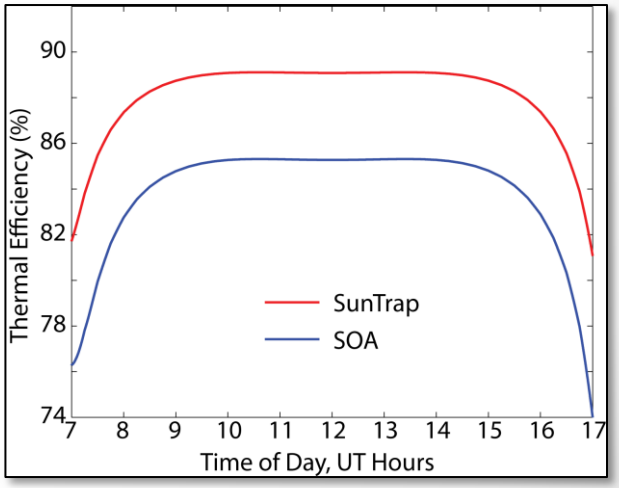
SunTrap™ Receivers:

Disrupting the CSP Market

SunTrap Solutions

1. Provides **more power with stronger margins**
2. Improved efficiency above 400˚C **enables high T trough operation**
3. Improves **energy capture and decreases storage costs**
4. Replacing the vacuum with a simpler structure **reduces O&M costs and increases reliability**

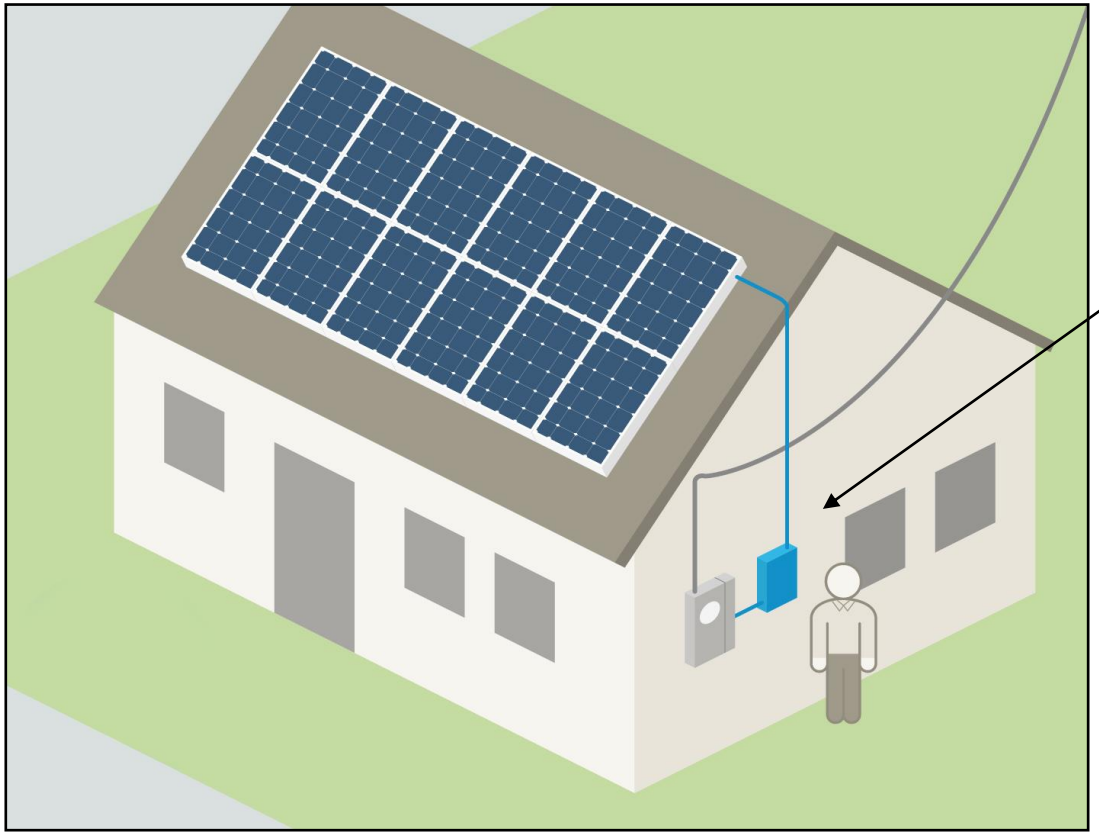




DE-EE0006687

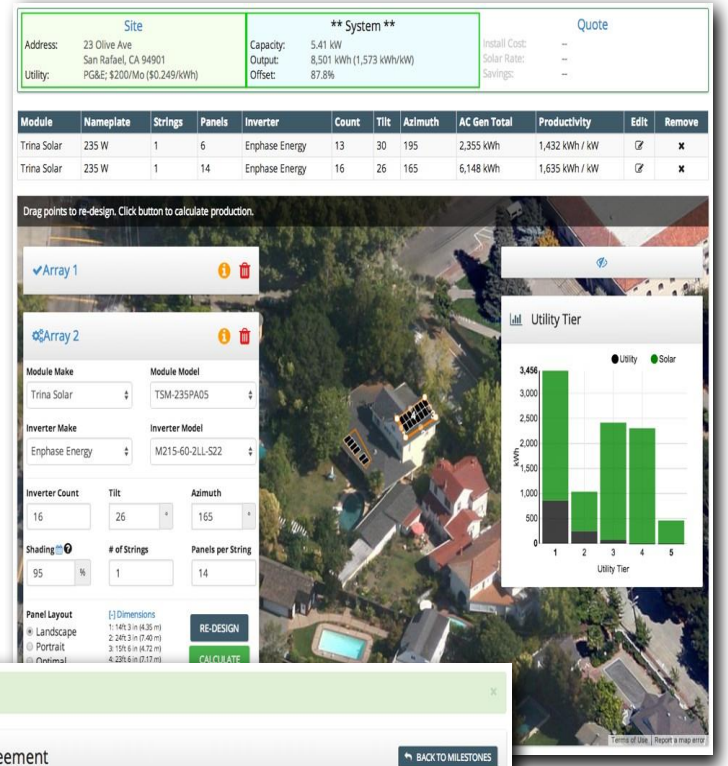
NORWICH TECHNOLOGIES

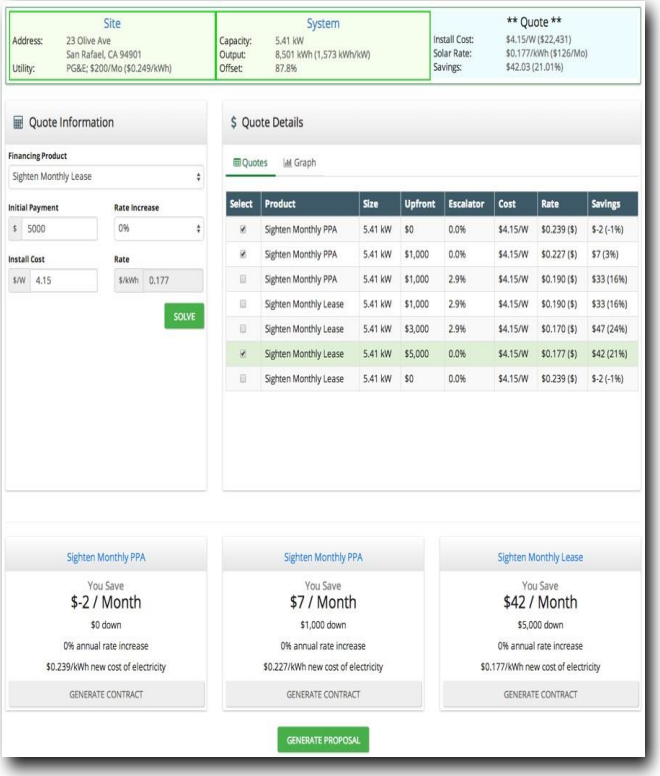
SafeConnect Solar: Maintaining Safety and Reducing Costs Via Hardware Innovation

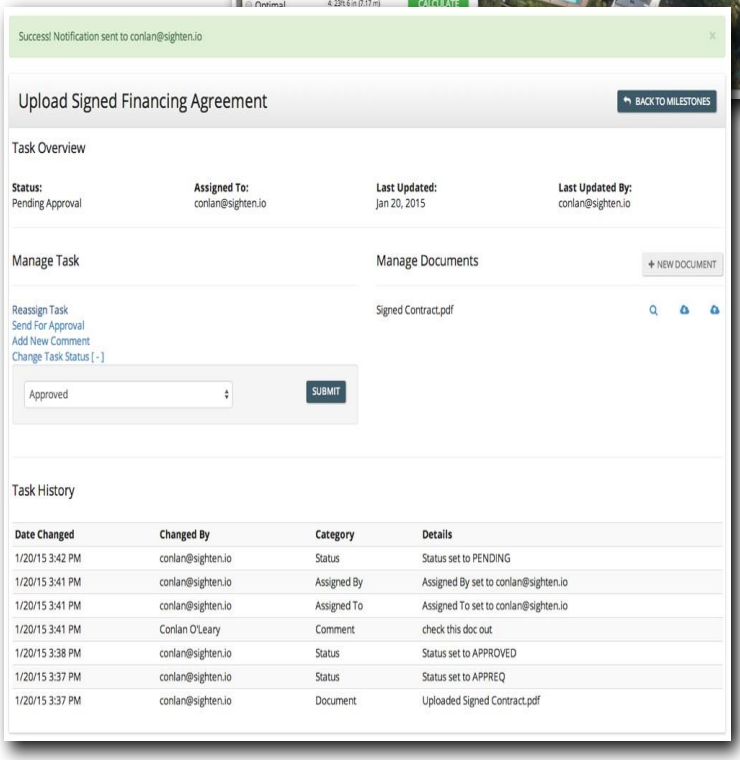


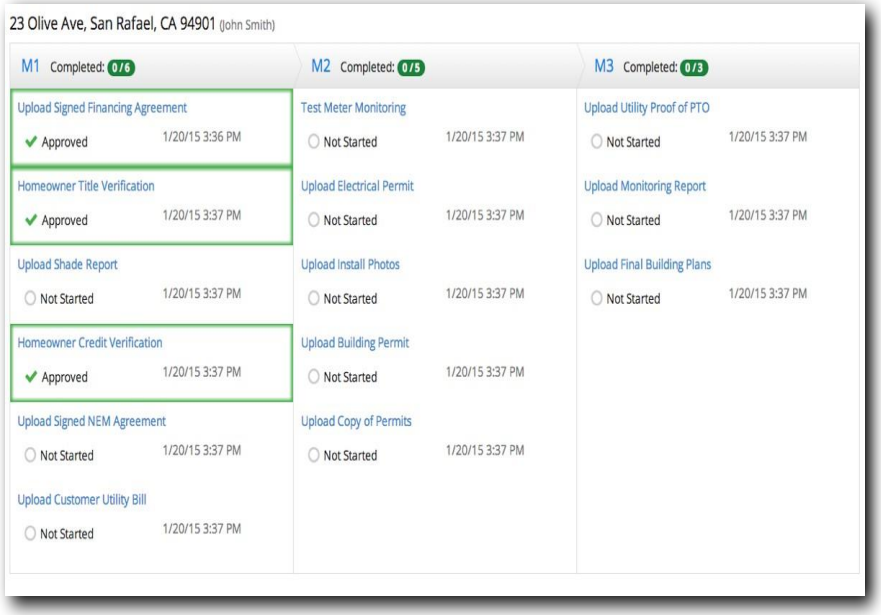
- Licensed electrician installs SafeConnect device only
- Non-specialty labor safely installs balance of ACPV system
- Safety for owner/installer; system installed at substantially lower cost

Salesforce for Solar

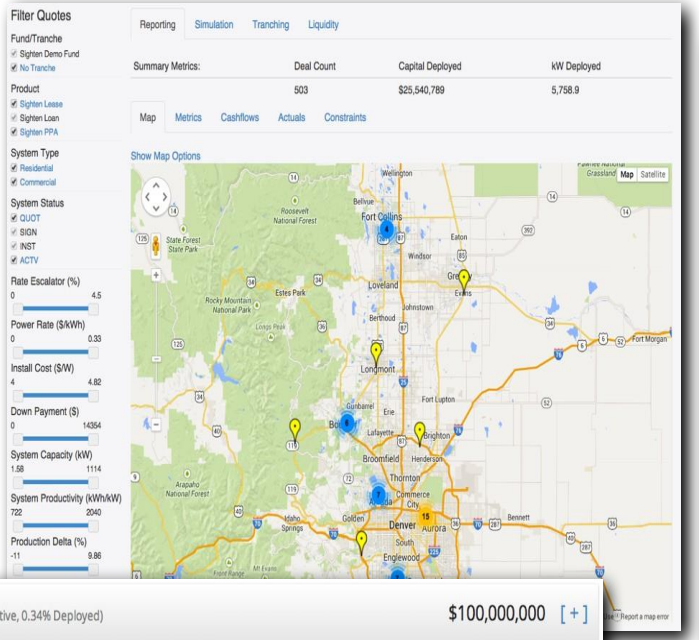


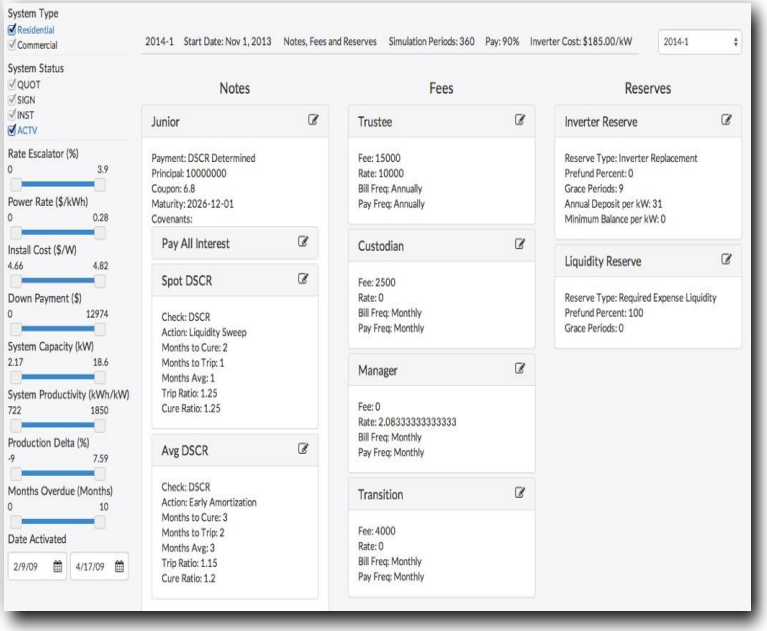


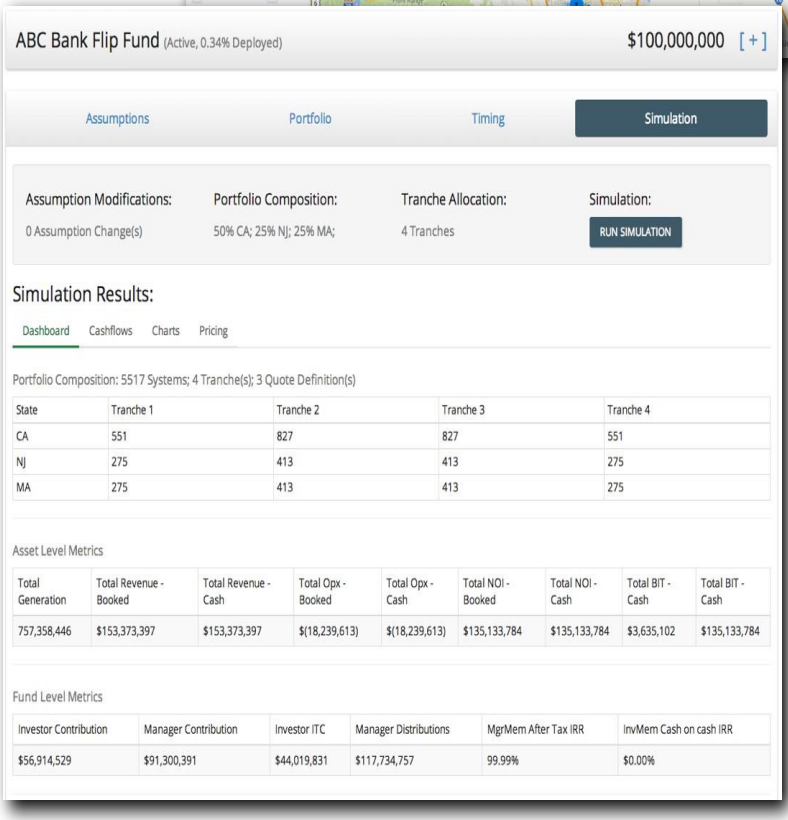




Bloomberg for Solar





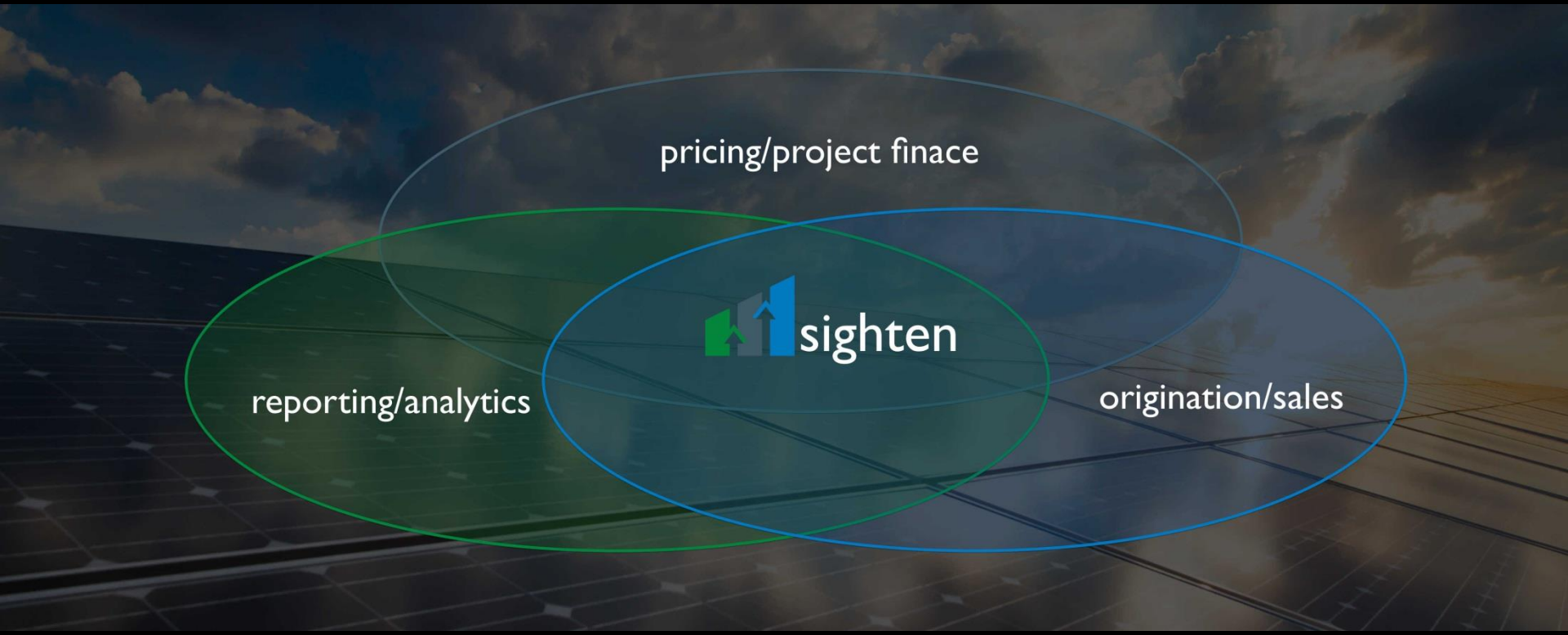


State	Tranche 1	Tranche 2	Tranche 3	Tranche 4
CA	551	827	827	551
NJ	275	413	413	275
MA	275	413	413	275

Total Generation	Total Revenue - Booked	Total Revenue - Cash	Total Opx - Booked	Total Opx - Cash	Total NOI - Booked	Total NOI - Cash	Total BIT - Cash	Total BIT - Cash
757,358,446	$153,373,397	$153,373,397	$(18,239,613)	$(18,239,613)	$135,133,784	$135,133,784	$3,635,102	$135,133,784

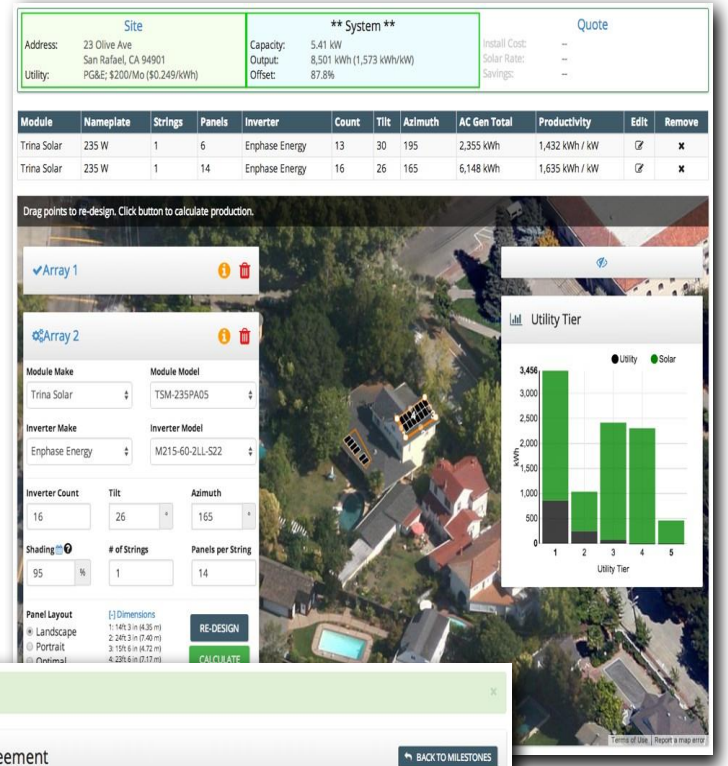
Investor Contribution	Manager Contribution	Investor ITC	Manager Distributions	MgrMem After Tax IRR	invMem Cash on cash IRR
$56,914,529	$91,300,391	$44,019,831	$117,734,757	99.99%	$0.00%

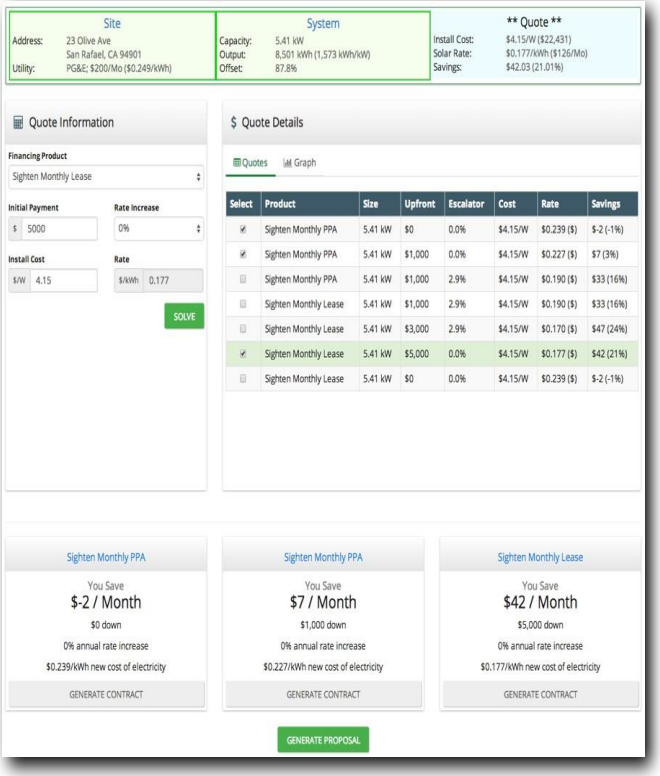
Comprehensive Software Toolset for Solar

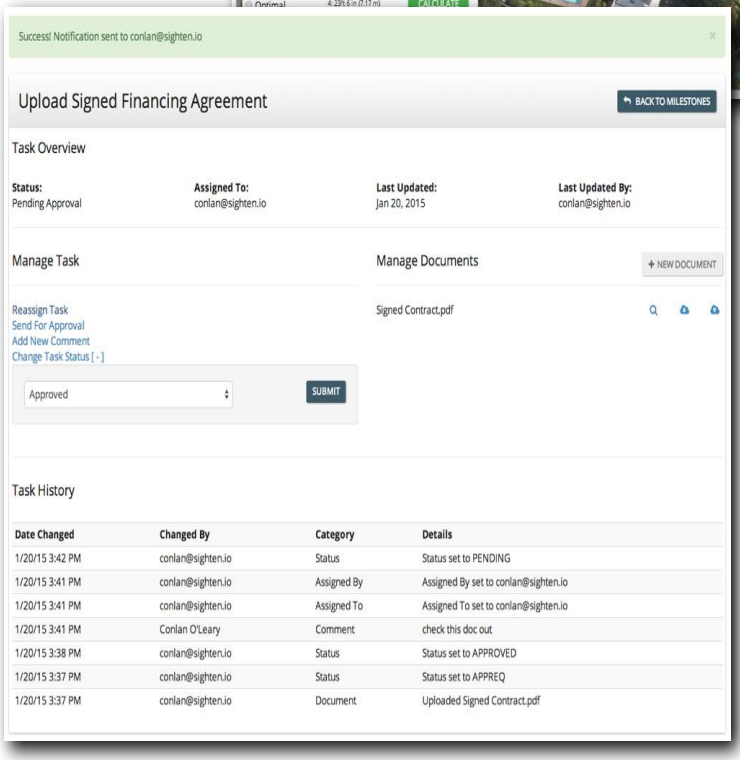


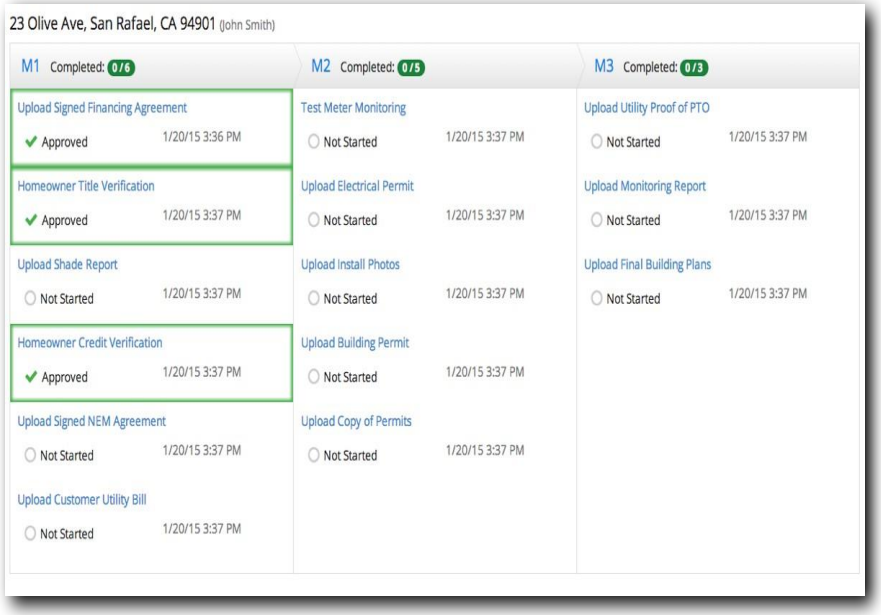
- Entire asset life cycle: lead to securitization
- Bleeding edge Software-as-a-Service platform
- Reduce costs, mitigate risk, scale effectively

Salesforce for Solar

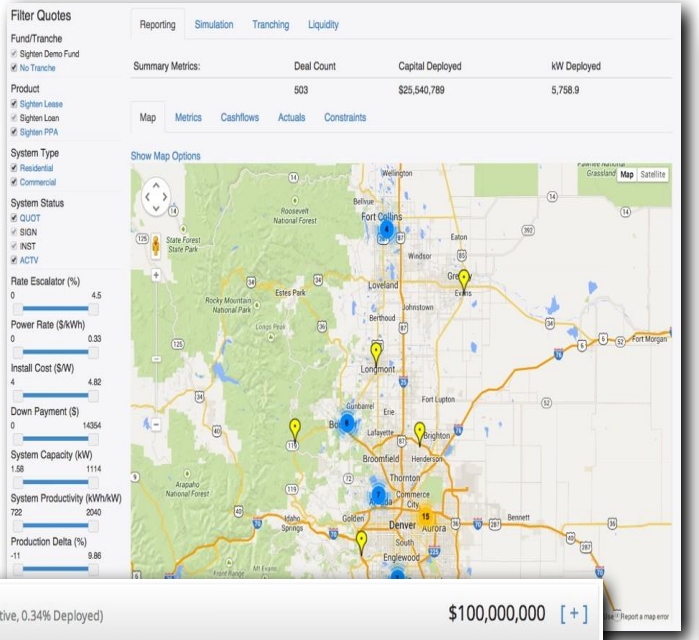


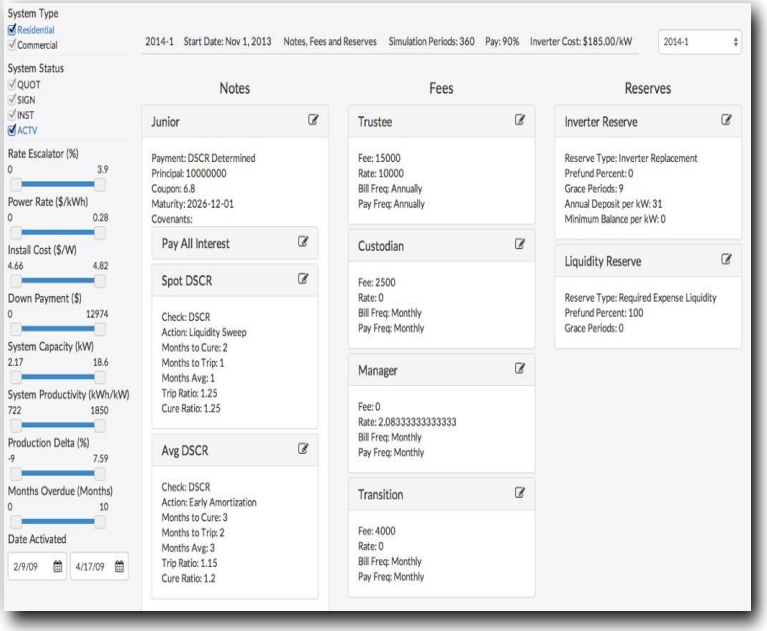


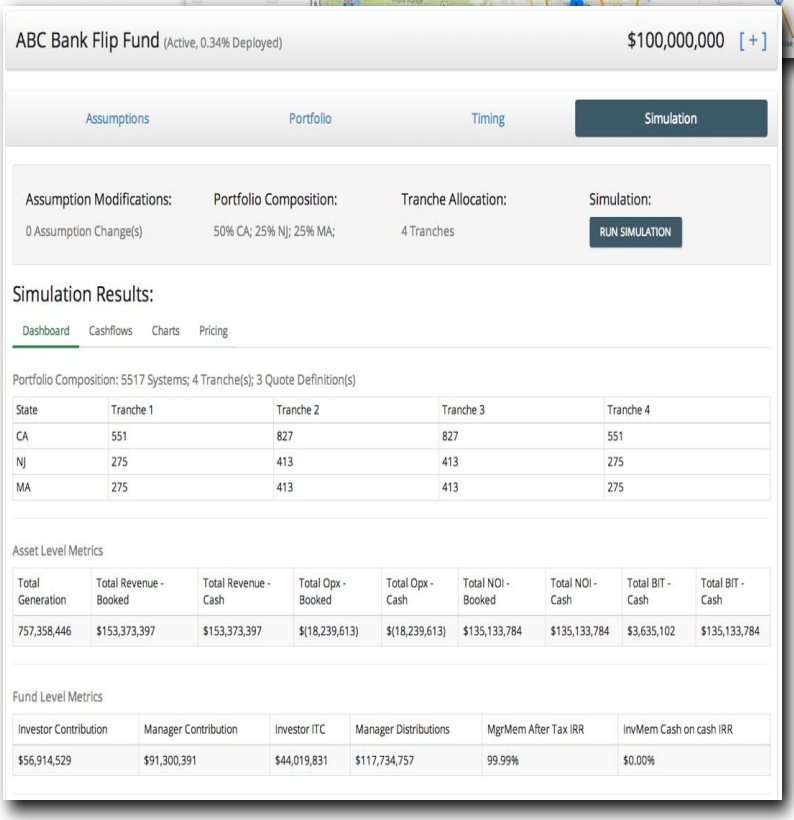




Bloomberg for Solar







State	Tranche 1	Tranche 2	Tranche 3	Tranche 4
CA	551	827	827	551
NJ	275	413	413	275
MA	275	413	413	275

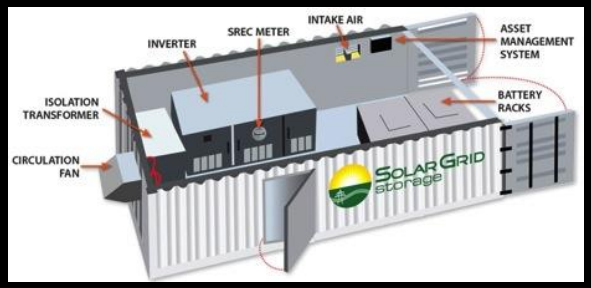
Total Generation	Total Revenue - Booked	Total Revenue - Cash	Total Opx - Booked	Total Opx - Cash	Total NOI - Booked	Total NOI - Cash	Total BIT - Cash	Total BIT - Cash
757,358,446	$153,373,397	$153,373,397	$(18,239,613)	$(18,239,613)	$135,133,784	$135,133,784	$3,635,102	$135,133,784

Investor Contribution	Manager Contribution	Investor ITC	Manager Distributions	MgrMem After Tax IRR	invMem Cash on cash IRR
$56,914,529	$91,300,391	$44,019,831	$117,734,757	99.99%	$0.00%

Solar Storage Operations Center

- Cost-effective control of residential, commercial and utility-scale PV + storage assets
- Management of intermittent, bi-directional power transactions unique to PV + storage
- Stabilizes grid via dynamic aggregation of multiple PV + storage resources

SOLAR GRID storage

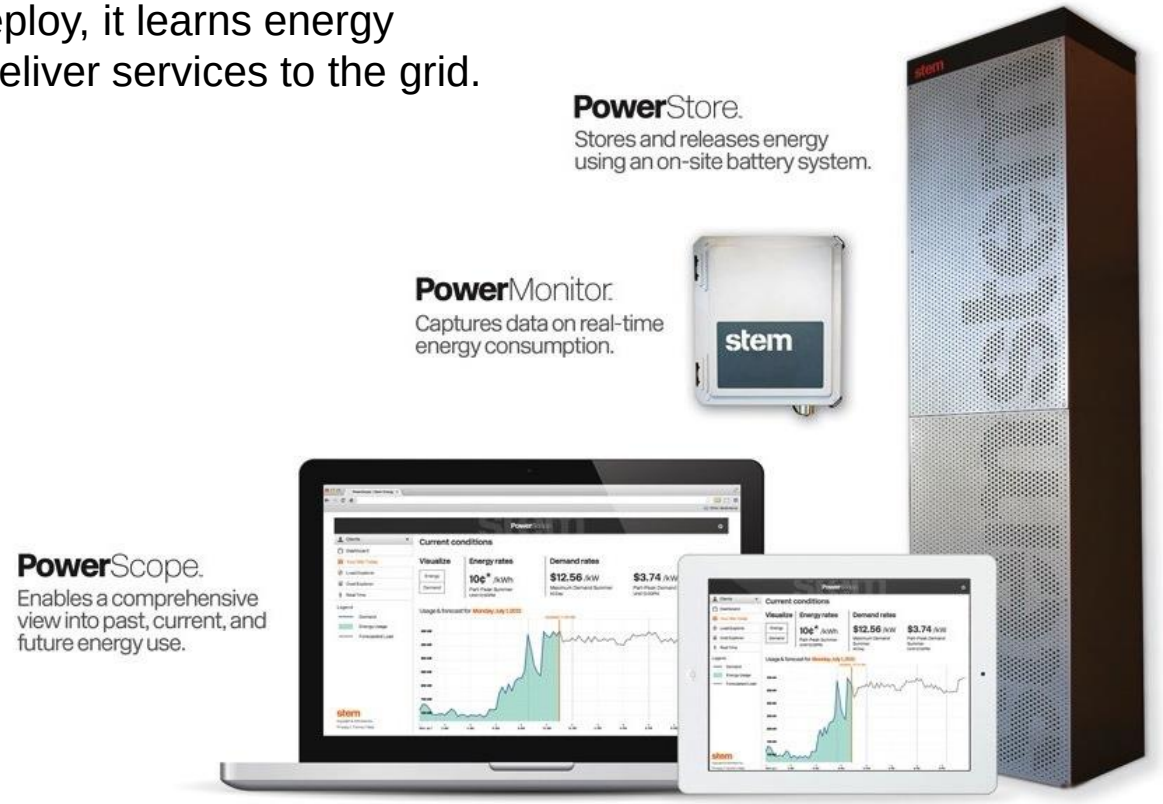


About Stem

Stem combines powerful learning software and advanced energy storage, simultaneously helping businesses better manage electricity use and enhancing grid operations.

Stem does more than store and deploy, it learns energy profiles to maximize savings and deliver services to the grid.

- Founded in 2009
- Headquartered in Millbrae, CA
- Product and technology UL-certified
- Engaged in programs with SMUD, PG&E, SCE, SDG&E and HECO



stem | SunShot U.S. Department of Energy

SunShot: SolarScope and SolarController

Adding storage to distributed solar:

- Increases the value of solar systems
- Reduces associated grid integration costs

SolarScope: Analysis tool to identify viable PV + storage projects.

SolarController: Autonomously dispatched distributed storage to mitigate voltage fluctuation and reduce curtailment

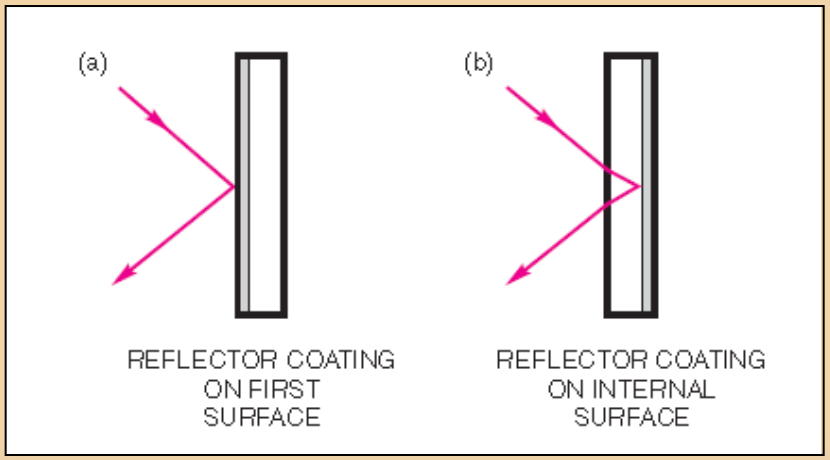
For more information, contact Program Manager margaret.hodes@stem.com

stem | SunShot U.S. Department of Energy

Low-Cost Front-Surface Reflectors

Sundog solar technology

Front-Surface Reflector **Traditional Glass Reflector**



- Lower Cost
- Higher Reflectance
- Unbreakable
- Antisoiling Surface

Reflector Costs Cut in Half

Higher Reflectance

Nanocoating Reduces Cleaning Costs

Key Corporate Partner

Red Spot Paint & Varnish Company, Inc.

RED SPOT

SunShot U.S. Department of Energy

Solar Loan Marketplace

Sungage Financial
your solar. your savings.

- Helping homeowners save more through ownership
- Easy integration with solar sales process—immediate, online credit decisions 24/7; electronic documentation
- Partner with debt providers to secure funds with low cost of capital

"The Number One Emerging Trend in Residential Roof-Top Solar is The Shift from Third-Party Leases & PPAs to Solar Loans that Allow Direct Ownership" (GTM Research)

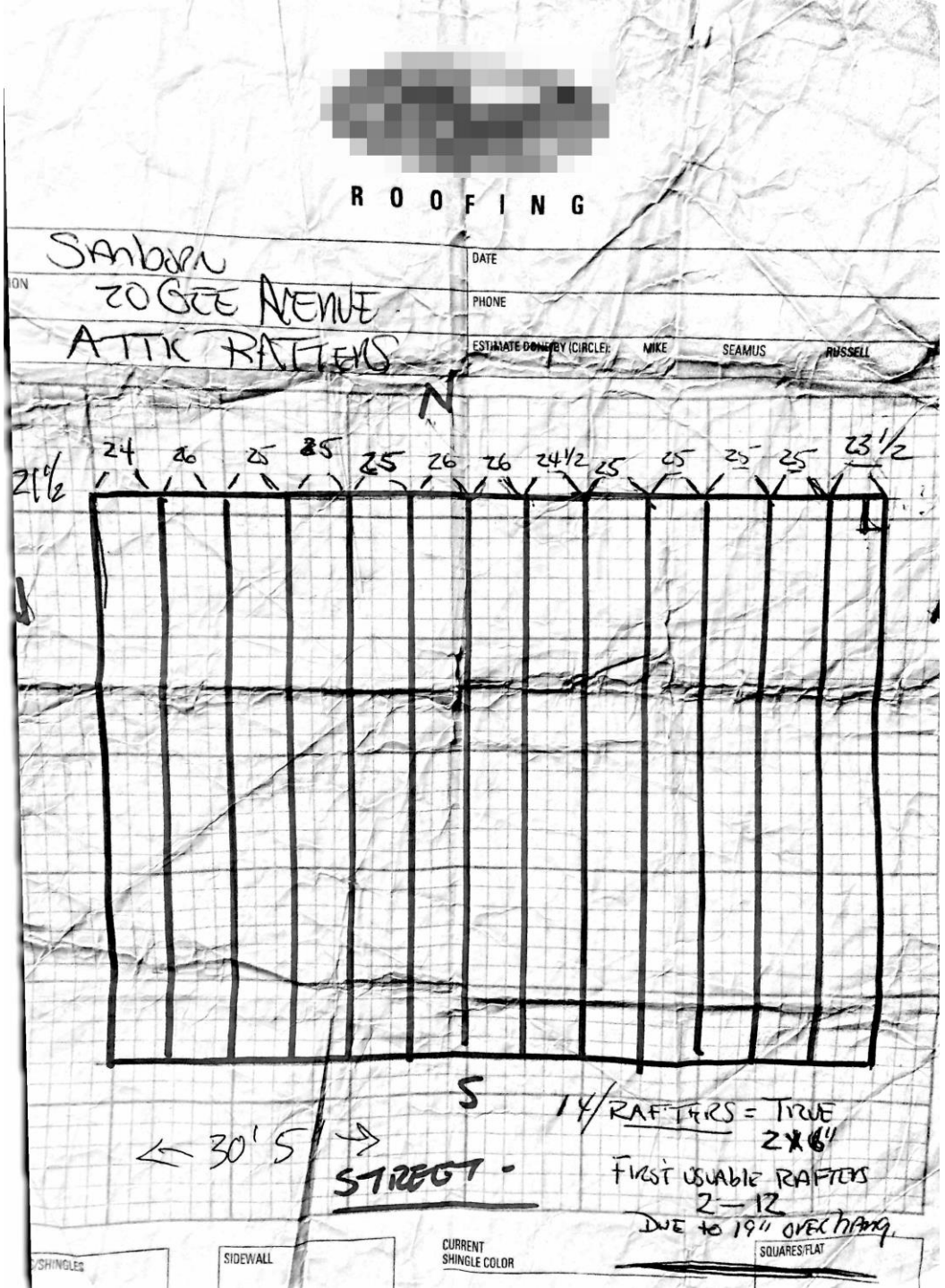
"We love working with Sungage. Their financing has become our go-to and has helped us increase conversion rates. They make it easy" (Solar Business Owner)

Sunlayar®

Sunlayar®

Today.

(Those not using Sunlayar)

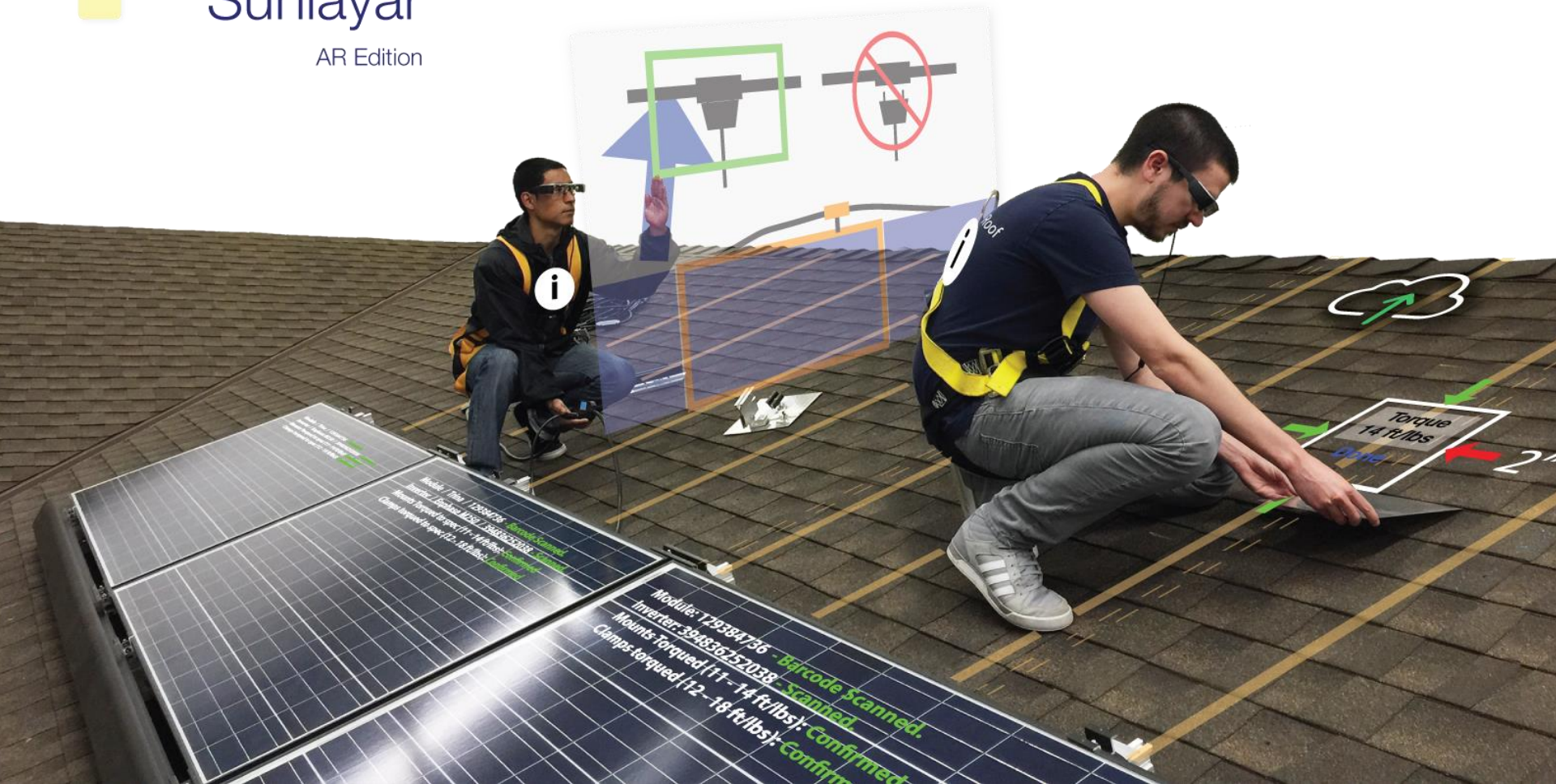


...engineering a real-time software platform to power the solar industry.

For more: DOE.Sunlayar.com

Sunlayar®

AR Edition



Community Sourced Funding

- Transparency and standardization in the mid-market project finance process
- Broadening the investor base by making project ownership easily accessible to community inspired investors
- Streamlined and efficient due diligence process to reduce the cost of capital

SUNVESTMENT group

Village Power Finance

What We Offer:

- -- Local solar crowdfunding platform for community organizations
- -- Accesses lower cost of capital
- -- Platform integrates whole project lifecyle
- -- Automated services for development, contracting, asset management
- -- Freemium model drives network value

Who We Serve:

- *** Solar Customers:** Churches, schools, clubs, universities, businesses and municipalities
- *** Investors:** Community members first; co-investment from crowdfunders & institutional investors
- *** Secret Weapon:** Empowered community champions, independent energy consultants, municipal leaders, “community solar” developers

- www.villagepowerfinance.com

VillagePower

Browse Projects

My Projects

All Projects (74)

- Seeking Funding (1)

- Funded (2)

- In Development (70)

Browse Projects

70 In Development

In Development

Projects in local development, coming soon.

San Francisco, CA

Goal: $0

Size: 0 kW

KEEP ME POSTED

Emeryville, CA

Goal: $351,789

Size: 98 kW

KEEP ME POSTED

Oakland, CA

Goal: $0

Size: 49 kW

KEEP ME POSTED

VillagePower BETA

Your Community. Your Solar.

Call Us Today
(855) 786-4376

First Baptist Church

Location: Selma, CA **Size:** 60 kW **Goal:** $229,254

Primary Champion
David Odishoo
Manteca, CA

Invite Friends | Contact Champions | Follow Project

Progress

Be first to pledge in this project!

Pledge to Invest

Returns
(Tax Equity Investors)

IRR: 14.6%
ROI: 84.5%

Payback time: 3 years

Return on $10,000 invested: $8,450

Returns
(Non Tax Equity Investors)

IRR: 4.4%
ROI: 54.2%

Payback time: 13 years

Return on $10,000 invested: $5,420

Overview | Gallery | Downloads | Bulletin | Champions | Financials | Investors | Invitations

Edit This Section

Automating Large Scale PV Construction

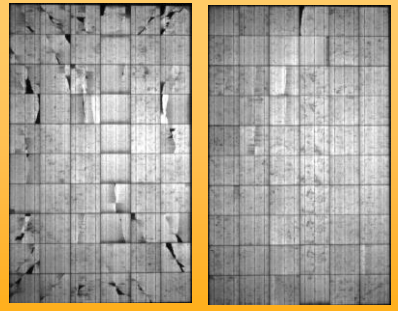

Mobile Panelization Factory


Automated Installation System


40+ panels per hour per robot

Cell Cracking Under Identical Loads*

Standard Framed Module



SolStak™ Bonded Back Rail

High Reliability Frameless Mounting

>10X Faster • 10% Lower Cost • Higher Reliability

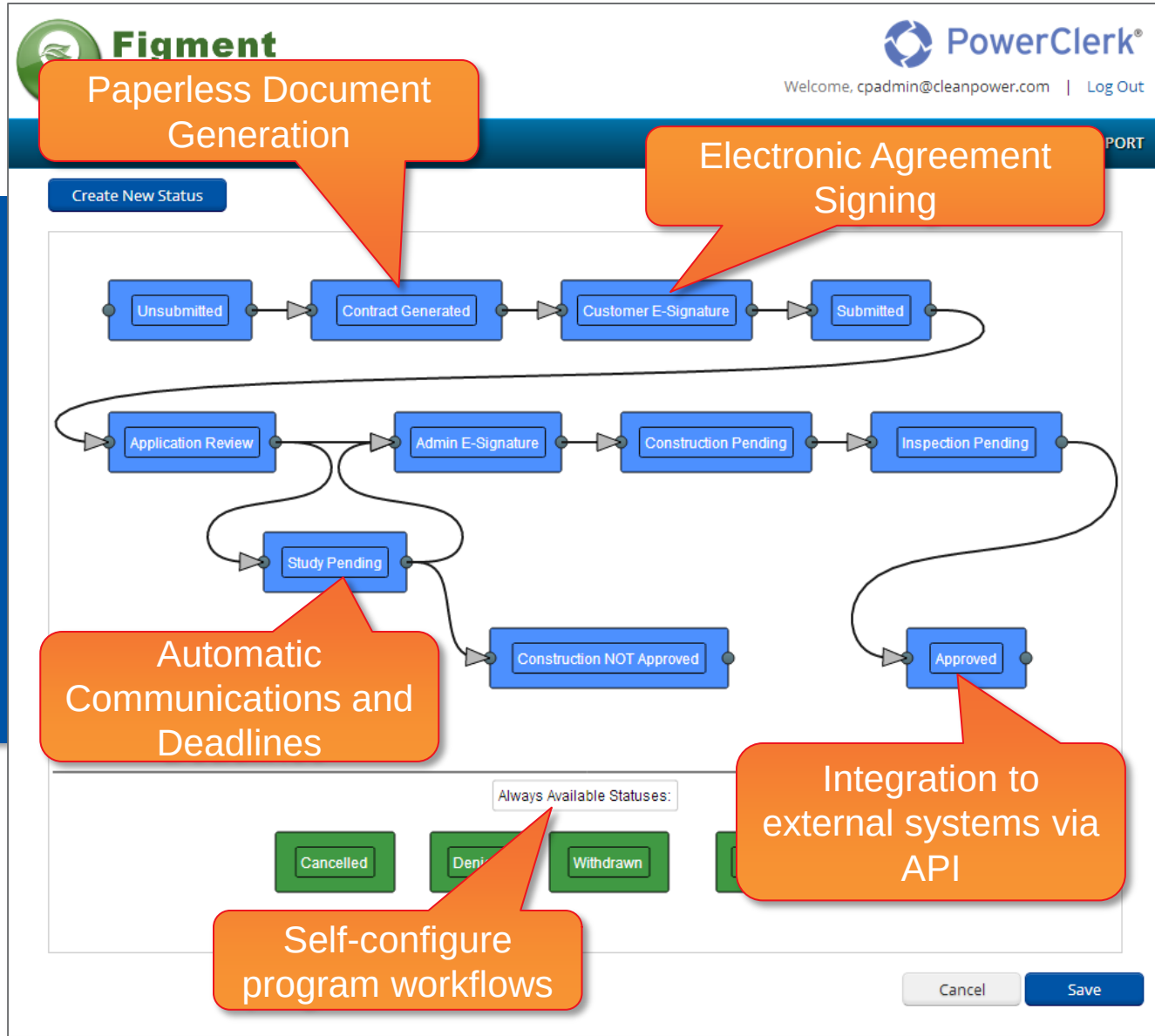
*Test conducted by NREL

PowerClerk®
powered by Clean Power Research®

Interconnection Administration Software for Utilities

Streamlines Interconnection

Reduces utility & installer costs



Clean Power Research®

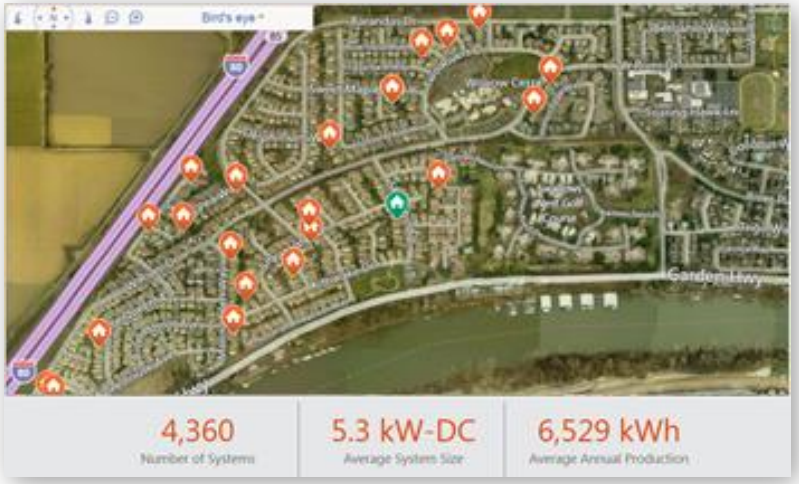
WattPlan™

powered by Clean Power Research®

Solar Customer Engagement Software for Utilities

Get an Instant Personal Estimate

Explore Financial Options



Take the Next Step Toward Solar

Pre-qualifies leads & reduces customer acquisition costs

Clean Power Research®

Secure & Scalable Solar Financing

DEMETER POWER GROUP
Powered by SunShot
U.S. Department of Energy

A Tool To "De-Meter" Your Building

- Commercial solar lease/PPA collected as a property tax assessment
- Enhanced credit by tying underwriting to the building – not the offtaker
- Credit pre-approval in minutes

EnergySage is the "Kayak of Solar"

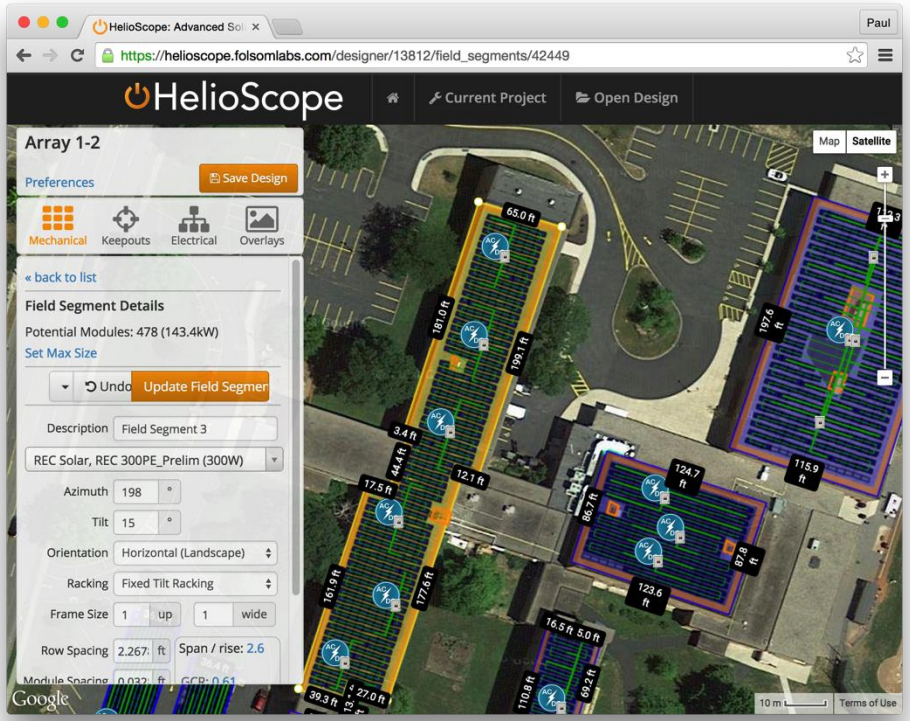
First and Only Online Solar Marketplace

- Destination Site for Solar
- Multiple quotes from pre-screened solar installers
- Quotes in apples-to-apples format

VIKRAM AGGARWAL
Founder & CEO
vikram@energysage.com
617.396.7243

HelioScope Revolutionizes the Solar Design Process for Commercial & Residential Arrays

- Easy-to-use CAD alternative
- Streamline sales/engineering
- Generate proposals 2-4x faster
- Evaluate design tradeoffs
- Collaborate in real-time

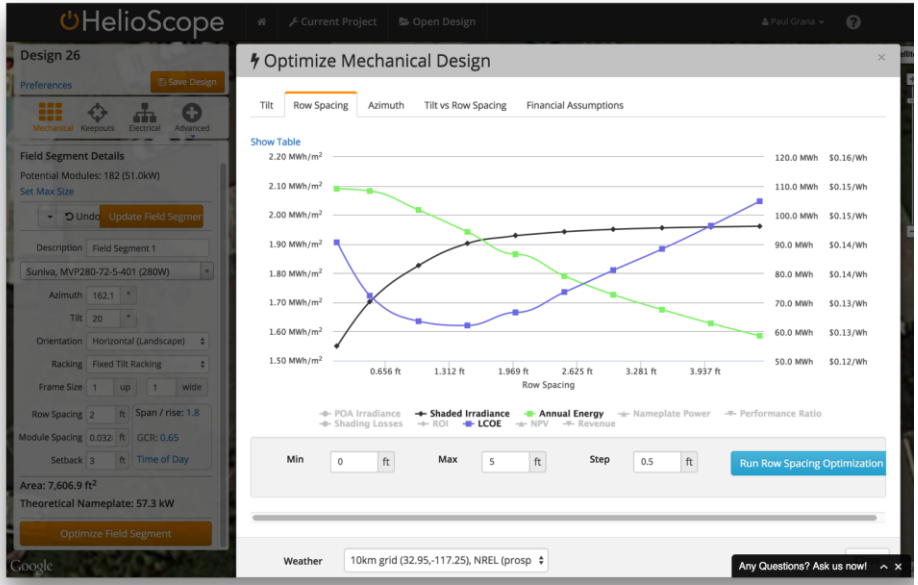


"HelioScope has cut our layout time by 50-75%. The larger the job, the higher the savings in design time."

Dan Holloway, Cobalt Power Systems

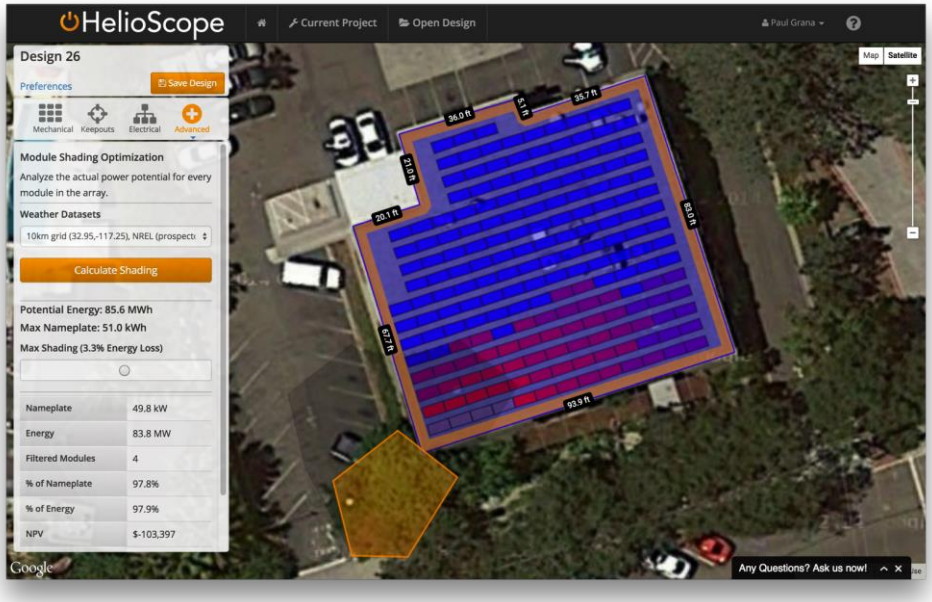
FOLSOM LABS

The HelioScope Optimizer Streamlines Engineering Analysis



Row Spacing

Shading Optimization



HelioScope

FOLSOM LABS

Customer Feedback for the Optimizer has been Extremely Positive

"I'm literally at a loss to describe my enthusiasm for the new features! Super useful."

"I'm finally playing around with the Optimizer. It's incredible! I've been waiting for something like this since I first got into solar. Well done!"

"I'm really excited at how this tool is developing."

"This is awesome."

"When will this beta be released? I would love to be able to run this on our projects now."

GENABILITY

VERIFIED BY GENABILITY

SWITCH V3 GAUGE V1

NEW & UPGRADED TOOLS. MORE AUTOMATION, OPTIMIZATION. ZERO-TOUCH ANALYSIS.

VERIFIED BY GENABILITY

TRUSTED 3RD PARTY. OUR NAME ALONG SIDE YOURS.

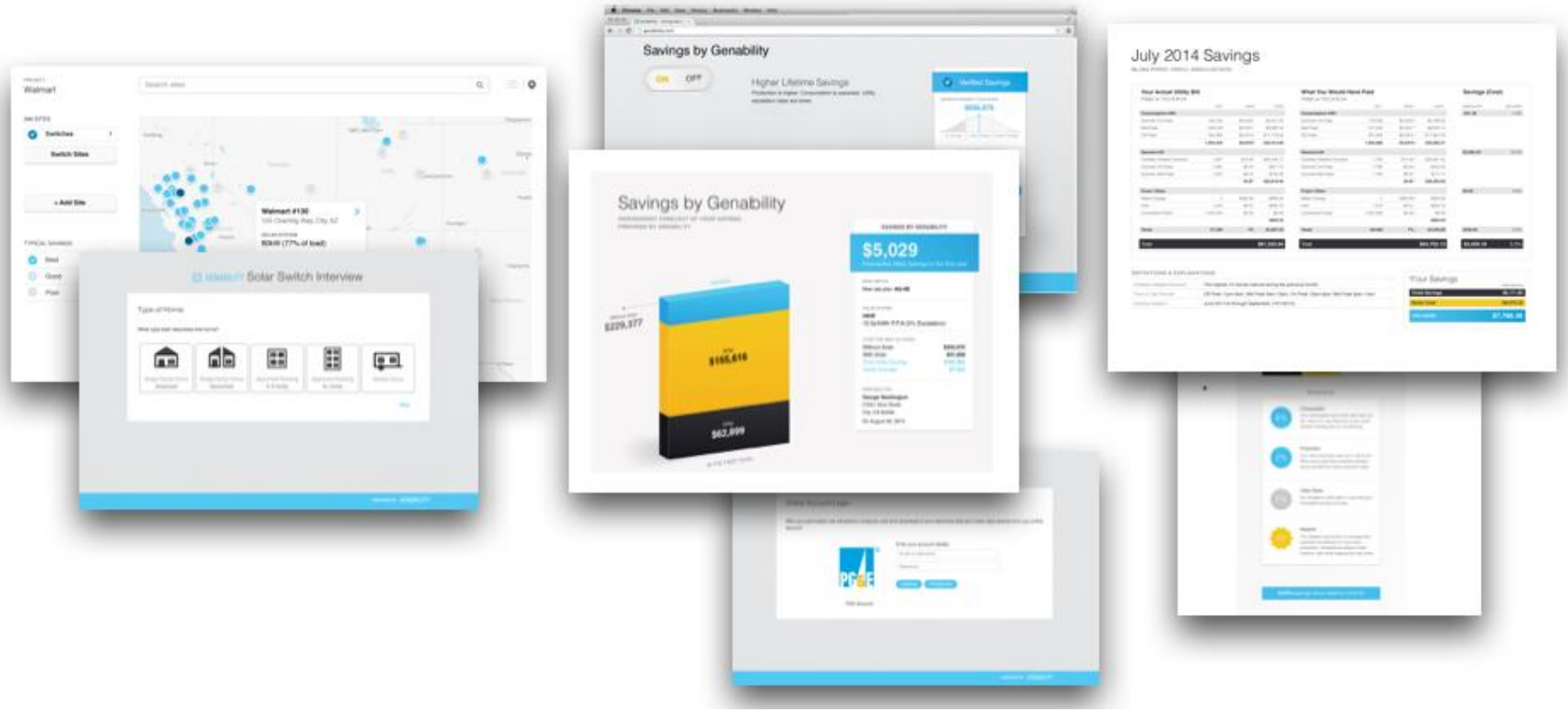
GENABILITY

VERIFIED BY GENABILITY

INSTANT SAVINGS POTENTIAL

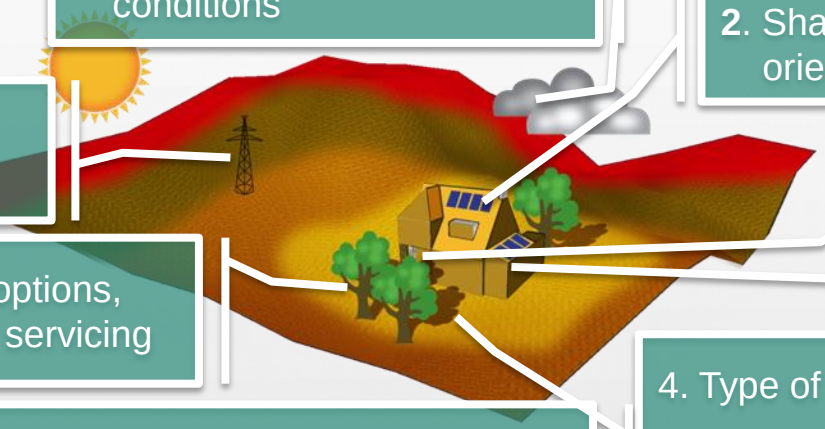
QUOTE SPECIFIC FORECASTED SAVINGS

VERIFIED ACTUAL SAVINGS



The Multi-dimensional *Solar Project Record*

An Integrated, Living Simulation over the Project Lifecycle



1. Latitude and atmospheric conditions

2. Shadows, slope, orientation

3. Property boundaries, building footprints, buildable area, setbacks and obstructions

4. Type of equipment, cost and efficiency

5. Installers, workmanship, warrantees

6. Financing options, incentives, servicing

7. Load profiles, utility rates, production

Available for every property in US!

Base Model
Predicts economic viability of site

Development Model
Tracks design, installation, financing

Operational Model
Tracks performance and results

54

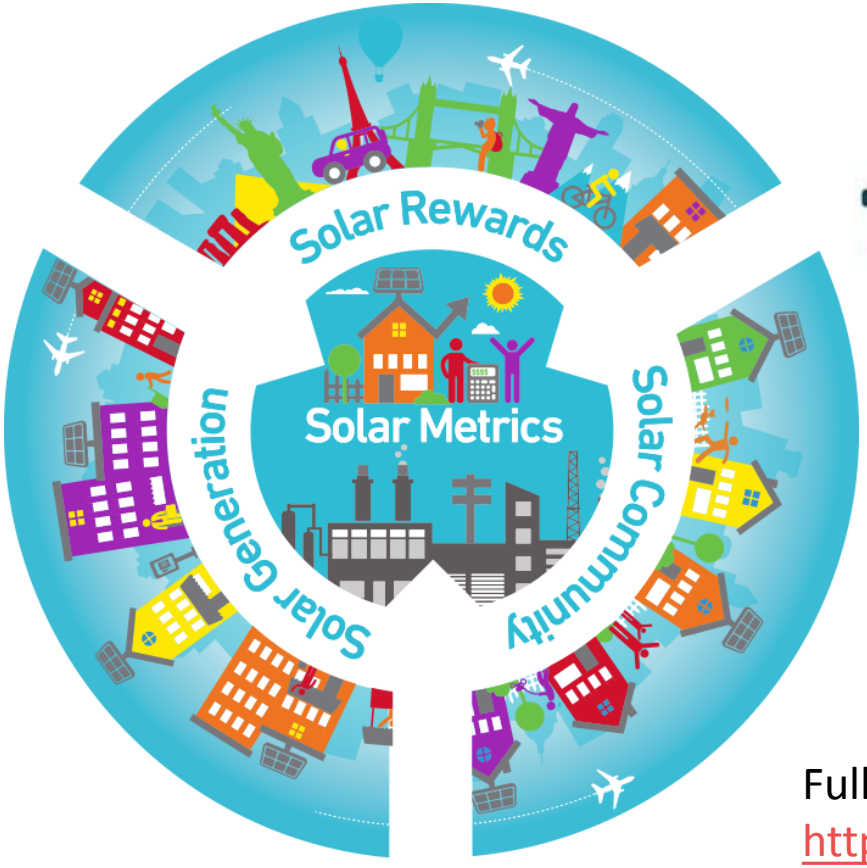
Solar Project Record has 50 Elements

1. Street Address
2. Latitude & Longitude
3. Average Monthly Bill (without solar)
4. Lifetime Electricity Usage Offset Percent
5. Lifetime Carbon Offset Percent
6. Lifetime Electricity Value from Solar
7. Average Monthly Cost per kWh for Solar (LCOE)
8. Average Monthly Cost of Utility Electricity
9. Average Utility Electricity Increase Percentage
10. First Month Cost for Solar + Grid
11. Gross System Cost
12. Net System Cost (after upfront incentives)
13. Total System Cost (after all incentives including PBIs)
14. Local Rebates & Tax Credits (“Upfront Incentives”)
15. State Upfront Incentives
16. Federal Upfront Incentives
17. Performance based Incentives
18. Cost per Watt of system for offering
19. Financing type available (Cash, Loan or Lease)
20. Logo of Offering Entity (Sponsor Logo)
21. Installer company name
22. When installer started in business
23. Certifications of Installer
24. Description of Installer
25. Amount of General Liability Coverage
26. When installer started installing solar
27. Typical install time
28. Workmanship Warranty Term
29. Equipment Provider
30. Description of Equipment Provider
31. Type of equipment
32. Ratings and specs
33. Warranty on equipment
34. Efficiency of equipment
35. Appearance of equipment
36. Finance provider name
37. Finance provider description
38. Finance provider capitalization
39. Increase in Home Value
40. Promotional Code Applied
41. Daily energy generation from monitor in kWhs
42. Daily peak power from monitor in kW
43. Weather at time of production
44. Deployed system size
45. Deployed solar panel model
46. Deployed inverter
47. Production of Team
48. Generation against PVWatts estimation
49. Monthly production
50. Annual production

Geostellar

55

In Use by…



Solar Partners

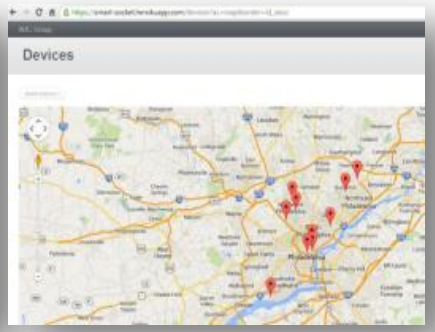
Major Partners such as:

Full API and developer kit coming 3/31/15 to:
http://geostellar.com/join-developers

Plug & Play Installation

connectDER

- $500-$3k off install costs
- Smart metering and grid management
- $855K in DOE funding



Delivering Insights From the Industry's Largest Independent PV Dataset

40,000+ PV Systems

50+ Module Brands

20+ Inverter Brands

~1GW of Capacity

Residential / Commercial / Utility

Next Generation Solar Power Converter
Renewable Power Conversion, Inc.

- Decentralized DC/AC power conversion
- Maintenance free lifetime = PV module lifetime
- Modular, safer, smaller, lighter
- Lower overall energy costs over life of system

PICASOLAR

Douglas Hutchings[CEO]
Rick Schwerdtfeger[COO]
Seth Shumate[CTO]
Matt Young[SVP]

Collaborators & Customers

Georgia Tech

MEYER BURGER

YINGLI SOLAR

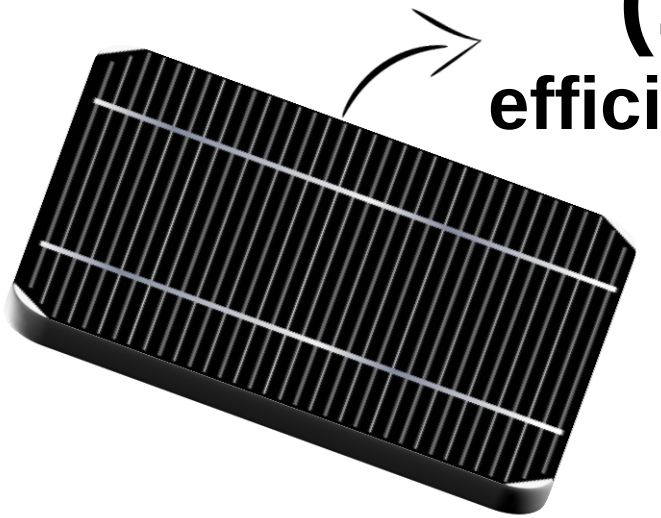
Powered by SunShot U.S. Department of Energy

doug@picasolar.com

The Opportunity

$32 Billion

(15%)
efficiency loss

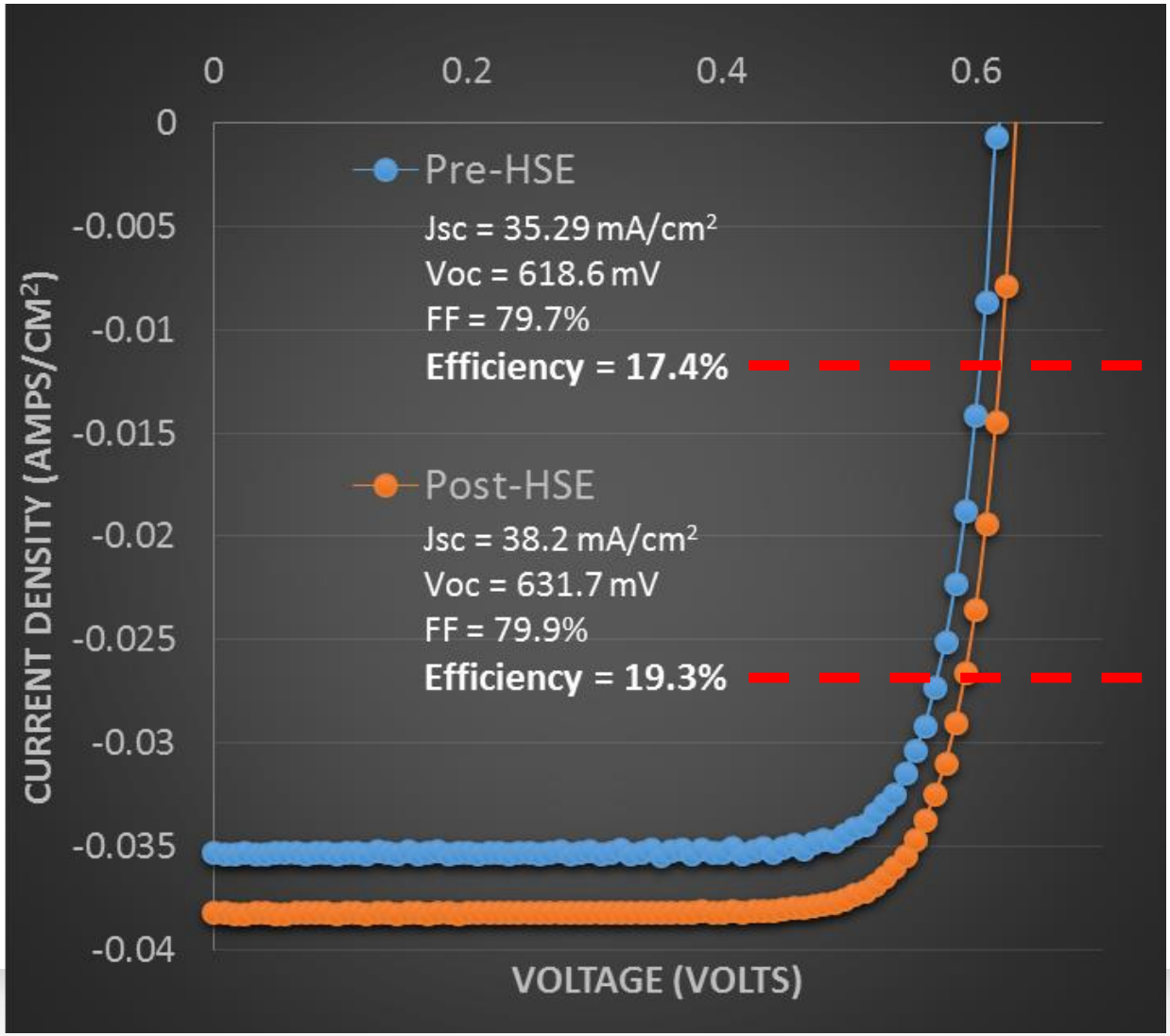


$5 Billion

doug@picasolar.com

[1]R.M. Swanson, “Developments in Silicon Solar Cells” IEEE, 2007

Demonstrated Performance



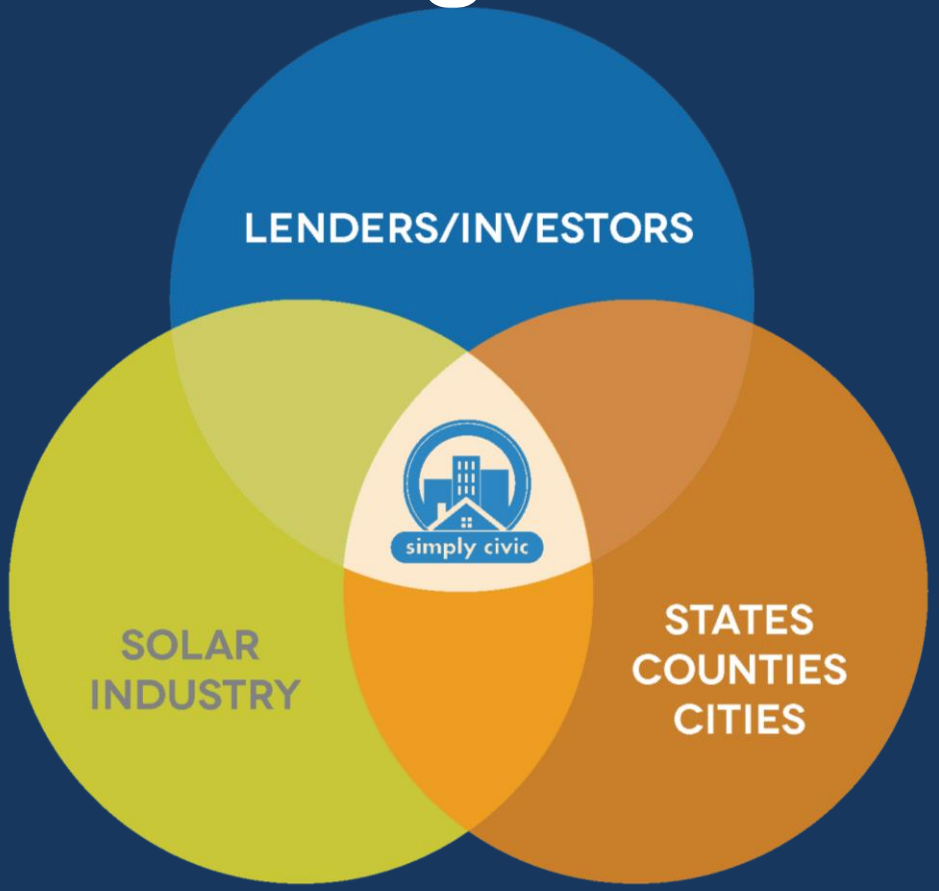
1.9% Absolute Improvement

Current work is on high efficiency cells targeting 21%+

doug@picasolar.com

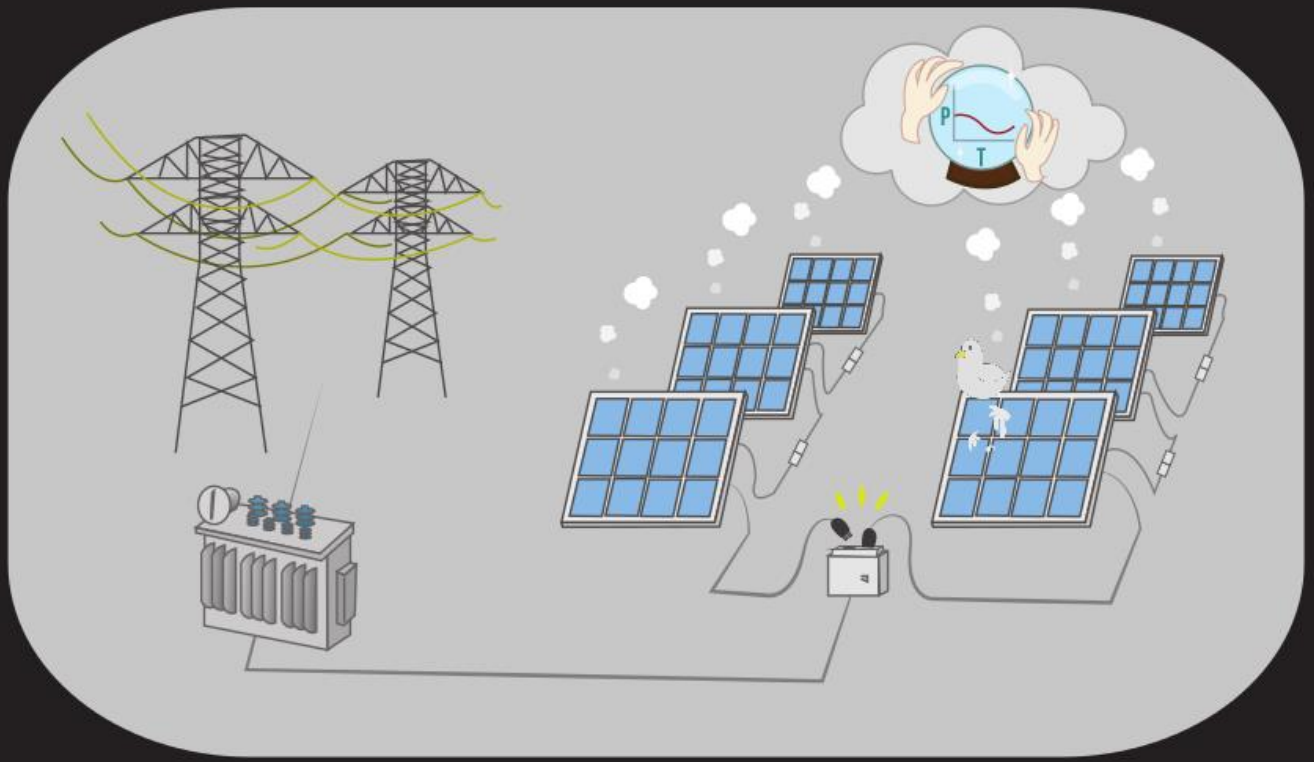
Streamlined Request Processing

- **Real-Time Information Access (Web-Based)**
- **Streamlines Multi-Agency/Department Collaboration**
- **Faster/Simpler Process**
- **1,500 Requests Submitted to Date**

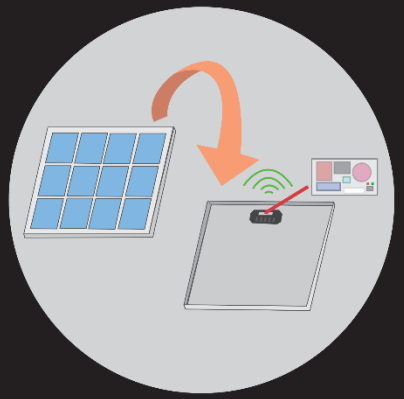


info@simplycivic.com

PV for Mainstream Generation



sineWatts
Inverter Molecule™



- 70% lower installed cost
- Plug & Generate™
- Guaranteed Capacity Availability™

simple, snap-together solar

SMASHsolar

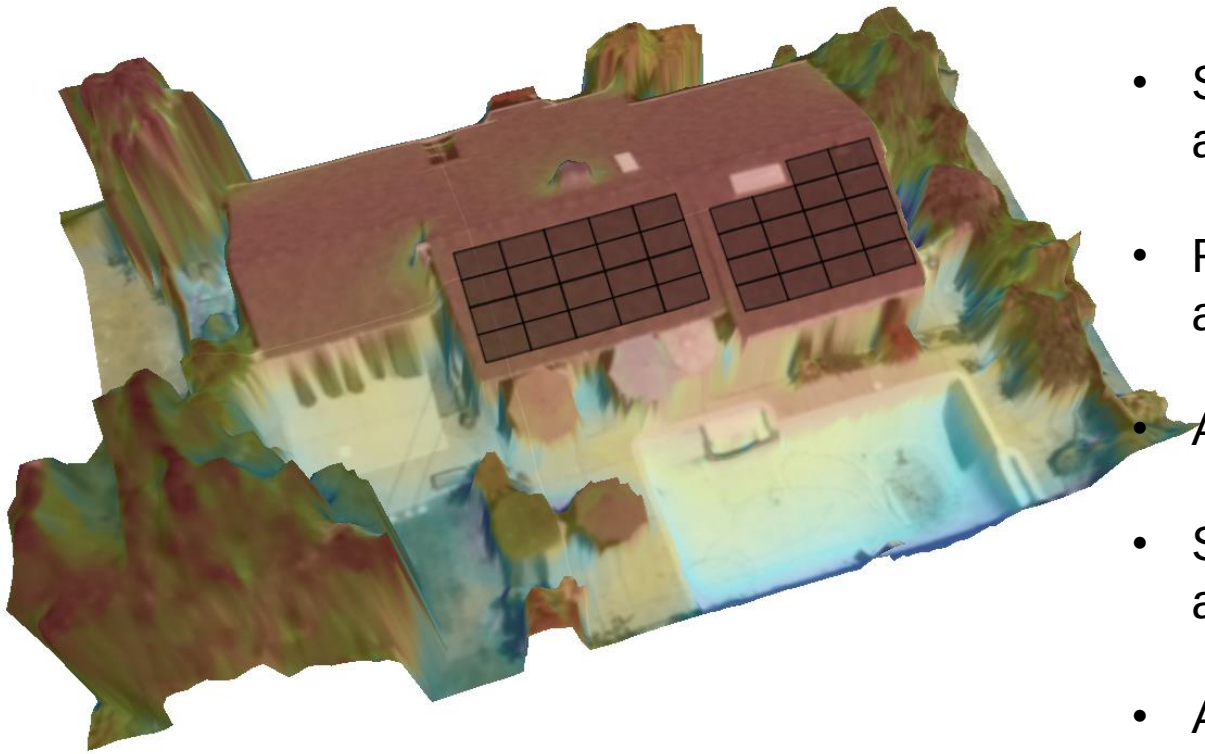
module integrated mounting

- 2x faster install
- <1 hour training
- lowers BOS cost

www.smashsolar.com

SOLAR CENSUS

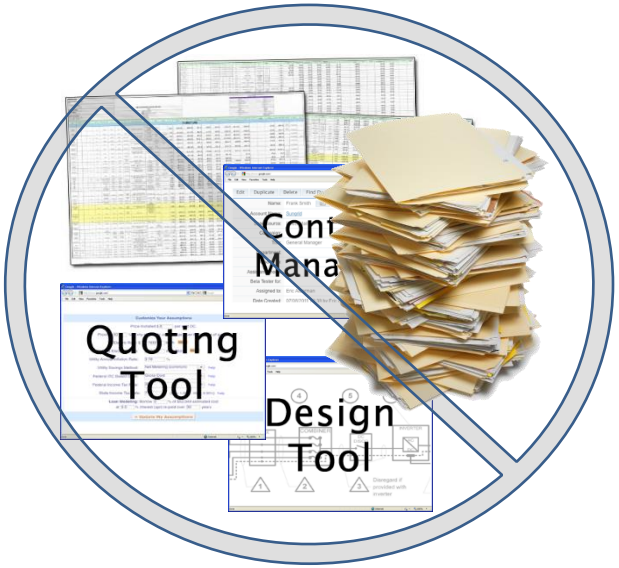
THE ONLINE SHADE TOOL



- Automated production of 3D city models with unprecedented accuracy
- Shading analysis as accurate as the Solmetric SunEye
- Roof dimensions as accurate as Eagle View
- Advanced panel layout
- SunEye is no longer available as of Feb 26th
- Available in key cities in CA and NY; expanding rapidly

solarnexus
Accelerating Your Solar Business

The central hub/nexus of solar project workflow



*An integrated suite of critical business management functions for **solar contractors** to profitably scale*

Tailored CRM & Sales Management

+

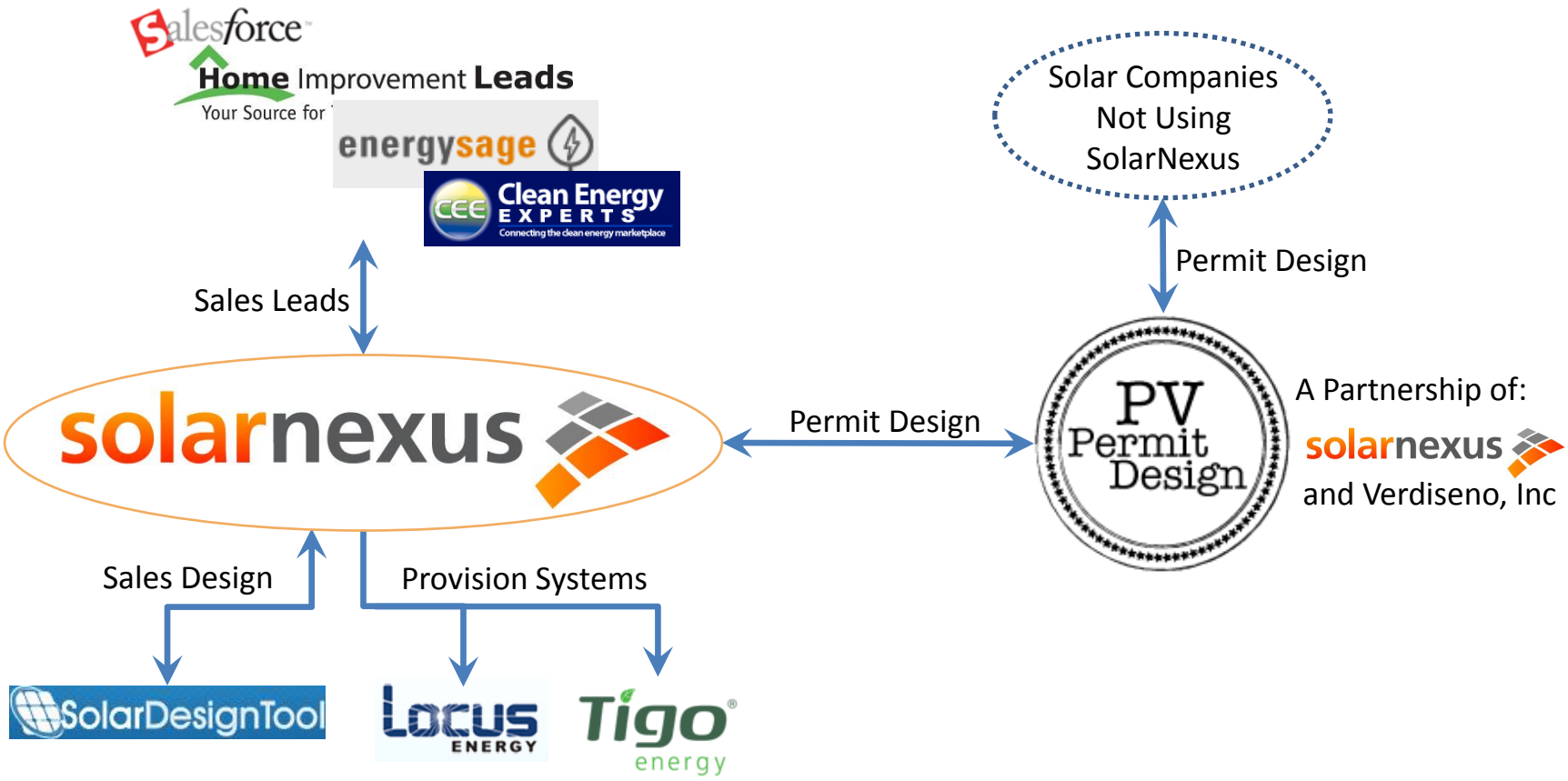
Design, Analyze, Quote

+

Project Management

Next Generation Workflow Platform

Michael Palmquist
SolarNexus, Inc.
SunShot Incubator 8



IEP Model
INTEGRATED ENERGY PROJECT

"Teaching the computers to talk to each other using a common language."

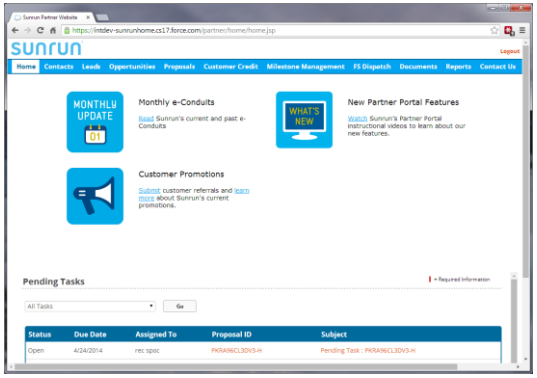
Big Data Saves Solar Industry $M

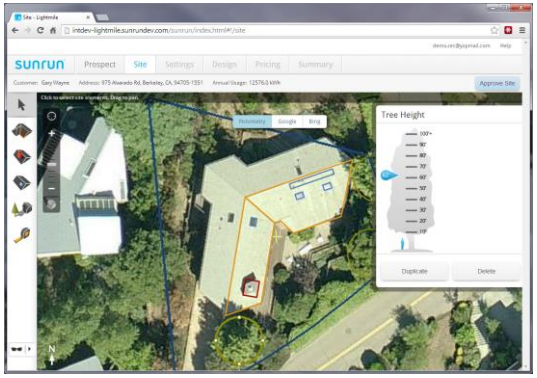
- Proprietary algorithms accurately analyze every roof
- Websites based on data generate more and better leads
- Instant property qualification, system sizing

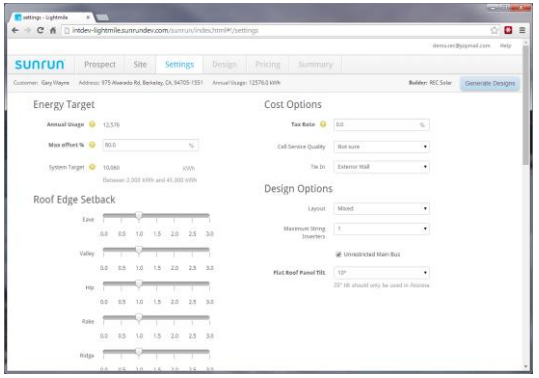
Contact Sun Number at
www.sunnumber.com
to save money now!

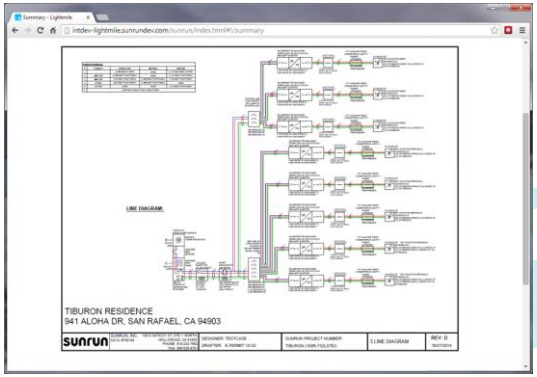
sunrun™

Powered by SunShot U.S. Department of Energy



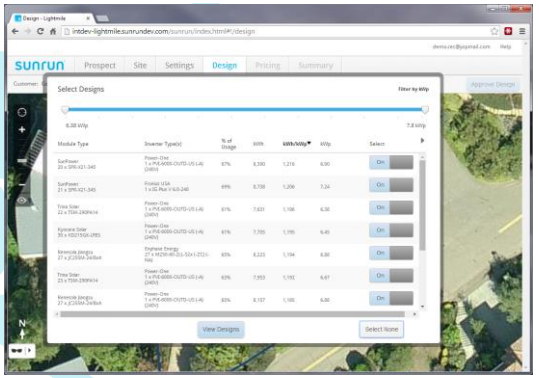


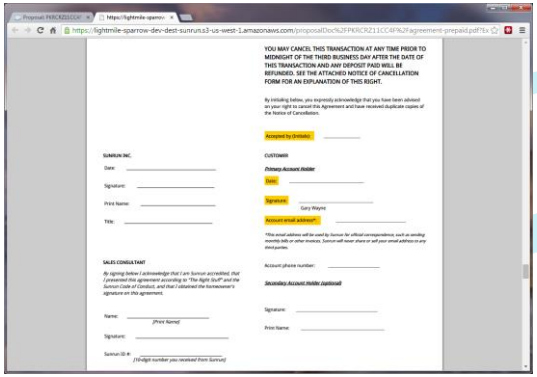


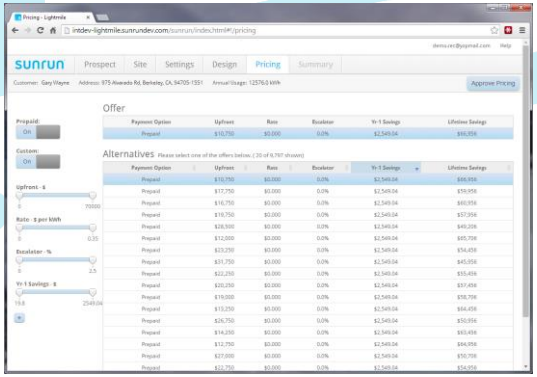


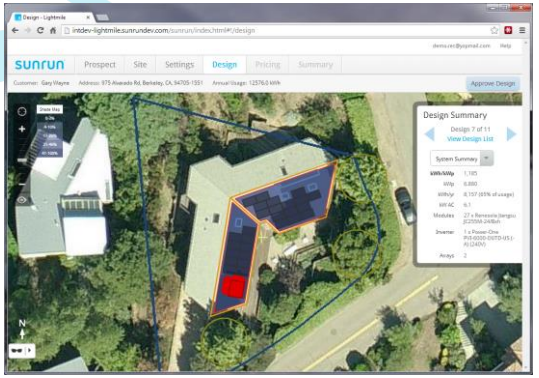
Cost Reduction thru End-to-End Automation

- Single Sign On
- 3D Site Modeling
- Automatic Design Generation, Engineering, Simulation, Costing, Permit
- Real-time design and price selection









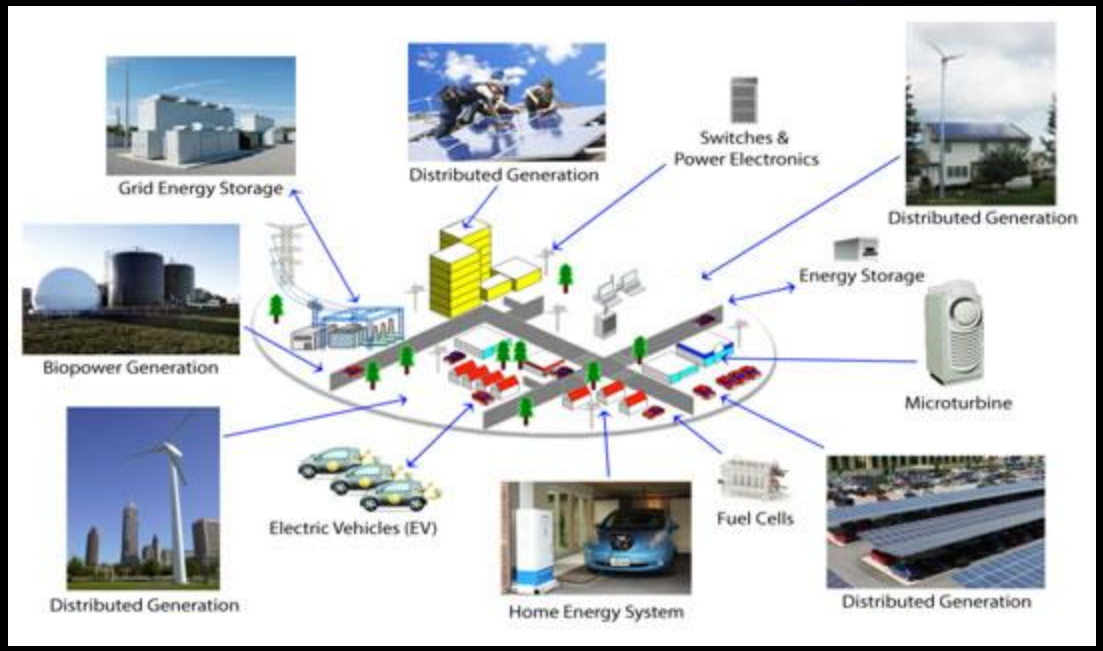
Cloud Based Distribution Grid Analytics Software

- Provides an end-to-end on-line process for all interconnections
- Automates DER technical screening and detailed impact studies
- Simplifies and accelerates system reliability decisions
- Enables interconnection review and approval to be performed in minutes instead of months

QADO energy™

21st Century
Smart Grid Analytics

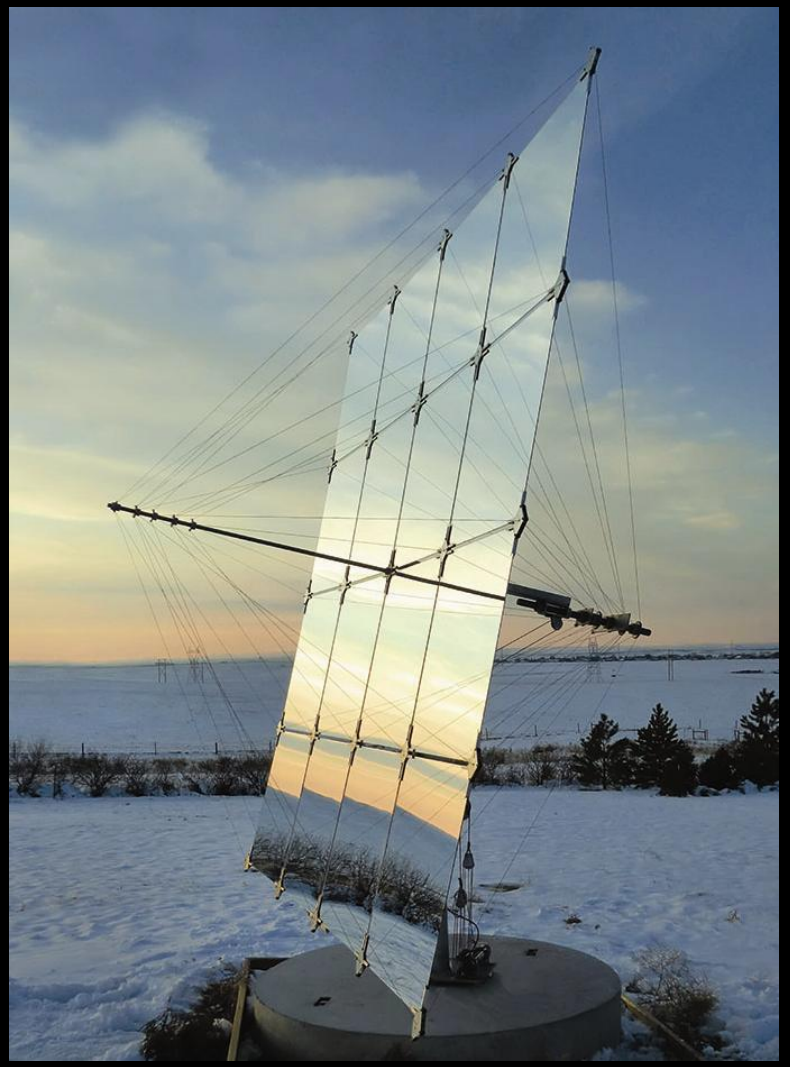
Powered by GridUnity™



Low-Cost Suspension Heliostats

- Cables suspend mirrors
- 65% steel reduction
- Costs reduced by 1/3
- $2 M DOE Funding

Solaflect Energy
THE CONCENTRATED SOLAR ENERGY SOLUTION



SunShot
U.S. Department of Energy

Thank you!

For more information about the Incubator Program visit:
http://www1.eere.energy.gov/solar/sunshot/incubator.html

Email us at: Sunshot.Incubator@ee.doe.gov