SOLAR ENERGY
TECHNOLOGIES OFFICE
U.S. Department Of Energy

SOLAR ENERGY TECHNOLOGIES OFFICE PORTFOLIO REVIEW

EVENT PROGRAM

FEBRUARY 12—14
2018

WASHINGTON, DC
Washington Marriott Wardman Park

WELCOME

Welcome to the 2018 Solar Energy Technologies Office Portfolio Review

The 2018 Solar Energy Technologies Office Portfolio Review will convene hundreds of the brightest minds in the solar industry to share stories of progress and explore some of the most advanced solar energy technologies and solutions being developed across the country.

We're honored to welcome more than 300 project teams, business leaders, and innovative researchers and scientists to Washington, D.C. to exchange ideas and identify the strategies that will shape our work over the next few years.

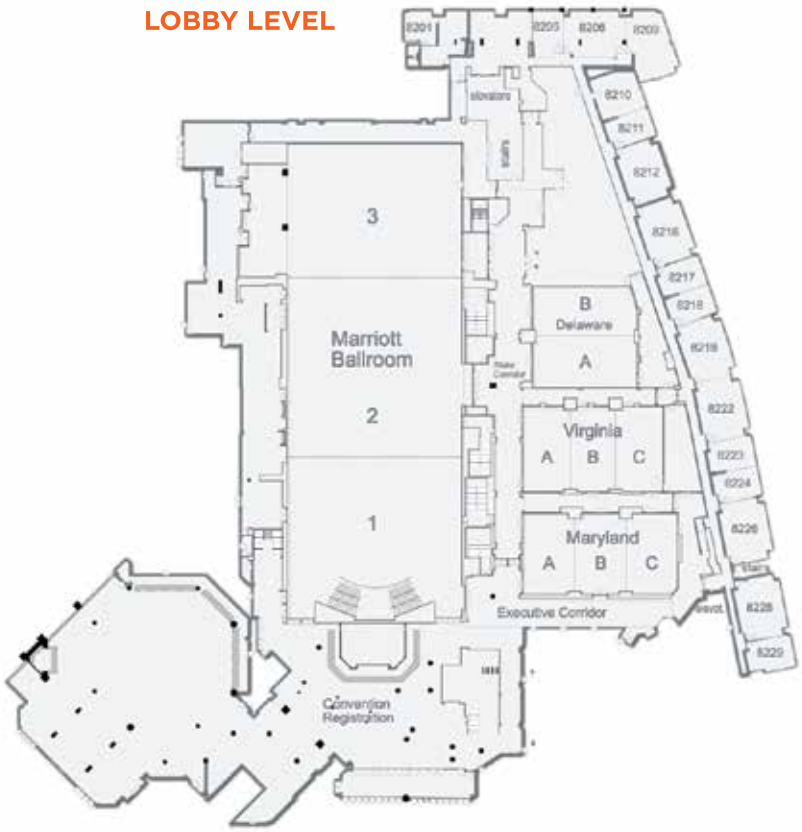
Just over 40 years ago, the idea that solar power could make the leap from powering satellites in space to powering the planet was the vision of only a few people, brought together by the shock of the first oil embargo. Today, solar power is everywhere. The exponential increase in applications powered by solar is directly tied to the predictable cost reduction experienced through economies of scale and continuous technology performance improvements.

As the office looks ahead to defining strategies to achieve scale in the solar industry, we will begin to explore a range of considerations appropriate for expanding every dimension of the solar value chain: how feedstocks are prepared, how modeling informs the panorama of possibilities, how factories consistently operate, how manufacturing environment, health, and safety is planned and audited, how life cycle benefits are quantified, and how to best use resources—all while ensuring that business prospers.

Our teamwork will be critical for achieving this vision and I thank you for participating in this event.

Dr. Charles Gay
Director
Solar Energy Technologies Office
U.S. Department of Energy

LOBBY LEVEL



Venue Information

WASHINGTON MARRIOTT WARDMAN PARK

2660 Woodley Road NW

Washington DC, 20008

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MARRIOTT

EXHIBIT LEVEL

MONDAY, FEBRUARY 12, 2018

7:30AM–8:30AM	**WOMEN'S NETWORKING BREAKFAST**	Wilson A and B
9:00AM–9:10AM	**THE STATE OF RESEARCH IN RENEWABLE POWER** *Tim Unruh, Deputy Assistant Secretary for Renewable Power, U.S. Department of Energy*	Salon 1 and 2
9:10AM–9:50AM	**WELCOME AND Q&A SESSION** *Charlie Gay, Director, Solar Energy Technologies Office, U.S. Department of Energy*	Salon 1 and 2
	SUBPROGRAM HIGHLIGHTS	
9:50AM–10:40AM	**Concentrating Solar Thermal Power** *Avi Shultz, Solar Energy Technologies Office* **Photovoltaics** *Lenny Tinker, Solar Energy Technologies Office* **Systems Integration** *Guohui Yuan, Solar Energy Technologies Office* **Soft Costs and Technology to Market** *Garrett Nilsen, Solar Energy Technologies Office*	Salon 1 and 2
10:40AM–11:00AM	**BREAK**	Salon 1 and 2
	SUBPROGRAM PARALLEL SESSIONS	
11:00AM–12:00PM	**Concentrating Solar Thermal Power Strategy and Vision** Past, Present, and Future of CSP R&D: SunShot, Gen3 CSP, and Beyond *Andru Prescod, Solar Energy Technologies Office* *Mark Lausten, Solar Energy Technologies Office* *Matt Bauer, Solar Energy Technologies Office*	Washington Rooms 1-4
	Photovoltaics Strategy and Vision Portfolio Highlights and Research Areas *Dana Olson, Solar Energy Technologies Office* Techno-Economic Analysis and Research Priorities *Susan Huang, Solar Energy Technologies Office* Evaluating the Impact of PV Research *Marie Mapes, Solar Energy Technologies Office*	Maryland Suite
	Grid Integration Grand Challenges *Guohui Yuan, Solar Energy Technologies Office*	Delaware Suite
	Soft Costs Landscape and Approaches *Elaine Ulrich, Solar Energy Technologies Office*	Virginia Suite

MONDAY, FEBRUARY 12, 2018

12:00PM–1:00PM	**LUNCH**	Salon 3
	SUBPROGRAM PARALLEL SESSIONS	
1:00PM–3:00PM	**CONCENTRATING SOLAR THERMAL POWER** **Technology to Market: Hardware Innovations in Concentrating Solar Thermal Power** 1:00PM – 2:00PM *Andrew Dawson, Solar Energy Technologies Office (Moderator)* *Evelina Vogli, LiquidMetal Group Holdings, Inc.* *Tim Held, Echogen Power Systems, DE* *Hank Price, Solar Dynamics LLC* **Research Guided by Techno-Economic Analysis** Techno-Economic Analysis of CSP Systems 2:00PM – 2:15PM *Craig Turchi, National Renewable Energy Laboratory* Supercritical Carbon Dioxide Cycles 2:15PM – 2:30PM *Matthew Carlson, Sandia National Laboratories* Sodium Ion Expansion Power Block for CSP 2:30PM – 2:45PM *Andrey Gunawan, Georgia Institute of Technology* Concurrent Optimization of Component Capital Cost and Expected O&M 2:45PM – 3:00PM *Michael Wagner, National Renewable Energy Laboratory*	Washington Rooms 1-4
	PHOTOVOLTAICS **Photovoltaics Research and Development: Awardee Highlights** Advances in Cadmium Telluride Material and Cell Development 1:00PM – 1:20PM *Wyatt Metzger, National Renewable Energy Laboratory* Perovskite-Silicon Tandem Solar Cells 1:20PM – 1:40PM *Michael McGehee, Stanford University*	Maryland Suite

MONDAY, FEBRUARY 12, 2018

1:00PM–3:00PM	**PHOTOVOLTAICS (Continued)** The R&D Trajectory for Silicon Photovoltaics 1:40PM – 2:00PM *David Young, National Renewable Energy Laboratory* Progress in the Development of III-V Solar Cells Using Dynamic Hydride Vapor Phase Epitaxy 2:00PM – 2:20PM *Aaron Ptak, National Renewable Energy Laboratory* **Research Discussion and Q&A Session about the Photovoltaics Subprogram** 2:20PM – 3:00PM *Jonathan Trinastic, Solar Energy Technologies Office*	
	SYSTEMS INTEGRATION **Systems Integration Research and Development: Awardee Highlights** Keystone Solar Energy Future Project 1:00PM – 1:10PM *Megan Toomey, PPL Electric Utilities* Rapid Quasi Static Time Series Simulations for High-Resolution Comprehensive Assessment of Distributed Photovoltaic Impacts 1:10PM – 1:20PM *Robert Broderick, Sandia National Laboratories* Opportunistic Hybrid Communications Systems for Distributed Photovoltaic Coordination 1:20PM – 1:30PM *Bri-Mathias Hodge, National Renewable Energy Laboratory* Accelerating Systems Integration Standards 1:30PM – 1:45PM *David Narang, National Renewable Energy Laboratory* Integration of Solar in the Distribution System 1:45PM – 2:30PM *Jeremiah Miller, Solar Energy Technologies Office (Moderator)* *Jason Fuller, Pacific Northwest National Laboratory* *Mads Almassalkhi, University of Vermont* *Sascha Vonmeier, University of California, Berkeley* *Dino Lelic, Commonwealth Edison Company* *Jhi-Young Joo, Laurence Berkeley National Laboratory*	Delaware Suite

MONDAY, FEBRUARY 12, 2018

SYSTEMS INTEGRATION (Continued)

Integration of Solar in the Bulk Electric System
2:30PM – 3:00PM

Kemal Celik, Solar Energy Technologies Office (Moderator)
Yingchen Zhang, National Renewable Energy Laboratory
Ali Abur, Northeastern University
Paul Denholm, National Renewable Energy Laboratory
Yilu Liu, Oak Ridge National Laboratory
Shirang Abhyankar, Argonne National Laboratory

1:00PM–3:00PM

SOFT COSTS

Data into Action
1:00PM – 2:00PM

Dave Rench-McCauley, Solar Energy Technologies Office (Moderator)
Tom Tansy, SunSpec Alliance
Ken Gillingham, Yale University
Ryan Wiser, Lawrence Berkeley National Laboratory

Virginia Suite

Technology to Market: Innovations in Soft Cost Reductions
2:00PM – 3:00PM

Kyle Fricker, Solar Energy Technologies Office (Moderator)
Brad Bowery, Pace Avenue
Ed Albanese, KryptonCloud
Emily Fritze, Powerhouse
Chris Barrett, ProjectEconomics
Benjamin Gaddy, Clean Energy Trust

3:00PM–6:00PM **POSTER SESSION** Exhibit Hall A North and South

TUESDAY, FEBRUARY 13, 2018

9:00AM–9:30AM	**WELCOME AND DAY 2 OVERVIEW WITH DIRECTOR CHARLIE GAY**	Salon 1 and 2
	PLENARIES FEATURING SOLAR ENERGY TECHNOLOGIES OFFICE AWARDEES	
9:30AM–10:45AM	**Concentrating Solar Thermal Power** *Hank Price, Solar Dynamics* **Photovoltaics** *Zachary Holman, Arizona State University* **Systems Integration** *Sila Kiliccote, SLAC National Accelerator Laboratory* **Soft Costs** *Debra Roepke, National Rural Electric Cooperative Association* **Technology to Market** *Leila Madrone, Sunfolding*	Salon 1 and 2
10:45AM–11:00AM	**BREAK**	Salon 1 and 2
	SUBPROGRAM PARALLEL SESSIONS	
11:00AM–12:00PM	**CONCENTRATING SOLAR THERMAL POWER: FROM CONCEPTS TO PROTOTYPES** **Advanced Anti-Soiling Coatings for Concentrating Solar Power Collectors** 11:00AM – 11:20AM *Barton Smith, Oak Ridge National Laboratory* **High Efficiency Latent Heat Thermal Energy Storage** 11:20AM – 11:40AM *Dileep Singh, Argonne National Laboratory* **Supercritical Carbon Dioxide Test Loop and Turboexpander** 11:40AM – 12:00PM *Jeff Moore, Southwest Research Institute*	Washington Rooms 1-4

TUESDAY, FEBRUARY 13, 2018

11:00AM–12:00PM	**TECHNOLOGY TO MARKET: HARDWARE INNOVATIONS IN PHOTOVOLTAICS** **Technology to Market Funding Review for Photovoltaic Projects** 11:00AM – 11:15AM *Manav Sheoran, Solar Energy Technologies Office* **Quick Talks from Technology to Market Awardees** 11:15AM – 12:00PM	Maryland Suite
	SYSTEMS INTEGRATION: VALUE FROM INTEROPERABILITY OF SOLAR WITH STORAGE AND LOADS **SESSION 1** Integrating System to Edge-of-Network Architecture and Management for SHINES 11:00AM – 11:10AM *Shari Ishikawa, Hawaiian Electricity Company* Austin SHINES 11:10AM – 11:20AM *Lisa Martin, Austin Energy* Dynamic Building Load Control to Facilitate High Penetration of Solar Photovoltaic Generation 11:20AM – 11:30AM *Teja Kuruganti, Oak Ridge National Laboratory* **SESSION 2** 11:30AM – 12:00PM *Hari Krishnaswami, Solar Energy Technologies Office (Moderator)* *Percy Haralson, Southern California Edison* *Aminul Huque, Electric Power Research Institute* *Kurt Roth, Fraunhofer USA, Center for Sustainable Energy* *Paul Ohodnicki, National Energy Technology Laboratory*	Delaware Suite

TUESDAY, FEBRUARY 13, 2018

11:00AM–12:00PM	**SOFT COSTS: STATE AND LOCAL INNOVATION** *Shubha Jaishankar, Solar Energy Technologies Office (Moderator)* *David Althoff, Pennsylvania Department of Environmental Protection* *Kristen Ardani, National Renewable Energy Laboratory* *Tria Case, City University of New York* *Zach Greene, The Solar Foundation*	Virginia Suite
12:00PM–1:00PM	**LUNCH**	Salon 3
	SUBPROGRAM PARALLEL SESSIONS	
1:00PM–3:00PM	**CONCENTRATING SOLAR THERMAL POWER** **Designing for Systems and Component Interfaces: Awardee Highlights** High Temperature Particle-based Receiver and Heat Exchanger 1:00PM – 1:20PM *Cliff Ho, Sandia National Laboratories* Receiver with Integrated Thermochemical Energy Storage 1:20PM – 1:40PM *Shaun Sullivan, Brayton Energy* Development of a High Efficiency Integrally Geared Supercritical Carbon Dioxide Compander 1:40PM – 2:00PM *Jason Wilkes, Southwest Research Institute* **Materials Challenges and Opportunities: Awardee Highlights** Green Parabolic Trough Collector 2:00PM – 2:15PM *Philip Gleckman, Sunvapor* Robust, Cost Effective Novel Material for High Temperature Heat Exchangers 2:15PM – 2:30PM *Ken Sandhage, Purdue University*	Washington Rooms 1-4

TUESDAY, FEBRUARY 13, 2018

	CONCENTRATING SOLAR THERMAL POWER (Continued) High Temperature Solar Selective Absorbers 2:30PM – 2:45PM *Jifeng Liu, Dartmouth University* **Question and Answers** 2:45PM – 3:00PM *Avi Shultz, Solar Energy Technologies Office*	
1:00PM–3:00PM	**PHOTOVOLTAICS** **Photovoltaic Durability and Characterization: Awardee Highlights** Materials Data Science: Using Distributed/High Performance Computing for Lifetime Performance of Photovoltaic Systems 1:00PM – 1:20PM *Roger French, Case Western Reserve University* The Impact of R&D, Analysis, and Standardization on Solar Financing Costs 1:20PM – 1:40PM *David Feldman, National Renewable Energy Laboratory* Performance Analysis of New and Innovative Photovoltaic Modules and Systems 1:40PM – 2:00PM *Josh Stein, Sandia National Laboratories* Understanding Photovoltaic Materials through Advanced Characterization 2:00PM – 2:20PM *Mariana Bertoni, Arizona State University* PV Device Modeling: Challenges and Opportunities 2:20PM – 2:40PM *Marco Nardone, Bowling Green State University* The DuraMat Research Consortium 2:40PM – 3:00PM *Teresa Barnes, National Renewable Energy Laboratory*	Maryland Suite

TUESDAY, FEBRUARY 13, 2018

1:00PM–3:00PM	**SYSTEMS INTEGRATION** **Technology to Market: Innovations in Systems Integration Technology** 1:00PM – 2:00PM *Dave Walter, Solar Energy Technologies Office (Moderator)* *Jackie Hines, Sensanna* *John Powers, Extensible Energy* *Suzanne Russo, Pecan Street* **Enabling Technologies: Session 1** CleanStart 2:00PM – 2:10PM *Emma Stewart, Lawrence Livermore National Laboratory* Secure, Scalable Control and Communications for Distributed Photovoltaics 2:10PM – 2:20PM *Jay Johnson, Sandia National Laboratories* Improvement and Validation of the System Advisor Model 2:20PM – 2:30PM *Janine Freeman, National Renewable Energy Laboratory* **Enabling Technologies: Session 2** 2:30PM – 3:00PM *Tassos Golnas, Solar Energy Technologies Office (Moderator)* *Brian Johnson, National Renewable Energy Laboratory* *Manajit Sengupta, National Renewable Energy Laboratory* *Vahan Gevorgian, National Renewable Energy Laboratory* *Madhu Chinthavali, Oak Ridge National Laboratory*	Delaware Suite

TUESDAY, FEBRUARY 13, 2018

1:00PM–3:00PM	**SOFT COSTS** **Accelerating Learning Curves** 1:00PM – 1:45PM *Odette Mucha, Solar Energy Technologies Office (Moderator)* *Lora Toothman, Council of Independent Colleges in Virginia* *Doug Danley, National Rural Electric Cooperative Association* *Andy Walker, National Renewable Energy Laboratory* *Cosimina Panetti, Building Codes Assistance Project* **Small Group Discussions** 1:45PM – 2:30PM **The Future of Soft Costs** 2:30PM – 3:00PM	Virginia Suite
3:00PM–5:45PM	**POSTER SESSION**	Exhibit Hall A North and South
5:45PM–6:00PM	**CLOSING SESSION**	Salon 1 and 2

Leadership

DIRECTOR

DR. CHARLIE GAY

Dr. Charlie Gay is the Solar Energy Technologies Office Director for the Office of Energy Efficiency and Renewable Energy (EERE) of the U.S. Department of Energy (DOE). In this position he is leading a team that is dedicated to research, manufacturing and market solutions to make solar energy one of the most affordable sources of electricity in the United States.

Dr. Gay is an internationally recognized pioneer in photovoltaics. After starting his career in 1975 designing solar power system components for communications satellites at Spectrolab, he later joined ARCO Solar, where he established the research and development program and led the commercialization of crystalline silicon and thin film technologies.

In 1990, he became president and chief operating officer of Siemens Solar Industries, and from 1994 to 1997, he served as director of DOE's National Renewable Energy Laboratory. In 1997, he was named president and chief executive officer of ASE Americas, and from 2001 to 2005 served as founding chairman of the technical advisory board at SunPower Corporation. He joined Applied Materials in 2006 as corporate vice president and general manager of the Solar Business Group. He served as president of Applied Solar and chairman of the Applied Solar Council from 2009-2013. As president, Dr. Gay was responsible for positioning Applied Materials and its solar efforts with important stakeholders in the energy industry, technical community and governments around the world.

He earned a Ph.D. from the University of California, Riverside and was elected a member of the U.S. National Academy of Engineering in 2013. He established the Greenstar Foundation in 1997 to demonstrate an economically sustainable model that delivers solar power and internet access for health, education and microenterprise projects to developing world villages.

DEPUTY DIRECTOR

DR. BECCA JONES-ALBERTUS

Dr. Becca Jones-Albertus is the deputy director of the Solar Energy Technologies Office within the Office of Energy Efficiency and Renewable Energy. Previously, Dr. Jones-Albertus was the Solar Energy Technologies Office Photovoltaics (PV) subprogram manager and has spent her career advancing solar cell materials and devices, from research and development to manufacturing. Dr. Jones-Albertus was also the characterization and design manager at Solar Junction, where she led work contributing to the development of the company's breakthrough dilute nitride solar cells, their two-time world record triple junction solar cells, and then the successful transfer of that technology to a high-volume manufacturing toolset. She has 35 technical publications and 8 patents. Dr. Jones-Albertus graduated magna cum laude from Princeton University with a B.S. in electrical engineering, and also holds a M.S. and Ph.D. in materials science and engineering from the University of California, Berkeley.

SENIOR ADVISOR (ACTING)

DR. ELAINE ULRICH

Dr. Elaine Ulrich is a Senior Advisor for strategy in the solar office at the Department of Energy. She formerly led the balance of systems/soft costs team that works to reduce the non-hardware (soft costs) of solar and lower barriers to U.S. solar adoption. She recently served as a Senior Advisor for Energy in the White House Office of Science and Technology Policy.

A former American Physical Society/American Association for the Advancement of Science policy fellow, Dr. Ulrich has spent the past several years working on renewable energy. She previously held positions in the office of former U.S. Senator Ken Salazar, U.S. House of Representatives Committee on Science and Technology, the Energy Department's Office of Strategic Planning and Analysis, and in the office of U.S. Representative Gabrielle Giffords, where she worked to build a comprehensive solar energy portfolio. Dr. Ulrich holds a B.A. in physics from Wellesley College and a Ph.D. in optical science from the University of Arizona.

OPERATIONS SUPERVISOR

EBONY VAUSS

Ebony Vauss is the operations supervisor for the Solar Energy Technologies Office, a position that she has held since March 2014. Prior to joining SETO, Ebony served as a lead budget analyst managing the Weatherization and Intergovernmental Programs portfolio. Ebony began her federal service in 1999 in the Office of Science and went on to manage the Office of Science's internship and fellowship programs within the Office of Workforce Development for Teachers and Scientists. She was selected to join the first Assistant Management Board, which recognized rising talent within the Energy Department's Office of Energy Efficiency and Renewable Energy. Ebony holds two bachelor's degrees—one in economics and another in government and politics—from the University of Maryland-College Park, a master's degree in organization management from Trinity University, Washington, DC, and is considering law school.

Subprograms

CONCENTRATING SOLAR THERMAL POWER

PROGRAM MANAGER (ACTING): DR. AVI SHULTZ

The Solar Energy Technologies Office's Concentrating Solar Thermal Power (CSP) subprogram supports early-stage research and development of CSP technologies. Projects in the CSP portfolio focus on novel technologies that will integrate thermal storage, lower cost, increase efficiency, and improve reliability compared to current state-of-the-art technologies. This includes the exploration of new concepts for operations, system designs and innovations in the collector, receiver, thermal storage, heat transfer fluids, and power block subsystems. Most of all, the CSP subprogram seeks out transformative concepts with the potential to break through existing performance barriers.

PHOTOVOLTAICS

PROGRAM MANAGER (ACTING): DR. LENNY TINKER

The Solar Energy Technologies Office's Photovoltaics subprogram supports the early-stage research and development of technologies to drive down the cost of solar electricity and contribute to greater energy affordability by improving efficiency and reliability and lowering manufacturing costs. The project portfolio funds innovative concepts and experimental designs across a range of technology approaches that show promise to achieve dramatic cost reductions. The scope of the projects goes beyond the industry, focusing on non-proprietary innovations that have the potential to achieve commercial success in 10-20 years. This creates an innovation ecosystem in the United States, supporting the long-term growth of the solar industry.

TECHNOLOGY TO MARKET

PROGRAM MANAGER: GARRETT NILSEN

The Solar Energy Technologies Office's Technology to Market subprogram funds projects that develop and validate groundbreaking, early-stage technology and business models to strengthen concepts and develop a path to accelerate innovations to the market. Also known as Innovations in Manufacturing Competitiveness, the Technology to Market subprogram targets funding gaps that occur at the pre-prototype and pre-commercial stages of industry R&D. Historically, projects have focused on photovoltaics, photovoltaics system components, concentrating solar power and power electronics technologies, as well as innovations to reduce soft costs such as financing, interconnection, and operations and maintenance.

SOFT COSTS

PROGRAM MANAGER (ACTING): GARRETT NILSEN

The Solar Energy Technologies Office's Balance of Systems Soft Costs subprogram works to address challenges associated with non-hardware costs of solar electricity, reduce the regulatory burden of adding solar to the grid, and identify technology-neutral pathways that provide affordable and reliable solar electricity to American consumers. For residential systems, soft costs account for nearly 70 percent of the total cost of a new solar system. This includes financing, customer acquisition, supply chain costs, permitting, installation labor, and sales taxes, as well as developer overhead and profit.

SYSTEMS INTEGRATION

PROGRAM MANAGER: DR. GUOHUI YUAN

The Solar Energy Technologies Office's Systems Integration subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher levels of solar penetration, while supporting a safe, reliable, secure and cost-effective electric grid. The Systems Integration subprogram works to make solar energy more dispatchable, enabling its use regardless of whether the sun is shining. Projects are working to advance technology that integrates solar with energy storage, as well as building loads, to better match solar energy supply with demand. As the amount of grid-connected solar continues to increase, these solutions will significantly contribute to cost effective and reliable integration of solar generation.

Portfolio Review Leadership

Portfolio Review Chair

JULIE BLUNDEN
Founder, Julie Blunden Consulting

Portfolio Review Panel

PETER ASCHENBRENNER
Executive Vice President, SunPower

MARK HARTNEY
Chief Technology Officer
Director, Applied Energy Division, SLAC National Accelerator Laboratory

DANIELLE MERFELD
Chief Technology Officer
Renewable Energy, General Electric

Subprogram Review Chairs

CONCENTRATING SOLAR THERMAL POWER CHAIR

MILT VENETOS
Founder, Wyatt Enterprises

PHOTOVOLTAICS CHAIR

JAMES GEE
Chief Scientist, Applied Materials

SYSTEMS INTEGRATION CHAIR

BOB CUMMINGS
Senior Director, North American Electric Reliability Corporation

SOFT COSTS CHAIR

TOM MCCALMONT
CEO, Paired Power

TECHNOLOGY TO MARKET CHAIR

TERRY JESTER
Chairman, Silicor Materials
Chief Operating Officer, Solaria

EXHIBITION HALL A

SETO Poster Session

SETO Awardee Posters					
Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
CSP	1	National Renewable Energy Laboratory	29642	Hydrogen Mitigation	Greg Glatzmaier
CSP	2	Oak Ridge National Laboratory	30284	Lifetime Model Development for Supercritical Carbon Dioxide CSP Systems	Bruce Pint
CSP	3	Argonne National Laboratory	30335	Refractory Solar Selective Coatings	Jeff Elam
CSP/T2M	4	Brayton Energy	11965	Flexible All-Metal Pipes and Pipe Couplings for High-Temperature Fluid Transport	Bill Caruso
CSP	5	Los Alamos National Laboratory	30336	High-Temperature Heat Pipe Receiver for Parabolic Trough Collectors	Stephen Obrey
CSP	6	Los Alamos National Laboratory	30337	Binary Metal Chalcogenides for High-Temperature Thermal Storage	Stephen Obrey
CSP	7	National Renewable Energy Laboratory	30338	Concurrent Optimization of Component Capital Cost and Expected Operations and Management	Michael Wagner
CSP	8	Sandia National Laboratories	1506	Particle Mass Flow Control	Cliff Ho
CSP	9	National Renewable Energy Laboratory	30339	CSP Systems Analysis	Craig Turchi
CSP	10	Oak Ridge National Laboratory	30340	Advanced Anti-Soiling Coatings for CSP Collector Mirrors and Heliostats	Panos Datskos
CSP	11	Sandia National Laboratories	30341	National Solar Thermal Test Facility Operations and Maintenance	Joshua Christian
CSP	12	Sandia National Laboratories	30342	High-Temperature Particle Heat Exchanger for Supercritical Carbon Dioxide Power Cycles	Cliff Ho
CSP	13	Argonne National Laboratory	30382	High Efficiency Latent Heat Based Thermal Energy Storage System Compatible with Supercritical Carbon Dioxide Power Cycle	Dileep Singh
CSP/T2M	14	LM Group Holdings	17682	Novel Corrosion and Erosion Protective Amorphous Alloys Coatings	Evelina Vogli
CSP	15	Southwest Research Institute	05804	Development of a High Efficiency Hot Gas Turbo-Expander and Low Cost Heat Exchangers for Optimized Concentrating Solar Power Applications	Jeff Moore
CSP	16	University of California Los Angeles	05941	High-Operating Temperature Liquid Metal Heat Transfer Fluids	Sungtaek Ju
CSP	17	University of Arizona	05942	Halide and Oxy-Halide Eutectic Systems for High-Performance, High-Temperature Heat Transfer Fluids	Perry Li
CSP	18	Oregon State University	07108	High Flux Microchannel Receiver Development	Kevin Drost
CSP/T2M	19	Sporian Microsystems, Inc.	17712	High Tempature, Raman Spectroscopy Based, Inline, Molten Salt Composition Monitoring System for Concentrating Solar Power Systems	Kevin Harsh
CSP	20	General Electric	07109	Compression System Design and Testing for sCO_2 CSP Operation	Jason Mortzheim
CSP	21	Georgia Institute of Technology	07110	Sodium Ion Expansion Power Block for Distributed CSP	Shekar Balagopal
CSP	22	Dartmouth College	07112	Thermodynamically Stable, High Temperature, Long-Term Antioxidation Cermet Solar Selective Absorbers	Jifeng Liu
	23				
CSP	24	SolarReserve LLC	07113	Development of 800° Celsius Integrated Flow Channel Ceramic Receiver	David Wait
CSP	25	Southwest Research Institute	07114	Development of an Ultra High Efficiency Wide-Range Integrally-Geared Supercritical Carbon Dioxide Compander	Jason Wilkes
CSP/T2M	26	HiFunda LLC	17758	Development of Novel Alloys Identified by High-Throughput Computational Methods for Use in Concentrated Solar Power Components	Isaac Corn
CSP	27	Southern Research Institute	07116	Demonstration of High-Temperature Calcium-Based Thermochemical Energy Storage System	Santosh Gangwal
CSP	28	Purdue University	07117	Robust, Cost-Effective Heat Exchangers for 800° Celsius Operation with Supercritical Carbon Dioxide	Kenneth Sandhage
CSP	29	Brayton Energy	07118	Solar Receiver with Integrated Thermal Storage for a Supercritical Carbon Dioxide Power Cycle	Shaun Sullivan
CSP	30	Boston University	07119	Enhancement of Optical Efficiency of CSP Mirrors for Reducing Operation and Maintenance Costs via Near-Continuous Operation	Malay Mazumder
CSP/T2M	31	Echogen Power Systems	08126	sCO_2 Power Cycle with Integrated Thermochemical Energy Storage	Timothy Held
CSP	32	University of Wisconsin	07120	Advanced Supercritical Carbon Dioxide Cycles	Mark Anderson
CSP	33	Agira, Inc.	07338	Unique Single-Axis Tracking Planar Waveguide Optical Collector for CSP Modules	Bal Mukund Dhar

SETO Awardee Posters

Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
CSP/T2M	34	Solar Dynamics	08140	Design and Reliability Improvements for High-temperature Parabolic Trough Solar Fields	Patrick Marcotte
CSP	35	Solar Dynamics	07121	Advanced Trough with Lower-Cost System-Architecture (ATLAS)	Patrick Marcotte
CSP	36	University of California San Diego	07341	Dielectric Metasurface Concentrators	Boubacar Kante
CSP	37	Hyperlight Energy	07342	Low-Cost Concentrated Solar Power Collector	Greg Mungas
CSP/T2M	38	SolarReserve	08141	Re-Designing the Consentrating Solar Power Thermal Energy Storage System to Enable Higher Temperature Performance at Reduced Cost	William Gould
CSP	39	Sunvapor, Inc.	07343	Green Parabolic Trough Collector Inspired by an Architectural Paradigm	Philip Gleckman
CSP	40	Solar Dynamics	08024	DROP C: The Drop-in, Ring-Of-Power Heliostat	Kyle Kattke
CSP	41	University of Illinois at Urbana Champaign	07339	Development of a Planar Focusing Collector for CSP	Kimani Toussaint
CSP	42	Norwich Technologies	06813	Design and Field Testing of Manufacturable Advanced Low-Cost Receiver for Parabolic Trough Solar Power	Joel Stettenheim
CSP	43	Sandia National Laboratories	00850	High Performance Reduction/Oxidation Metal Oxides for Thermochemical Energy Storage (PROMOTES) / CSP	Andrea Ambrosini
SI	44	National Renewable Energy Laboratory	32918	Estimating the Impact of Solar Eclipse on Grid Operations	Santosh Veda
SI	45	Pacific Northwest National Laboratory	11000	Grid Modernization Lab Consortium: Metrics Framework	Michael Kintner-Meyer
SI	46	Pacific Northwest National Laboratory	33517	Laboratory Valuation Analysis	Michael Kintner-Meyer
SI	47	Sandia National Laboratories	13100	Grid Modernization Lab Consortium: Vermont Regional Partnership Enabling the Use of Distributed Energy Resources	Robert Broderick
SI	48	Sandia National Laboratories	30691	Rapid Quasi Static Time Series Simulations for High-Resolution Comprehensive Assessment of Distributed Photovoltaic Impacts	Robert Broderick
SI	49	National Renewable Energy Laboratory	14100	Standards and Test Procedures for Interconnection and Interoperability	Dave Narang
SI/T2M	50	Extensible Energy	15792	Solar Load Balancing Simulator	John Powers
SI	51	Pacific Northwest National Laboratory	14150	Grid Modernization Lab Consortium: Development of Integrated Transmission, Distribution, and Communication Models	Henry Huang
SI	52	National Renewable Energy Laboratory	14250	Grid Modernization Lab Consortium: Distribution System Decision Support Tool Development and Application	Mike Ingram
SI	53	Lawrence Berkeley National Laboratory	14290	Grid Modernization Lab Consortium: Future Electric Utility Regulation	Lisa Schwartz
SI	54	Oak Ridge National Laboratory	14400	Advanced Sensor Development	Tom King
SI/T2M	55	Nhu Energy	15936	Developing Optimal Control Technology for Distributed Energy Resources (DOCTdER)	Rick Meeker
BOS	56	Nhu Energy	07668	Florida Alliance for Accelerating Solar and Storage Technology Readiness	Rick Meeker
SI	57	National Renewable Energy Laboratory	30359	SuNLaMP Solar Resource Calibration, Measurement, and Dissemination	Manajit Sengupta
SI	58	National Renewable Energy Laboratory	30360	System Advisor Model	Janine Freeman
SI	59	National Renewable Energy Laboratory	30361	Concentrating Solar Power in a SunShot Future	Paul Denholm
SI	60	National Renewable Energy Laboratory	30362	Opportunistic Hybrid Communications Systems for Distributed Photovoltaic Coordination	Bri Mathias Hodge
SI/T2M	61	Leaptran	17683	An Open Source Proactive Energy Management System for Integrated Control of Energy Storage and Solar Powered Buildings	Jeff Xu
SI	62	National Renewable Energy Laboratory	30363	Accelerating Systems Integration Codes and Standards (ASICS)	David Narang
SI	63	National Renewable Energy Laboratory	30364	Stabilizing the Power System in 2035 and Beyond: Evolving from Grid-Following to Grid-Forming Distributed Inverter Controllers	Brian Johnson
SI	64	Sandia National Laboratories	30690	Secure, Scalable, Stable Control and Communications for Distributed Photovoltaics	Ray Byrne
SI/T2M	65	Battery Informatics	17794	Integration of Battery Modeling with Solar Building Energy Storage	Bjorn Frogner

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Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
SI	66	National Renewable Energy Laboratory	13290	Grid Modernization Lab Consortium: Grid Frequency Support from Distributed Inverter-Based Resources in Hawaii	Andy Hoke
SI	67	Lawrence Berkeley National Laboratory	33508	Grid Resilience and Intelligence Platform	Sila Kiliccote
SI	68	SLAC National Accelerator Laboratory	31003	Visualization and Analytics of Distribution Systems with Deep Penetration of Distributed Energy Resources	Sila Kiliccote
SI	69	Oak Ridge National Laboratory	30844	Frequency Response Assessment and Improvement of Three Major North American Interconnections Due to High Penetrations of Photovoltaic Generation	Yilu Liu
SI	70	National Energy Technology Laboratory	31004	Combined Photovoltaics and Battery Grid Integration with High-Frequency Magnetics Enabled Power Electronics	Paul Ohodnicki
SI	71	Oak Ridge National Laboratory	31081	Dynamic Building Load Control to Facilitate High Penetration of Solar Photovoltaic Generation	Teja Kuruganti
SI	72	Argonne National Laboratory	31221	An Integrated Tool for Improving Grid Performance and Reliability of Combined Transmission-Distribution with High Solar Penetration	Shirang Abhyankar
SI	73	Pacific Northwest National Laboratory	31251	Enabling High Penetration of Distributed Photovoltaics through the Optimization of Sub-Transmission Voltage Regulation	Samaan Nader
SI	74	Lawrence Berkeley National Laboratory	31266	CyDER: A Cyber Physical Co-Simulation Platform for Distributed Energy Resources in Smart Grids	Jhi-Young Joo
SI	75	National Renewable Energy Laboratory	32402	North American Renewable Integration Study (NARIS)	Gregory Brinkman
SI	76	Sandia National Laboratories	32931	Voltage Regulation and Protection Assurance Using Distributed Energy Resource Advanced Grid Functions	Jay Johnson
SI	77	National Renewable Energy Laboratory	30356	Additively Manufactured Photovoltaic Inverter	Madhu Chinthavali
SI	78	National Renewable Energy Laboratory	32960	Grid Optimization with Solar	Yingchen Zhang
SI	79	National Renewable Energy Laboratory	32962	Enhanced Control, Optimization, and Integration of Distributed Energy Applications	Murali Baggu
SI/T2M	80	Blazetech	18167	Solar Building Energy Storage Management	Albert Moussa
SI	81	Pacific Northwest National Laboratory	33510	Decentralized FLISR	Kevin Schneider
SI	82	Lawrence Livermore National Laboratory	33513	CleanStart-DERMS	Emma Stewart
SI	83	Sandia National Laboratories	33516	Designing Resilient Communities: A Consequence-Based Approach for Grid Investment	Robert Jeffers
SI/T2M	84	Edgepower Inc.	07858	Reducing Storage Cost with Photovoltaic Forecasting and Load Control	Nathan Glasgow
SI	85	Pacific Northwest National Laboratory	12100	Grid Modernization Lab Consortium: Grid Architecture	Jeffrey Taft
SI	86	Oak Ridge National Laboratory, Savannah River National Laboratory	00131	Grid Modernization Lab Consortium: Southeast Regional Consortium	Joe Cordaro
SI	87	Hawaiian Electric Company	07162	Integrating System to Edge-of-Network Architecture and Management	Dora Nakafuji
SI	88	Electric Power Research Institute	07163	Beneficial Integration of Energy Storage and Load Management with Photovoltaics	Aminul Huque
SI	89	Fraunhofer USA	07164	SunDial - An Integrated System to Enable High-Penetration Feeder-Level Photovoltaics	Kurt Roth
SI	90	Carnegie Mellon University	07165	Agent-Based Coordination Scheme for Photovoltaic Integration	Soummya Kar
SI/T2M	91	Operant Solar Corporation	08135	Reliable and Secure Bidirectional Communications Link for Distributed Energy Resources	Randall King
SI	92	Commonwealth Edison Company	07166	Microgrid-Integrated Solar-Plus-Storage Technology	Shay Bahramirad
SI	93	Austin Energy	07177	Austin SHINES	Karl Popham
SI	94	University of Central Florida	07998	Scalable and Secure Cooperative Algorithms and Framework for Extremely High Penetration Solar Integration	Zhihua Qu
BOS	95	University of Central Florida	06340	Foundations for Engineering Education for Distributed Energy Resources	Zhihua Qu
SI	96	University of California, Riverside	08001	Integrated Distributed Energy Resource Management System	Hamed Mohsenian-Rad
SI	97	PPL Electric Utilities	08002	Keystone Solar Energy Future Project	Megan Toomey

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SI	98	University of Southern California	08003	Data Driven Modeling and Analytics for Enhanced Systems Layer Implementation	Viktor Prasanna
SI	99	Southern California Edison	08004	Electric Access System Enhancement (EASE)	Le Xu
SI	100	Northeastern University	08005	Robust Distributed State Estimator for Interconnected Transmission and Distribution Networks	Ali Abur
SI	101	University of Vermont	08006	Robust and Resilient Coordination of Feeders with Uncertain Distributed Energy Resources: From Real-Time Control to Long-Term Planning	Mads Almassalkhi
SI	102	University of California Berkeley	08008	Phasor-Based Control Scalable Solar Photovoltaic Integration	Carl Blumstein
SI/T2M	103	Sensanna Incorporated	08139	Low-Cost Wireless Voltage and Current Monitoring of the Distribution Grid	Jacqueline Hines
SI	104	Massachusetts Institute of Technology	Post-Doc	A Spatially Resolved Value of Solar to Guide Grid Development and Policy Design for Enhanced PV Deployment	Patrick Brown
SI	105	National Renewable Energy Laboratory	32887	PV Plant and Battery Energy Storage	Vahan Gevorgian
SI	106	National Renewable Energy Laboratory	27917	New Industry Partnerships: Four Years and Six Cutting-Edge Collaborations, Highlighting SoCalGas Power-to-Gas: Solar to Renewable Natural Gas for Long-Term Energy Storage	Bryan Palmintier
SI	107	National Renewable Energy Laboratory	31105	U.S. Representation in IEA PVPS Task 14-High Penetrations of Photovoltaics in Electricity Grids	Barry Mather
SI	108	National Renewable Energy Laboratory	31797	Demonstration of Ancillary Services by Large PV Plant in California	Vahan Gevorgian
BOS	109	Sandia National Laboratories	01535	Glare and Avian Hazards	Cliff Ho
BOS	110	Lawrence Berkeley National Laboratory	30123	Towards a Low-Cost Solar Future: Tracking and Analyzing Solar Cost, Price, and Market Trends	Ryan Wiser
BOS/ T2M	111	Energy Sense Finance	12038	Developing Aggregated Data Sets to Standardize the Collateral Valuation Process Utilizing an Economic Pricing Model	Mark Handschy
BOS	112	Pacific Northwest National Laboratory	30125	Solar-Centered Grid	Laurie Miller
BOS	113	Lawrence Berkeley National Laboratory	30348	Aligning Utility and Solar Interests: Utility Regulation and Planning for a SunShot Future	Galen Barbose
BOS/ T2M	114	ProjectEconomics	15868	Middleware Oriented Community Solar Platform	Eric Dahnke
BOS	115	Lawrence Berkeley National Laboratory	30349	Solar Photovoltaics and Real Estate: Harnessing Big Data to Drive Demand, Increase Transparency, and Lower Balance of System Costs	Ben Hoen
BOS/ T2M	116	Interplay Learning	07585	Interplay Solar Training Platform: A New System of Learning	Doug Donovan
BOS	117	Savannah River National Laboratory	30426	Promotion of Photovoltaic Soft Cost Reductions in the Southeastern United States	Elise Fox
BOS	118	National Renewable Energy Laboratory	30820	Orange Button Phase 3: Standardizing Datasets	Debbie Brodst-Giles
BOS	119	National Renewable Energy Laboratory	32312	Innovative Framework to Increase Dispersion of Lab Data	Debbie Brodst-Giles
BOS/ T2M	120	National Renewable Energy Laboratory	29839	Solar Technology Cost Modeling and Competitive Analysis	Robert Margolis
BOS	121	National Renewable Energy Laboratory	32310	Strategic Analysis: Core Analytical Support to SunShot	Robert Margolis
BOS	122	National Renewable Energy Laboratory	32314	Towards a Low-Cost Solar Future: Baselines, Trajectories, and Impacts	Robert Margolis
BOS/ T2M	123	Ethical Electric (Doing Business as CleanChoice Energy)	07590	Scalable Direct-to-Consumer Community Solar	Daniel Murray
BOS/ T2M	124	Genbright	07589	Achieving Ubiquitous Solar through Market Transformation and Grid Integration	Joe Crespo
BOS	125	National Renewable Energy Laboratory	32313	Solar-Plus-Storage: Removing Barriers through Cost-Optimization and Market Characterization	Joyce McLaren
BOS	126	National Renewable Energy Laboratory	32311	Meeting SunShot Cost and Deployment Targets through Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE)	Jordan Macknick
BOS	127	National Renewable Energy Laboratory	32315	Best Practices for Operation and Maintenance of Photovoltaic and Storage Systems	Andy Walker

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BOS/ T2M	128	Kevala, Inc.	07595	Software Development: A Tool for Smart Integration of Solar Power	Susie Monson
BOS	129	National Renewable Energy Laboratory	32316	SunShot State Solar Technical Assistance Team Network	Elizabeth Doris
BOS	130	National Renewable Energy Laboratory	33469	Studies and Information for Public Utilities Commissions	Elizabeth Doris
BOS	131	National Renewable Energy Laboratory	32954	Solar Energy Innovation Network	Kristen Ardani
BOS/SI	132	National Renewable Energy Laboratory	32314	An Analysis of Distribution System Costs and Benefits Associated with Distributed Photovoltaic Generators	Kelsey Horowitz
BOS/ T2M	133	EnergySage	08129	An Online Marketplace that Allows Consumers to Comparison Shop for Solar Equipment, Financing, and Labor, Independently	Jamie Biggar
BOS	134	National Renewable Energy Laboratory	32317	Untapped Markets: Catalyzing Mid-Scale Solar Deployment through Deep-Dive Analysis and Decision Support	Jenny Heeter
BOS	135	State University of New York Polytechnic Institute	06015	Solar in Your Community Challenge	Michael Fancher
	136				
BOS/ T2M	137	KryptonCloud	08131	Krypton Shine	Ed Albanese
BOS	138	Electric Power Research Institute	06338	Leveraging Industry Research to Educate a Future Electric Grid Workforce	Thomas Reddoch
	139				
BOS	140	Missouri University of Science and Technology	06341	The Mid-America Regional Microgrid Education and Training Consortium	Suzanna Long
BOS/ T2M	141	Omnidian	08134	A Software Platform to Drive Disruptive Innovation in Solar Performance Assurance Through Software Automation	David Kenny
BOS	142	Interstate Renewable Energy Council	06342	National Network Administrator of GEARED	Joseph Sarubbi
BOS	143	Council of Independent Colleges of Virginia	06904	A Solar Market Pathway for Independent Colleges in Virginia	Robert Lambeth
BOS	144	Institute for Sustainable Communities	06907	Solar Market Pathways National Coordinator	Debra Perry
BOS/ T2M	145	Pace Avenue	08137	Customer Acquisition Platform for Rooftop Solar Property Assessed Clean Energy Financing	Gary Kremen
	146				
BOS	147	Smart Electric Power Alliance	06909	Community Solar Design Models for Consumer, Industry, and Utility Success	John Sterling
	148				
BOS	149	City University of New York	06913	NYSolar Smart Distributed Generation Hub	Tria Case
	150				
BOS	151	International City/County Management Association	07154	Solar Powering America by Recognizing Communities SolSmart Designation Program	Andrea Fox
BOS/ T2M	152	Pecan Street Inc.	08237	The Pecan Street Leveraged Assets for Technology Feasibility Review, Optimization and Market Validation (PLATFORM) for Product Launch	Suzanne Russo
BOS	153	The Solar Foundation	07155	SPARC SolSmart Technical Assistance	Philip Haddix
BOS	154	kWh Analytics	07314	Orange Button Phase 3: Standardizing Datasets	Jason Kaminsky
BOS	155	Smart Grid Interoperability Panel	07315	Orange Button Phase 1: Convening Stakeholders	Aaron Smallwood
BOS	156	Sunspec Alliance	07316	Orange Button Phase 2: Establishing Data Standards	Thomas Tansy
BOS	157	North America Board of Certified Energy Practitioners	07318	Personnel Certifications for the Design, Installation, and Maintenance of Photovoltaic Systems	Shawn O'Brien
BOS	158	The Solar Foundation	07319	Solar Training Network	Ed Gilliland
BOS/ T2M	159	Powerhouse Accelerator	08238	Partnerships for Intelligent Energy	Emily Kirsch

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BOS	160	Clean Energy States Alliance	07321	Training for State Officials to Make Solar More Inclusive, Affordable, and Consumer Friendly	Warren Leon
BOS	161	Elevate Energy	07322	Training Real Estate Professionals to Find the Value of Solar	Pamela Brookstein
BOS	162	Interstate Renewable Energy Council	07323	Integration of Solar Training into Allied Industry Professional Development Platforms	Laure-Jeanne Davignon
BOS	163	Trust for Conservation Innovation	07324	Solar Training for Design Professionals	Maureen Guttman
BOS/ T2M	164	Activation Energy	08239	First-Look Fund: An Early-Stage Aligned Intermediary to Enhance the Flow of Private Capital into Energy Companies	Matt Price
BOS	165	George Washington University	07325	Multimedia Solar Knowledge Library	Amit Ronen
PV	166	National Renewable Energy Laboratory		Bay Area Photovoltaic Consortium (BAPVC)	Michael Woodhouse
SI/T2M	167	Power Integration Laboratory	08138	Ultra-Compact High Efficiency Multi-Level GaN-Based Photovoltaic Inverter	Robert Pilawa
BOS	168	Yale University	07657	Using Behavioral Science to Target Low- and Moderate-Income and High-Value Solar Installations	Kenneth Gillingham
BOS	169	University of Austin Texas	07658	Knowledge Spillovers and Cost Reductions in Solar Soft Costs	Varun Rai
BOS/ T2M	170	UtilityAPI	08144	Unlocking Utility Data to Address Solar Soft Costs through a UtilityAPI OpenESPI Data Custodian	Daniel Roesler
BOS	171	Solstice Initiative	07659	Data-Driven Understanding of Low- to Moderate-Income Customers' Adoption and Financial Qualification in Community Solar	Stephanie Speirs
BOS	172	Virginia Polytechnic Institute and State University	07660	Coupled Social and Infrastructure Approaches for Enhancing Solar Energy Adoption	Achla Marathe
BOS	173	SRI International	07661	Machine Learning for Solar Technology Portfolio Management	Christina Freyman
BOS	174	Massachusetts Institute of Technology	07662	Modeling Photovoltaics Innovation and Deployment Dynamics	Jessika Trancik
BOS	175	Center for Sustainable Energy	07663	Understanding Adoption of a Key Soft Cost Reduction Strategy: Modeling Administrative Choices Regarding Streamlined Solar Permitting	Margaret Taylor
BOS	176	Arizona State University	07664	Advancing Solar Innovation for Low- and Moderate-Income Households: Analysis of the Arizona Experience	Jacqueline Hettel
BOS	177	Washington Department of Commerce	07665	Solar Plus Strategies for Oregon and Washington	Jaimes Valdez
BOS/ T2M	178	Clean Energy Trust	08240	501vc: A New Model for Investing in Energy Innovation	Ben Gaddy
BOS	179	Pennsylvania Department of Environmental Protection	07666	Finding Pennsylvania's Solar Future	David Althoff
BOS	180	Clean Energy States Alliance	07667	State Strategies to Bring Solar to Low- and Moderate-Income Communities	Diana Chase
	181				
BOS	182	Minnesota Department of Commerce	07669	Minnesota Solar Pathways: Illuminating Pathways to 10 Percent Solar	Stacy Miller
BOS/ T2M	183	Energetic Insurance	08127	The Democratization of Solar: Expanding the Commercial and Industrial Solar Market to Small and Medium Businesses through Financial Risk Mitigation	Jeff McAulay
BOS	184	North Carolina Clean Energy Technology Center	07670	Community Solar for the Southeast	Achyut Shrestha
BOS	185	Montana State Energy Office	07672	Montana Community-Scale Solar Strategy Project	Garrett Martin
BOS	186	Western Interstate Energy Board	07673	Enhanced Distributed Solar Photovoltaic Deployment via Barrier Mitigation or Removal in the Western Interconnection	Maury Galbraith
BOS	187	National Renewable Energy Laboratory	33761	Valuing PV and EE	Monisha Shah
BOS	188	City and County of San Francisco	06906	Solar + Storage for Resiliency	Jessica Tse
BOS	189	National Renewable Energy Laboratory	32307	Unlocking Widespread Solar Adoption: Understanding Preferences of Low- to Moderate-Income Households to Create Scalable, Sustainable Models	Benjamin Sigrin
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Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
	191				
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PV	193	National Renewable Energy Laboratory	30299	Silicon-Based Tandem Solar Cells	Adele Tamboli
PV	194	National Renewable Energy Laboratory	28394	Selective Area Growth of III-V Materials on Silicon Patterned with Nanoimprint Lithography	Adele Tamboli
PV	195	National Renewable Energy Laboratory	28395	Optimized, Low-Cost, Higher than 30 Percent Efficient Indium Gallium Arsenide Phosphide and Silicon Tandem Solar Cells	Aaron Ptak
PV	196	National Renewable Energy Laboratory	30290	High-Efficiency, Low-Cost, One-Sun, III-V Photovoltaics	Aaron Ptak
PV/T2M	197	National Renewable Energy Laboratory	28396	Ultra High-Efficiency and Low-Cost Polycrystalline Halide Perovskite Thin-Film Solar Cells	Kai Zhu
PV	198	Lawrence Livermore National Laboratory	29911	Non-Destructive Evaluation of Water Ingress in Photovoltaic Modules	Mihail Bora
PV	199	Nevados Engineering	07859	Installation and Soft Cost Reduction for Horizontal Single Axis Trackers	Yezin Taha
PV	200	National Renewable Energy Laboratory	30291	Hybrid Perovskite Solar Cells	Joseph Berry
PV	201	Sandia National Laboratories	31427	Photovoltaic Lifetime Project	Joshua Stein
PV	202	National Renewable Energy Laboratory	30287	Regional Test Center Operations	Joshua Stein
PV	203	Sandia National Laboratories	30286	Performance Models and Standards for Bifacial Photovoltaic Module Technologies	Joshua Stein
PV	204	Sandia National Laboratories	30507	Photovoltaic Stakeholder Engagement Initiatives	Joshua Stein
PV	205	National Renewable Energy Laboratory	30292	National Center for Photovoltaics Community Engagement	Mowafak Al-Jassim
PV	206	Halo Industries	08130	Brittle Fracture Wafering of Silicon Ingots for Low-Cost, High-Efficiency Crystalline Silicon Solar Cells	Andrei Iancu
PV	207	National Renewable Energy Laboratory	30293	Enabling High-Concentration Photovoltaics with 50 Percent Efficient Solar Cells	John Geisz
PV	208	National Renewable Energy Laboratory	30295	Photovoltaic Risk Reduction through Quantifying In-Field Energy	Chris Deline
PV	209	National Renewable Energy Laboratory	30296	Manufacturing and Reliability Science for Copper Indium Gallium Selenide Photovoltaics	Lorelle Mansfield
PV	210	National Renewable Energy Laboratory	30297	High-Resolution Investigations of Transport Limiting Defects and Interfaces in Thin-Film Photovoltaic Devices	Helio Moutinho
PV/T2M	211	Leading Edge Crystal Technologies	08132	Refinement of the Floating Silicon Method: A Low-Cost Monocrystalline Silicon Wafer Manufacturing Process	Peter Kellerman
PV	212	National Renewable Energy Laboratory	30298	Mechanically Stacked Hybrid Photovoltaic Tandems	Kirstin Alberi
PV	213	National Renewable Energy Laboratory	25537	Solar Energy Research Institute for India and the United States	David Ginley
PV	214	National Renewable Energy Laboratory	30300	Defining the Defect Chemistry and Structural Properties Required for 24 Percent Efficient Cadmium Telluride Devices	Wyatt Metzger
PV	215	National Renewable Energy Laboratory	30307	Interface Science and Engineering for Reliable, High-Efficiency Cadmium Telluride	Wyatt Metzger
PV/T2M	216	Next Energy Technologies	08133	Building Windows with Transparent Photovoltaics to Lower Costs	Corey Hoven
PV	217	National Renewable Energy Laboratory	30302	Rapid Development of Disruptive Photovoltaic Technologies	Andriy Zakutayev
PV	218	National Renewable Energy Laboratory	30304	From Modules to Atoms: Increasing Reliability and Stability of Commercially Relevant Photovoltaic Technologies	Steve Johnston
PV	219	National Renewable Energy Laboratory	30305	Cell and Module Performance Characterization	Dean Levi
PV/T2M	220	P4P Energy	08136	Highly Efficient Steel Cable Solar Photovoltaic Mounting System	Michael Fuller
PV	221	National Renewable Energy Laboratory	30306	Correlative Electronic Spectroscopies for Increasing Photovoltaic Efficiency	Darius Kuciauskas
PV	222	National Renewable Energy Laboratory	30301	Overcoming Bottlenecks to Low-Cost, High-Efficiency Silicon Photovoltaic and Industrially-Relevant, Ion-Implanted, Interdigitated Back-Passivated-Contact Cell Development	Paul Stradins
PV	223	National Renewable Energy Laboratory	30308	Support of International Photovoltaic Module Quality Assurance Task Force	Ingrid Repins

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Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
PV/T2M	224	Tomark-Worthen	08143	Cost-Efficient and Highly Weather-Resistant Solar Panel Backsheet Produced through Continuous Co-Extrusion Processing	Christopher Thellen
PV	225	National Renewable Energy Laboratory	30309	Scientific Approach to Reducing Photovoltaic Module Material Costs While Increasing Durability	Nick Bosco
PV	226	National Renewable Energy Laboratory	30310	Reducing Photovoltaic Performance Uncertainty by Accurately Quantifying the Photovoltaic Resource	Manajit Sengupta
PV	227	National Renewable Energy Laboratory	30311	Addressing Soiling: From Interface Chemistry to Practicality	Lin Simpson
PV	228	National Renewable Energy Laboratory	30312	Advanced Thermal Management for Higher Module Power Output	Tim Silverman
PV	229	National Renewable Energy Laboratory	30313	2D Materials for Low Cost Epitaxial Growth of Single Sun Gallium Arsenide Photovoltaics	Andrew Norman
PV	230	Sandia National Laboratories	30288	Degradation Assessment of Fielded Copper Indium Gallium Selenide Photovoltaic Module Technologies	Bruce King
PV	231	Sandia National Laboratories	30289	Improving Photovoltaic Performance Estimates in the System Advisor Model with Component and System Reliability Metrics	Geoffrey Klise
PV	232	National Renewable Energy Laboratory	32509	Durable Module Materials Consortium (DuraMat)	Teresa Barnes
PV/T2M	233	Tau Science Corporation	17851	Mobile In-Situ Imaging of Photovoltaic Modules	Greg Horner
PV	234	National Renewable Energy Laboratory	33663	Streamlined Module Manufacturing using Back Contact Solar Cells and Conducting Adhesives	Talysa Klein
PV	235	National Renewable Energy Laboratory	33665	Metal Nano-Grids for Next-Generation Transparent Conduction in Solar Cells and Modules	Chris Muzzillo
PV	236	University of Texas El Paso	05958	Collaborative Atomic-Scale Design, Analysis, and Nanofabrication for Record Breaking, Single-Crystal Cells	David Zubia
PV	237	University of Michigan	06708	Reliable and Large Organic Solar Cells on Flexible Foil Substrates	Stephen Forrest
PV	238	University of Nebraska	06709	Developing Efficient Perovskite and Silicon Tandem Devices	Jinsong Huang
PV/T2M	239	Advanced Power Electronics Corporation	17872	Predictive Module Degradation and Failure Identification Solution	John Elmes
PV	240	University of Washington	06710	Rapid Development of Hybrid Perovskites and Novel Tandem Architectures	Hugh Hillhouse
PV	241	University of Houston	06711	High-Efficiency, Inexpensive Thin Film III-V Photovoltaics Using Single-Crystalline-Like, Flexible Substrates	Venkat Selvamanickam
PV	242	Duke University	06712	High-Performance Perovskite-Based Solar Cells	David Mitzi
PV	243	Electric Power Research Institute	07137	Novel Accelerated Aging Protocols for Photovoltaic Modules	Cara Libby
PV	244	Arizona State University	07138	Plant and Module Designs for Uniform and Reduced Operating Temperature	Govindasamy Tamizhmani
PV	245	Arizona State University	07548	Correlation of Qualification Testing with Field Degradation	Govindasamy Tamizhmani
PV	246	Arizona State University	08165	Non-Contact Simultaneous String-Modules I-V Tracer	Govindasamy Tamizhmani
PV	247	Fraunhofer USA Inc., Center for Sustainable Energy Systems	08173	Adhesive Mounting of Conventional Photovoltaic Modules for Residential Solar	Christian Honeker
PV	248	Colorado School of Mines	07141	Generalizable Mechanistic Understanding of Module-Level Light-, Heat- and Humidity-Induced Instability	Angus Rockett
PV	249	Colorado School of Mines	07551	Post-Growth Recrystallization by Halides for High Throughput CIGS Photovoltaics	Angus Rockett
PV	250	Underwriters Laboratories	07143	Backsheets: Correlation of Long-Term Field Reliability with Accelerated Laboratory Testing	Ken Boyce
PV	251	University of Central Florida	07533	Enabling Efficiencies Greater than 22.5 Percent with Metal Oxide Passivated Contacts Using Low-Cost, In-Line, Atmospheric Pressure Chemical Vapor Deposition	Kris Davis
PV	252	University of Delaware	07534	Rapid Patterning and Advanced Device Structures for Low-Cost Manufacturable Crystalline Silicon Interdigitated Back Contact Cells	Steven Hegedus

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Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
PV/T2M	253	WattGlass	7582	High Performance, Self-Cleaning, Antireflective Coating for PV Glass to Increase Module Output	Corey Thompson
PV	254	Massachusetts Institute of Technology	07535	Low-Cost Tool Design for Cell and Module Fabrication with Thin, Free-Standing Silicon Wafers	Tonio Buonassisi
PV	255	Arizona State University	07536	Solution for Predictive Physical Modeling in Cadmium Telluride and Other Thin-Film Photovoltaic Technologies	Dragica Vasileska
PV	256	Washington State University	07537	Developing a Low-Cost, High-Volume and Scalable Manufacturing Technology for Cadmium Telluride Feedstock Materials	Kelvin Lynn
PV	257	University of Utah	Post-Doc	Materials Separation Methods (Electrodynamic Eddy Current) Development for Removing Metals in Module Recycling	York Smith
PV	258	Arizona State University	07538	Monolithic Silicon Module Manufacturing at Under $0.40 per Watt	Zachary Holman
PV	259	Arizona State University	07552	Fifteen Percent Efficient (Magnesium, Zinc) Cadmium Telluride Solar Cells with 1.7 eV Bandgap for Tandem Applications	Zachary Holman
PV	260	Arizona State University	07540	Pushing the Limits of Silicon Heterojunction Solar Cells: Demonstration of 26 Percent Efficiency and Improving Electrical Yield	Stuart Bowden
PV	261	Arizona State University	08164	Fault-Tolerant, Shade-Tolerant High-Voltage Photovoltaic Modules	Stuart Bowden
PV	262	University of Delaware	07542	Improved Performance and Reliability of Photovoltaic Modules using the Reaction of Metal Precursors	William Shafarman
PV/T2M	263	Sunfolding, Inc.	07594	Sunfolding Mass-Manufactured Trackers for High Performance Photovoltaic Systems	Leila Madrone
PV	264	Colorado State University	07543	Device Architecture for Next-Generation Cadmium Telluride Photovoltaics	James Sites
PV	265	University of Chicago	07545	Improving Reliability and Reducing Cost in Cadmium Telluride Photovoltaics via Grain Boundary Engineering	Robert Klie
PV/T2M	266	Fracsun	17882	Automatic Reference for Empirical Soiling	Scott Lewis
PV/T2M	267	Sunpreme, Inc.	07632	Advanced Manufacturing Toolset for Low-Cost Copper Metallization of High-Efficiency Heterojunction Solar Cells and Glass-Glass Bifacial Modules	Farhed Moghadam
PV	268	University of Michigan	07549	Research and Development of Architectures for Photovoltaic Cell-Level Power Balancing Using Diffusion Charge Redistribution	Al-Thaddeus Avestruz
PV	269	SRI International	07550	Continuous Silicon Reduction and Consolidation	Marc Hornbostel
PV	270	Ohio State University	07539	Tandem Solar Cells: Pathway to Low-Cost, High-Efficiency Photovoltaics	Tyler Grassman
PV	271	Colorado School of Mines	07553	New Approaches to Low-Cost Scalable Doping for Interdigitated Back Contact Crystalline Silicon Solar Cells	Sumit Agarwal
PV	272	Colorado School of Mines	08171	Revealing the Mechanism of Light Induced Degradation and Regeneration of P-Type Czochralski Silicon	Sumit Agarwal
PV	273	University of Nevada Las Vegas	07750	Metastability, Potential Induced Degradation, Damp Heat Degradation and Recovery in Copper Indium Gallium Selenide Devices: Effect of Alkali	Shubhra Bansal
PV	274	Arizona State University	08150	Electroplated Aluminum - An Alternative to Copper or Silver Electrode in Silicon Solar Cells	Meng Tao
PV	275	Massachusetts Institute of Technology	08151	Two-Dimensional Material-Based Layer Transfer for Low-Cost, High-Throughput, High-Efficiency Solar Cells	Jeehwan Kim
PV	276	BrightSpot Automation LLC	08152	Improving Solar Panel Durability through Novel Panel Designs and Advanced Manufacturing Equipment	Andrew Gabor
PV	277	University of Colorado	08153	Isovalent Alloying and Heterovalent Substitution for Super-Efficient Halide Perovskite Photovoltaic Solar Cells	Alex Zunger
PV	278	Stanford University	08154	Low-Cost Scaffold-Reinforced Perovskite Solar Modules with Integrated Light Management	Reinhold Dauskardt
PV	279	University of Central Florida	08155	Characterization of Contact Degradation in Crystalline Silicon Photovoltaic Modules	Kristopher Davis
PV	280	Electric Power Research Institute	08156	Direct Current Arc-Flash Safety for 1,500 Volts: Methodology, Verification, and Codifying	Michael Bolen

SETO Awardee Posters

Sub Program	Poster Number	Awardee	CID / CPS	Project Title	PI Name
PV	281	University of Central Florida	08157	Levelized Cost of Energy Reduction through Proactive Operations of Photovoltaic Systems	Joseph Walters
PV	282	University of Michigan	Post-Doc	Atomically-Precise Interfacial Engineering of Perovskite/Si Tandem Photovoltaics	Orlando Trejo
PV	283	University of California San Diego	08160	Understanding and Overcoming Water-Induced Interfacial Degradation in Silicon Modules	David Fenning
PV	284	Colorado State University	08161	Advanced Module Architecture for Reduced Costs, High Durability, and Significantly Improved Manufacturability	Kurth Barth
PV	285	Massachusetts Institute of Technology	Post-Doc	Divalent Metal Alloyed Perovskites Based on Narrow and Wide Bandgap Materials for Thin Film Solar Cells	Juan-Pablo Correa-Baena
PV	286	Arizona State University	08163	Operando X-ray Nanocharacterization of Polycrystalline Thin Film Modules	Mariana Bertoni
PV	287	Arizona State University	08170	Sound Assisted Low Temperature (SALT) Spalling: Upscaling and Throughput	Mariana Bertoni
PV	288	SunPower Corporation	07139	Predictive Models and Novel Accelerated Tests for the Reliability of Cell Metallization and Solder Joint Failures	Staffan Westerberg
PV	289	Arizona State University	08166	Direct Metallization with Reactive Inks: Assessment of Reliability and Process Sensitivities	Owen Hildreth
PV	290	Stanford University	08167	Perovskite on Silicon Tandem Solar Cells	Michael McGehee
PV	291	Portland State University	08168	Enhanced Convection for Higher Module and System Efficiency	Raul Cal
PV	292	University of Utah	08169	Spread Spectrum Time Domain Reflectivity for String Monitoring in Photovoltaic Power Plants	Michael Scarpulla
PV	293	Texas State University	07541	Crosscutting Recombination Metrology for Expediting Open-Circuit Voltage Engineering	Mark Holtz
PV	294	Georgia Tech Research Corporation	07554	Pushing the Efficiency Limit of Low-Cost, Industrially-Relevant Silicon Solar Cells by Advancing Cell Structures and Technology Innovations	Ajeet Rohatgi
PV	295	Case Western Reserve University	08172	Reliability and Power Degradation Rates of Passivated Emitter Rear Contact Modules Using Differentiated Packaging Strategies and Characterization Tools	Roger French
PV	296	Case Western Reserve University	07140	Module-Level Exposure and Evaluation Test for Outdoor and Indoor Photovoltaic Modules	Roger French
PV	297	Colorado School of Mines	08174	Perovskite Solar Cells: Addressing Low-Cost, High-Efficiency, and Reliability through Novel Hole Transport Materials	Alan Sellinger
PV	298	SunPower Corporation	08175	Aligned Wire Metallization and Stringing for Back Contact Solar Cells	Richard Sewell
PV/T2M	299	Cellink Corporation	07200	Interconnect Circuit Manufacturing Technology	Kevin Coakley
PV	300	Lehigh University	08176	Tunneling Back-Contacted Silicon Photovoltaics	Nicholas Strandwitz
PV	301	Colorado State University	08177	High Lifetime and Mobility Cadmium Telluride Alloys by Co-Sublimation	Walajabad Sampath
PV/T2M	302	Energy Materials Corporation	08128	Low Cap-Ex, High Speed Roll-to-Roll Perovskite Solar Module Development	Stephan DeLuca
PV	303	Arizona State University	07758	Quantum Energy and Sustainable Solar Technologies (QESST)	Christiana Honsberg
PV/T2M	304	Picasolar	07191	One-Step Super Emitters for High-Efficiency Solar Cells	Douglas Hutchings
PV	305	Northwestern University	Post-Doc	Scalable, Strongly Correlated Metal Oxides for Transparent Conductors	Michael Yeung
PV/T2M	306	SunPower Corporation	07190	Catalyzing PV Manufacturing in the US with Cogenra Solar's Next-Generation Dense Cell Interconnect PV Module Manufacturing Technology	David Okawa
PV	307	Northwestern University	07751	Defect Kinetics and Control for Module Reliability	Mariana Bertoni
PV	308	Northwestern University	Post-Doc	Understanding the Role of the Cation in Perovskite Solar Cells	Jeffrey Christians

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