

50TH ANNIVERSARY



# ASES SOLAR 2021

Empowering a Sustainable Future

## CONFERENCE PROGRAM

August 3-6, 2021 | Hybrid Conference  
University of Colorado Boulder + Online

[ases.org/conference](https://ases.org/conference)

# ASES SOLAR 2021

Empowering a Sustainable Future



50th Annual  
National Solar Conference



Boulder, Colorado  
August 3-6, 2021

## EVENTS\*

### Tuesday, August 3

Chapter Caucus | 8:00am - 12:00pm  
Technical Divisions Caucus | 1:00pm - 4:00pm  
SOLAR 2021 Opening Reception | 6:00pm - 9:30pm

### Wednesday, August 4

Women in Solar Energy (WISE) Forum | 10:45am - 12:15pm  
Women in Solar Energy (WISE) Networking & Lunch  
12:30pm - 2:00pm  
Colorado Spotlight Session | 2:15pm - 3:45pm  
Annual ASES Awards Banquet | 6:30pm - 9:30pm

### Thursday, August 5

Emerging Professionals Forum | 10:45am - 12:15pm  
Emerging Professionals Networking & Lunch  
12:30pm - 2:00pm  
Industry Roundtable & Lunch | 12:30pm - 2:00pm

Spirit and Sustainability Forum | 2:15pm - 3:45pm  
Climate Ride Solar Fundraiser & Evening Event at the  
Rayback Collective | 6:00pm - 9:00pm

### Friday, August 6

Jack's Solar Garden Tour | 11:00am - 12:45pm  
Nuances of Residential Battery System Design Forum  
10:45am - 12:15pm  
ASES Membership Meeting & Lunch | 12:30pm - 2:15pm  
NREL Virtual Tour | 2:30pm - 4:00pm

## WORKSHOP/COURSE\*

### Friday, August 6

DIY Energy Efficiency Workshop | 10:45am - 12:15pm  
Solar PV Intensive Workshop (NABCEP Registered)  
10:45am - 12:15pm  
Energy Storage, PV & NEC Workshop (NABCEP Registered)  
2:30pm - 4:30pm

\* Mountain Time

## FROM THE CONFERENCE CHAIR

Welcome to Boulder, Colorado, and the American Solar Energy Society's 50th Annual National Solar Conference, SOLAR 2021: Empowering a Sustainable Future.

The American Solar Energy Society is dedicated to helping America work towards the goal of a 100 percent renewable energy society. Attendees of this conference also support this "greening" of America regarding the decreased use of fossil fuels and increased use of renewable energy sources, and the potential positive impact renewable energy use can have on the larger issues of climate change.

The much-talked about "browning" of America coincides in time with this trend toward "green" energy. And it coincides in place because predominantly brown and black and economically disadvantaged communities have often borne the weight of pollution and other environmental effects related to energy production and use.

Indeed, the browning of America is underway and inevitable; the greening of America is not inevitable. I say that as someone old enough to have been excited in the 1960s about the prospects of gender equality, racial equality, and equal rights for LGBTQ+ folks, only to see now how much and how little progress has been made. Then, later, in the 1970s I was excited by President Jimmy Carter's introduction of a renewable energy plan, only to see it dismantled and the industries move away across U.S. borders. I learned that policies and politics can change for the better and the worse, and that industry and market forces alone cannot always make change happen. Thus, in this conference we have a section dedicated to the latest technologies, and among others, also have a section devoted to discussing social and energy justice.

Whereas solar and other renewable energies have generally been perceived as doing positive work, more attention is now being placed on equity, and on racial and social justice aspects of green energy. Some of the attention is rightly focused on the opportunity to not be affected by energy pollution, but also to participate through careers, investment, business ownership, and leadership in the "greening" of the U.S. energy system.

I am deeply, personally and professionally committed to equal opportunity and equity, and to the greening of America. I look forward to the SOLAR 2021 conference with excitement and anticipation. New information and perspectives will be shared and gained, and that through the personal interactions (we all miss, but crave) that the conference can provide, some new positive change will result to help us toward these lofty and attainable goals of 100% renewable energy, social and racial justice and equality.

*Dale Miller*

Dale Miller,  
Chair SOLAR 2021, Senior Instructor, Environmental Studies Program,  
University of Colorado Boulder

## SOLAR 2021 NATIONAL ORGANIZING COMMITTEE

Dale Miller, Conference Chair  
Carly Cipolla, Conference Director  
Dave Ginley, Technical Chair  
Paul Ndione, Technical Co-Chair  
Robert Foster, ASES Board Chair  
Carly Rixham, ASES Executive Director  
Paulette Middleton, ASES Board Secretary  
Dara Bortman, ASES Board Member  
Larry Kazmerski, Awards Chair  
Gina Johnson, Fellows Chair

## SOLAR 2021 LOCAL ORGANIZING COMMITTEE

Carly Cipolla, Conference Director  
Carly Rixham, Executive Director  
Peter Eberle, Colorado Renewable Energy Society (CRES)  
Janna West-Heiss, Solaris Energy  
Kirsten Frysinger, Southwest Energy Efficiency Project (SWEET)  
Kate Collardson, BayWa r.e.  
Leslie Glustrom, Clean Energy Action  
Martin Voelker, Colorado Renewable Energy Society (CRES)  
Michael Haughey, Silvertip Integrated Engineering Consultants  
Vincent Calvano, Colorado Public Utilities Commission  
Carlyla Dawson, Renewable and Sustainable Energy Institute (RASEI)

## ASES STAFF

Carly Rixham, Executive Director  
Carly Cipolla, Director of Operations  
Sarah Townes, Chief Financial Officer and ZEN Director  
Narelle Kipple, Membership & Programs Coordinator  
Phil Arndt, Business Development  
Jane Pulaski, Editor-in-Chief *Solar Today*  
Sunshine Urbaniak, Creative Director/Webmaster  
Ella Nielsen, Volunteer Coordinator  
Remi Akinwonmi, Volunteer  
Benjamin Guthrie, Conference Intern  
Gabriel Semenza, Tour Intern  
Anna Bybee, Conference and Tour Intern  
Marjorie Tabora, Social Media Intern  
Virginia Weiskopf, Fundraising & Grants Intern  
Amos Ancell, Data & Divisions Intern



REGISTRATION:

University Memorial Center, Glenn Miller Ballroom Foyer

Tuesday: 6:00pm - 7:00pm

Wednesday & Thursday: 8:00am - 7:00pm; 8:00am – 6:00pm

Friday: 8:00am – 3:00pm

Note: All times are Mountain Time

- Keynote
- Session
- Special Event
- Workshop/Course
- Networking Break

Tuesday, August 3

8:00am - 12:00pm	Chapter Caucus <i>(Invite only)</i>	Aspen Room/Zoom
1:00pm - 4:00pm	Technical Divisions Caucus	Aspen Room/Zoom
6:00pm - 9:30pm	SOLAR 2021 Opening Reception	South Terrace Tent

Wednesday, August 4

9:00am - 10:30am	Opening Keynote Session	Center Ballroom
10:30am - 10:45am	Networking Break	South Terrace Tent
10:45am - 12:15pm	Women in Solar Energy (WISE) Forum	Center Ballroom
10:45am - 12:15pm	Modeling and Scaling Track: Community Solar via Micro/Mini/Macrogrids	West Ballroom
10:45am - 12:15pm	Social/Environmental Justice Track: LMI Community Strategies	East Ballroom
10:45am - 12:15pm	Solar Advancements Track: Solar Performance	Aspen Room
12:30pm - 2:00pm	Women in Solar Energy (WISE) Networking & Lunch	Center Ballroom
2:15pm - 3:45pm	Colorado Spotlight Session	Center Ballroom
2:15pm - 3:45pm	Sustainability Track: Sustainable Buildings	Aspen Room
2:15pm - 3:45pm	Modeling & Scaling Track: Grid Scale via Modeling Tools	East Ballroom
2:15pm - 3:45pm	Policy, Education & Finance Track: Economic, Workforce, and Environmental Impacts	West Ballroom
3:45pm - 4:00pm	Networking Break	South Terrace Tent
4:00pm - 5:30pm	Poster Session	Center Ballroom
4:00pm - 5:30pm	Modeling and Scaling Track: Sustainable Resource Planning & Capture	East Ballroom
4:00pm - 5:30pm	Sustainability Track: Electric Vehicles	Aspen Room
4:00pm - 5:30pm	Solar Advancements Track: Solar Novelty/Safety	West Ballroom
5:45pm - 6:30pm	Fellows Reception <i>(Invite only)</i>	Center Ballroom
6:30pm - 9:30pm	Annual ASES Awards Banquet	Center Ballroom

Thursday, August 5

9:00am - 10:30am	Social & Environmental Justice Keynote	Center Ballroom
10:30am - 10:45am	Networking Break	South Terrace Tent
10:45am - 12:15 pm	Emerging Professionals Forum	Center Ballroom
10:45am - 12:15 pm	Modeling & Scaling Track: Grid Integration and Maintenance	West Ballroom
10:45am - 12:15 pm	Solar Advancements Track: Solar Economics	Aspen Room
10:45am - 12:15 pm	Policy, Education & Finance Track: Federal, State, and Local Policies/Programs	East Ballroom
12:30pm - 2:00pm	Emerging Professionals Networking & Lunch	Center Ballroom
12:30pm - 2:00pm	Industry Roundtable & Lunch	West Ballroom
2:15pm - 3:45pm	Spirit and Sustainability Forum	Center Ballroom
2:15pm - 3:45pm	Policy, Education & Finance Track: Financing Clean Energy	East Ballroom
2:15pm - 3:45pm	Social/Environmental Justice Track: Tribal & Rural Advances	West Ballroom
3:45pm - 4:00pm	Networking Break	South Terrace Tent
4:00pm - 5:30pm	~switch Session	Center Ballroom
4:00pm - 5:30pm	Sustainability Track: Responsible Solar	West Ballroom
4:00pm - 5:30pm	Policy, Education & Finance Track: Youth Energy Education & Development	East Ballroom
6:00pm - 9:00pm	Climate Ride Solar Fundraiser & Evening Event	Rayback Collective

Friday August 6

9:00am - 10:30am	Closing Keynote	Center Ballroom
10:30am - 10:45am	Networking Break	South Terrace Tent
10:45am - 12:15pm	Nuances of Residential Battery System Design Forum	Center Ballroom
10:45am - 12:15pm	DIY Energy Efficiency Workshop	East Ballroom
10:45am - 12:15pm	Solar PV Intensive Workshop <i>(NABCEP Registered)</i>	West Ballroom
11:00am - 12:45pm	Jack's Solar Garden Tour	Off Campus
12:30pm - 2:15pm	ASES Membership Meeting & Lunch	Center Ballroom
2:30pm - 4:30pm	Energy Storage, PV & NEC Workshop <i>(NABCEP Registered)</i>	West Ballroom
2:30pm - 4:00pm	National Renewable Energy Laboratory (NREL) Virtual Tour	Online

## Tuesday, August 3

### Chapter Caucus *(Invite only)*

8:00am - 12:00pm | Aspen Room

### Technical Divisions Caucus

1:00pm - 4:00pm | Aspen Room

### SOLAR 2021 Opening Reception

6:00pm - 9:00pm

**Speakers:** **Carly Rixham**, *Executive Director, ASES*; **Dale Miller**, *University of Colorado Boulder*; **James Rattling Leaf**, *Climate Partnerships for the Great Plains Tribal Water Alliance*; **Peter Green**, *Deputy Laboratory Director, Science and Technology at NREL*

The Opening Reception will feature speakers James Rattling Leaf Sr., the Coordinator of Climate Partnerships for the Great Plains Tribal Water Alliance and Peter Green, Deputy Laboratory Director at the National Renewable Energy Laboratory (NREL). The reception will also feature a conversation about the history of ASES and NREL as we celebrate this 50th Annual National Solar Conference anniversary.

The Reception is open to every attendee of SOLAR 2021 who has a Hybrid Conference pass. This event will be live streamed. Drinks and appetizers will be provided.

## Wednesday, August 4

### Opening Keynote Session

9:00am - 10:30am | Center Ballroom

**Moderator:** **Paulette Middleton**, *ASES Board Secretary*

**Speakers:** **Bill Ritter**, *Center for the New Energy Economy and Past Colorado Governor*; **Dave Renné**, *Leader in IRENA Coalition for Action and Immediate Past President of the International Solar Energy Society*; **Alice Jackson**, *President, Xcel Colorado*

Accelerating the necessary transformation to 100% renewable energy in all end-use sectors (electricity, transportation, heating and cooling) in all cities, regions and nations throughout the world, requires effective technologies, markets, policies, community actions, public support and commitment to justice, equity, diversity and inclusion (JEDI) principles. This opening plenary explores progress and promise occurring globally, nationally and regionally on all of these fronts. In addition, presenters provide insights into challenges from perspectives of utilities, policy makers and technology experts.

### Women in Solar Energy (WISE) Forum

10:45am - 12:15pm | Center Ballroom

**Moderator:** **Marlene Brown**, *Prep 4 Resilience*

**Speakers:** **Chandra Farley**, *Just Energy Director, Partnership for Southern Equity*; **Amanda Bybee**, *Amicus O&M Cooperative*; **Marika Woods-Frankenstein**, *Buffalo Heritage Carousel*; **Fayeann Lawrence**, *CEO at Sologistics*

The purpose of the WISE forum is to inspire women to become more technically involved in solar, not just peripheral to it. It's easy for us to talk about what we do, but this isn't a forum to just talk about our jobs, but about how we got where we are and the obstacles and barriers that we've come up against and broke through or just moved out of the way to continue on our path. this is a forum for accomplished women to share lessons learned and heartfelt stories about their lives. It is the story about the journey.

### Modeling and Scaling Track: Community Solar via Micro/Mini/Macrogrids

10:45am - 12:15pm | West Ballroom

**Moderator:** **David Ginley**, *NREL*

**Speakers:** **Adam Eberwein**, *Technical Lead at EarthSpark International*; **Daniel Laurilliard**, *Graduate Student at George Washington University*; **Mahvish Ilyas**, *Philadelphia Energy Authority*; **Matt DaCorte**, *Project Coordinator at Meriden Housing Authority*; **Zach Emond**, *Co-founder and CEO at RPSi*

The session will examine the increasingly diverse length scale of renewable energy systems from single huts or neighborhood communities. This will look at the integration of renewable energy sources with storage and use across these various length scales. There are applications where Micro/Mini/Macrogrids are superior to even grid connected systems. The sessions will examine the nature and the application space for these different length scales.

### Social/Environmental Justice Track: LMI Community Strategies

10:45am - 12:15pm | East Ballroom

**Moderator:** **Dara Bortman**, *Exact Solar*

**Speakers:** **Kimberly Shields**, *Director of Strategic Initiatives at Energy Outreach Colorado*; **Mary Marshall**, *Solar Forward Program Manager at Solar Energy International*; **Rich Strömberg**, *Program Director, Faculty and Doctoral Student at Equitable Solar Solutions/Coldharbour Inst./Western Colo Univ/Univ Alaska Fairbanks*; **Sarah Townes**, *CFO & ZEN Director at ASES*; **Yesenia Rivera**, *Director of Energy Equity and Inclusion at Solar United Neighbors*

Access to renewable energy is a great social equalizer, and it is essential for accelerating the energy transformation needed to address the climate crisis. This session discusses a wide variety of successful approaches to making solar available to everyone regardless of economic status. These include repurposing decommissioned PV modules, enabling solar panel ownership for LMI homes, implementing utility owned community solar models, establishing no cost solar programs, and developing more versatile solar co-ops. The session also explores how students are helping individuals, and particularly LMI families and business, learn how to reduce carbon footprints and gain access to solar.

### Solar Advancements Track: Solar Performance

10:45am - 12:15pm | Aspen Room

**Moderator:** **Drew Gillett**, *Solar Engineers*

**Speakers:** **Alan Bigelow**, *Science Director at Solar Cookers International*; **Dan Shea**, *QD Solar Inc.*; **David Allen**, *Founder at Elemental Dynamics*; **Eduardo Rincón-Mejía**, *Professor at Autonomous University of México City*; **Kerry Rippy**, *Post Doc at NREL*; **Samuel Schreiber**, *PhD Student at CU Boulder*

One of the keys to achieving solar advancement is to develop techniques and methods that improve solar performance and efficiency with low material and processing complexities. In this session, three types of such high-performance solar technologies are presented, in terms of perovskite solar cells, solar-thermal cookers, and concentrated solar power systems. Some important performance parameters, such as conversion efficiency, stability, optimal temperature, and affordability have been specifically considered in these research efforts.

### Women in Solar Energy (WISE) Networking & Lunch

12:30pm - 2:00pm | Center Ballroom

Tickets required.

### Colorado Spotlight Session

2:15pm - 3:45pm | Center Ballroom

**Moderator:** **Janna West-Heiss**, *Solaris Energy*

**Speakers:** **Adrienne Dorsey**, *Executive Director at GRID Alternatives Colorado*; **Beth Osnes**, *Associate Professor of Theatre and Environmental Studies & Co-Founder of Inside the Greenhouse at CUBoulder*; **Diego Lopez**, *Executive Director at Northern Colorado Clean Cities*; **Douglas Arent**, *Executive Director, Strategic Public-Private Partnerships*; **Suzanne Jones**, *Past Mayor of Boulder | ECO-CYCLE Boulder*; **Theresa Barnes**, *Group Research Manager III-Materials Science at NREL*

Join us for a session highlighting all of the wonderful actions people and organizations are taking around the state of Colorado to implement sustainable actions and renewable energy policy.

### Sustainability Track: Sustainable Buildings

2:15pm - 3:45pm | Aspen Room

**Moderator:** **Julian Wang**, *State College*

**Speakers:** **Ash Ragheb**, *Lawrence Technological University*; **Dale Miller**, *University of Colorado Boulder*; **Steve Stevens**, *Founder, Chief Sustainabilist, Curator*; **William Young**, *Florida Solar Energy Center*

Because of its large energy expenditure and the abundance of homes, office buildings, and industrial complexes, the building sector is one of the most appropriate candidates for solar energy utilization. Energy from the sun can be used passively, actively, or both. More specifically, solar heat gains can reduce building heating loads in winter, and lighting loads during the day. Natural light can be beneficial to the occupant's health and well-being. The building structure can support solar panels on the roof or integrated into the building skin. These PV (photovoltaic panels) can also produce electricity for appliances and electronics as well as supply energy for vehicles. The importance of these topics will be covered in the Building Session of the Sustainability Track.

### Modeling & Scaling Track: Grid Scale via Modeling Tools

2:15pm - 3:45pm | East Ballroom

**Moderator:** **James Stalker**, *RESPR, Inc.*

**Speakers:** **Brock Mosovsky**, *VP of Analytics at cQuant.io*; **Brooke Stanislawski**, *Ph.D. Student at University of Utah*; **James Stalker**, *President & CEO at RESPR*; **Jesse Duroha**, *University of Rhode Island*; **Jill Cliburn**, *Cliburn and Associates, LLC*; **Nir Krakauer**, *City College of New York*; **Richard Wilk**, *Union College*

Modern grids are becoming increasingly complicated from the generation, storage and use aspects. Thus it is increasingly important to understand how to optimize these complex systems locally, nationally and globally. With the increased importance of electric vehicles and buildings the situation becomes even more complex. It is necessary to have operative models for grid optimization and the interconnection of components across grid units. Such modeling enables more efficient utilization of existing infrastructures and the optimization of future grids.



Policy, Education & Finance Track: Economic, Workforce, and Environmental Impacts

2:15pm - 3:45pm | West Ballroom

**Moderator:** Gilbert Michaud, *Ohio University*

**Speakers:** Gilbert Michaud, *Ohio University*; Matt Stern, *Philadelphia Energy Authority*; Milton Newberry, *Sustainable Technology Director at Bucknell University*; Remilekun Akinwonmi, *Programs Associate at ASES*

The growth of solar energy has helped stimulate a variety of positive impacts, ranging from economic to environmental. This session will examine these impacts, including workforce development through training programs, pollution mitigation, economic and fiscal implications, and impacts to the agricultural sector, by highlighting projects and circumstances from different regions across the United States.

Poster Session

4:00pm - 5:30pm | Center Ballroom

**Moderator:** Kate Collardson, *BayWa r.e.*

For a full list of poster presentations see page 14.

Modeling and Scaling Track: Sustainable Resource Planning & Capture

4:00pm - 5:30pm | East Ballroom

**Moderator:** Paul Ndione, *NREL*

**Speakers:** Emma Hubbard, *Electra Tech and Stuff*; James Moran, *Advanced Energy Group*; Joachim Seel, *Lawrence Berkeley National Lab*; Marc Perez, *Clean Power Research*; Nico Bouwkamp, *Technical Program Manager at Frontier Energy*; Rebecca Powell, *Program Development Manager at August Mack Environmental*; Timothy Dewitt, *August Mack Environmental, Inc.*

The increasingly complex mix of sources, storage and use necessitate an evolving picture overtime of how to best optimize these components to lead to a truly sustainable energy system. It requires a new mindset to understand the implications of materials, resources and systems to provide truly sustainable systems. In the context of the circular economy it is important to plan many years in the future to assure sustainability.

Sustainability Track: Electric Vehicles

4:00pm - 5:30pm | Aspen Room

**Moderator:** Nigel Zeid, *EVtransformation*

**Speakers:** Brian Ross, *Great Plains Institute*; James Beregi, *Solar Transportation Technologies*; Kent Bullard, *EV Advocates of Ventura County*; Matthew Metz, *Coltura*

With the increasing efficiency of electric vehicles, batteries, and building design, charging electric vehicles is getting easier. Excess solar energy produced from photovoltaic on buildings and community solar grids can charge electric vehicles along with the earlier grid-produced electric charging stations and the increasing mini-PV shade and carport structures. Incentives for electric vehicles are increasing as are policies that encourage their use. New developments surrounding electric vehicles and example projects will be covered in the Electric Vehicles Session of the Sustainability Track.

Solar Advancements Track: Solar Novelty/Safety

4:00pm - 5:30pm | West Ballroom

**Moderator:** David Ginley, *NREL*

**Speakers:** Brian Ross, *Great Plains Institute*; Brian Wieliczka *NREL*; David Ginley, *NREL*; Qiuming Yu, *Cornell University*; V. Vinay K. Doddapaneni, *Oregon State University*

Every successful solar advancement of the future begins as an early research effort. The research and development efforts discussed in this session are focused on environmental health and safety (e.g., impact of solar projects on watersheds), energy production efficiency (e.g., controlled etching and nano-structured coatings) and diversified energy storage (e.g., hydrogen/ammonia fuel cells). One of the research efforts presented is about some key advantages (e.g., higher open circuit voltage) of perovskite quantum dots (PQDs) over their thin film counterparts.

Fellows Reception

5:45pm - 6:300pm | Center Ballroom

Invite only.

Annual ASES Awards Banquet

6:30pm - 9:30pm | Center Ballroom

**Moderator:** Larry Kazmerski, *NREL (Emeritus) & University of Colorado*

ASES honors persons making significant contributions to the society and generally within the field of solar and renewable energy each year. Join us for dinner and drinks as we present our annual ASES awards! The awards ceremony will be live streamed.

Tickets required.

Thursday, August 5

Social & Environmental Justice Keynote

9:00am - 10:30am | Center Ballroom

**Moderator:** Dara Bortman, *Exact Solar*

**Speakers:** Henry Red Cloud, *Executive Director at Red Cloud Renewable*; Michelle Romero, *National Director at Dream Corps*; Monique Dyers, *President/CEO at Enight Energy Consulting*; Pilar Thomas, *Part-time Professor of Practice at the University of Arizona*

Building on the conference theme of "Empowering a Sustainable Future," this session focuses on the topics of racism and social justice as they intersect with energy in general and renewable energy in particular. People in marginalized communities have often borne the burden of environmental exploitation and energy injustice in the name of unrestrained development and technical advancement. Here, the discussion is on these problem areas and on a vision of paths forward, how we can work together to ensure that all communities benefit from the clean energy transition, and how empowering a sustainable future can bring benefit to everyone without harming the most vulnerable among us. Each speaker presentation will be 20 minutes, and will allow questions in the final few minutes.

Emerging Professionals Forum

10:45am - 12:15pm | Center Ballroom

**Moderator:** Narelle Kipple, *ASES*

**Speakers:** Berlyn Hubler, *Tribal Program Manager at GRID Alternatives*; Maria Agazio, *Co-Founder & Business Developer at Equitable Solar Solutions & Iconergy*; Savannah Whitfield, *Society of Black Solar*

The Emerging Young Professionals Forum will provide students and emerging professionals to gain knowledge from professionals, build networks, and obtain guidance for navigating early career challenges. This event attracts attendees from a diversity of professional backgrounds and represents the interdisciplinary nature of the renewable energy community. ASES is committed to furthering professional development of our student members and the emerging professional community through education and supportive networking.

Modeling & Scaling Track: Grid Integration and Maintenance

10:45am - 12:15pm | West Ballroom

**Moderator:** Paul Ndione, *NREL*

**Speakers:** Ben Glenzer, *Solar Solutions For All*; James

Hyungkwan Kim, *Lawrence Berkeley National Laboratory*; Mark Bolinger, *Lawrence Berkeley National Laboratory*; Yacob Hiben, *Mekelle University*

On the opposite end of the spectrum from community power is integration of grid resources on increasingly large scales. This session discusses the increasing interest in how to both integrate and maintain a grids operatively across many different commercial and political entities. This becomes an even greater issue as the diversity of renewable resources and storage moieties become physically integrated with the grid. Ultimate grids will need to include the evolution of these resources as well as of the grid itself.

Solar Advancements Track: Solar Economics

10:45am - 12:15pm | Aspen Room

**Moderator:** Abraham Ellis, *Sandia National Laboratories*

**Speakers:** Dirk Jordan, *NREL*; Grant Hilti, *Heliospekt LLC*; Henry Vandermark, *Solar Wave Energy, Inc.*; Jonathan Harbour, *Axsus*; Spencer Fields, *Manager of Market Strategy and Intelligence at EnergySage*; Tom Thompson, *Vice President of Sales at Solaria Corporation*

The economics of renewable technologies are often looked at from the perspective of Payback or Return of Investment (ROI) when Life Cycle Analysis (LCA) is the true test. Like the "Test of Time", LCA evaluates all inputs, outputs, costs and benefits over a system's life. Presentations look at improving economic benefits and include Reliability of PV, enhanced aesthetics and increased efficiency of PV, drone technology's impact on siting and managing systems, diluted chemical bath deposition of cadmium zinc sulfide (CdZnS) thin film and applying Automotive Assembly Line Efficiencies to Solar Project Development.

Policy, Education & Finance Track: Federal, State, and Local Policies/Programs

10:45am - 12:15pm | East Ballroom

**Moderator:** Alison Mason, *Barrio Electrico*

**Speakers:** Alison Mason, *Barrio Electrico*; David Comis, *Maryland Energy Administration*; David Golembeski, *The Solar Foundation*; Emily Robichaux, *Groundswell*; Sarah Keane, *Kaplan Kirsch & Rockwell LLP*

Public policy plays an inevitable role in how and where solar is deployed. This session will investigate policy mechanisms and program models that supports solar energy growth at the federal, state, and local levels. Topics of interest include community solar, LMI inclusion, and other program designs and policies, as discussed through various case studies.



### Emerging Professionals Networking & Lunch

12:30pm - 2:00pm | Center Ballroom

### Industry Roundtable & Lunch

12:30pm - 2:00pm | West Ballroom

**Moderator:** Carly Rixham, ASES

**Speakers:** David Leevan, *Chief Executive Officer at cQuant.io*; Jessie Schiavone, *SunStyle CEO*; Luke Glass, *RealX CEO*; Janna West-Heiss, *Solaris Energy*; Ken Clem, *Roof Tech*; Marianne Leone, *Mid-Atlantic Solar & Storage Industries Association*, *SolarAPP+*, Robert Foster, *SolAqua*

All are welcome to join Industry Round Table Luncheon where sponsors will each give a five-minute pitch for their business or offering, along with an insightful discussion on renewable energy advances to expedite the energy transition. Join us as we flip the script!

### Spirit and Sustainability Forum

2:15pm - 3:45pm | Center Ballroom

**Moderator:** Paulette Middleton, *Panorama Pathways*

#### Spirit and Sustainability Community Forum 2021: Commitments and Political Will

Accelerating the transformation to a truly renewable energy, sustainable living world means universal commitments to 100% renewable energy across all sectors and populations; justice, equity, diversity and inclusion (JEDI) principles; circular economy (reuse, recycle, renew); environmental protection and restoration; and highest quality development standards. How do we grow the political will needed to make these commitments and successfully act on them? This forum provides SOLAR 2021 participants the opportunity to explore this question together. ASES Sustainability Division leaders will provide welcome comments, followed by participants' sharing (2 minutes maximum for each person who wants to present) interwoven with short reflections from others. This informal listen and learn moderated dialogue format aims to build community and create new insights.

### Policy, Education & Finance Track: Financing Clean Energy

2:15pm - 3:45pm | East Ballroom

**Moderator:** Sydney Muñoz, *Re-volv*

**Speakers:** Gerald Bernstein, *Interfaith Power and Light*; Jared Leader, *Senior Manager, Research and Industry Strategy at Smart Electric Power Alliance - SEPA*; Sydney Muñoz, *Re-volv*; Patrick Thompson, *AppleSEEd Energy Transition*; Philippe Hartley, *CleanFinancing LLC*; Raphael Schiffman, *New Energy Equity*; Ravi Malhotra, *ICAST*

Despite continued cost declines, innovative financing programs can be influential at encouraging investments in renewable energy and energy efficiency. This session will review financing options and programs such as commercial PACE, leases, PPAs, green banks, and many others, which can make deploying clean energy projects more affordable for customers.

### Social/Environmental Justice Track: Tribal & Rural Advances

2:15pm - 3:45pm | West Ballroom

**Moderator:** Laura Rigell

**Speakers:** Johnny Weiss, *Red Cloud Renewable Energy Center*; Mark Nabong, *Monotreme Consulting*; Ogechukwu Ukandu, *E and G Integrated Services Limited*; Renee Millard-Chacon, *Spirit of the Sun*; Robert Foster, *College of Engineering, New Mexico State University*

An essential aspect of the just and complete energy transformation is the dramatic expansion of solar use on tribal lands and in rural areas throughout the world. This session covers the challenges facing these communities and approaches that are helping them advance the transformation. Presenters discuss how to maximize the multiple socio-economic development benefits of solar on their lands, institute new paradigms of development, re-institute sustainability practices in general, and establish partnerships that are making a real impact on their advancements.

### ~switch Session

4:00pm - 5:30pm | Center Ballroom

**Moderator:** Karen Soares, *Go Eagle Energy, LLC*

**Speakers:** Aaron Boon, *Environmental Solutions and Innovations, Inc.*; Andy Bingle, *Colorado Agrivoltaic Learning Center*; Anita Ledbetter, *Build San Antonio Green*; Carol Flueckiger, *Texas Tech University*; Dave Finnigan, *Green Actioneers*; John Martin, *Himcen Battery*; Joseph Simon, *NREL*; Narelle Kipple, *National Solar Tour Director, ASES*; Sarah Younger, *Living Arts Meta Programs, Inc.*; Vince Lucia, *Good Sun Solar State University*

These presentations are rapid fire 5 minutes – 20 slides each, with opportunities for Q&A at the end of all of the presentations. This year's fast paced, information packed session provides new insights into a wide variety of topics. Enjoy creative presentations on passive solar, use of art in solar education in schools and communities, role of African women and youth in solar, solar and storage education, building batteries better, poultry industry and solar, agrivoltaics 101, regeneration and sustainability, Green Actioneers, and more.

### Sustainability Track: Responsible Solar

4:00pm - 5:30pm | West Ballroom

**Moderator:** Debbie Coleman, *Sun Plans*

**Speakers:** Amanda Cotton, *Minnesota Pollution Control Agency*; Kate Collardson, *BayWa RE*; Paulo Soares, *Graduate Student, The Pennsylvania State University*; Victor Olgyay, *Rocky Mountain Institute*; William Young, *Florida Solar Energy Center*; Monique Dyers, *President & CEO, Ensignt Energy Consulting, LLC*; Alan Bigelow, *Science Director at Solar Cookers International*

As solar becomes the rising star in the energy sector, there comes the responsibility of encouraging its rise in a manner to sustain living on earth. Although it is possible to place PV panels on poorly insulated buildings, or to construct large PV arrays to power luxury subdivisions, fewer PV panels would be needed for structures created with less embodied energy and lifestyles that consume less energy. What happens to the land beneath the large solar arrays covering acres of earth and to the panels themselves at the end of their life? How can solar assist with food production and cooking? These questions will be addressed with insightful presentations in the Responsible Solar Session of the Sustainability Track as examples are shared by individuals, businesses, non-profits and local government.

### Policy, Education & Finance Track: Youth Energy Education and Development

4:00pm - 5:30pm | East Ballroom

**Moderator:** Rachel Romero, *NREL*

**Speakers:** Brian Wieliczka, *NREL*; Bronte Payne, *Environment America*; Laura Tellez, *Solar United Neighbors*; Mark Weber, *Minnesota Renewable Energy Society (MRES)*; Numair Latif, *UNM*; Rachel Romero, *NREL*

Youth engagement and education regarding solar and other renewables is an increasingly important part of the broader energy transition. This session will highlight what teachers and students are doing to learn about renewable energy and sustainability through a discussion of programs in k-12, higher education, and beyond. Models and best practices of activities, creative projects, hurdles overcome, and others will be shared.

### Climate Ride Solar Fundraiser & Evening Event at the Rayback Collective

6:00pm - 9:00pm | Rayback Collective

On August 5th, from 6-7 pm, you're invited to be a champion for solar energy while getting active! Invite your network to sponsor you to complete one of the

biking or walking challenges on the recreational trails of Boulder. ASES will provide pre-set routes at various difficulty levels all leaving from CU Boulder's campus. Each participant is challenged to raise at least \$100 for ASES through their participation in the ride. Please consider joining us for this fun event, it is a great way to support ASES and our mission while getting some fresh air and exercise, exploring Boulder and all it has to offer. We will have a limited number of bikes available for out of town participants.

After the ride, all conference attendees are invited to join us at one of Boulder's popular gathering places, the Rayback Collective. Situated in the heart of Boulder, the Rayback is a food park, a bar, an event space, a backyard party with yard games and fire pit, and a collective of all things Colorado. They have more than 30 beer and kombucha taps on deck and a rotating set of some of the area's most beloved food trucks ready to dish up some of the finest, most eclectic cuisine the city has to offer. This is a casual, public event for networking and socializing. Hop on your bike, start walking, or get on the charter bus near the South Terrace of the UMC at 6pm. The bus will pick up participants at the Rayback at 8:30pm to return to campus by 9pm.





# Friday, August 6

## Closing Keynote

**9:00am - 10:30am | Center Ballroom**  
**Moderator:** Dale Miller, University of Colorado Boulder  
**Speakers:** Amory Lovins, Cofounder and Chairman Emeritus of the Rocky Mountain Institute; Carly Rixham, Executive Director, ASES; Dale Miller, University of Colorado Boulder  
This session will be sure to inspire! Join ASES special speaker, Amory Lovins, at the final keynote session of the conference to go over all of the great content from our technical sessions, forums and other special events.

## Nuances of Residential Battery System Design Forum

**10:45am - 12:15pm | Center Ballroom**  
**Moderator:** Leland Keller, City of Fort Collins  
**Speakers:** Ian Skor, Sandbox Solar; Leland Keller, Fort Collins Utilities; Matt Scherer, REenergizeCO  
Practical residential battery system design balances the overall cost with capabilities and functional requirements. Learn how battery systems are sized using a simple approach as well as the trade-offs involved based on the objectives and design constraints such as utility rules and rate structures. The capabilities of a battery system are more complex than just a storage size for dollars decision. Other factors include inverter programming options, home electrical system design, and customer energy use behavior.

## DIY Energy Efficiency Workshop

**10:45am - 12:15pm | East Ballroom**  
John Avenson, Energy Efficiency Expert, will be giving a Workshop at SOLAR 2021 on August 6 from 10:45am - 12:15pm on how to make your space more energy efficient by doing the upgrades yourself.  
John will go through a display of three tables of home improvement items and tools to use, from free things anyone can do, to weather stripping, to expensive upgrades. Tools include an expensive IR camera and some relatively cheap air quality sensors including a Particulate Matter Meter (dust) and more.  
Any home owner and apartment dweller will be made aware and inspired, and can do most of these upgrades themselves!

## Solar PV Intensive Workshop (NABCEP Registered)

**10:45am - 12:15pm | West Ballroom**  
This Intensive Workshop taught by Sean White will be fast paced and cover a lot of information. Students are recommended to plan on being alert, taking good notes, read the instructor's books and study the material intensively for the week following the course. For maximum learning, students can read the instructor's book Solar Photovoltaic Basics 2nd Ed. before the course. You can buy it here.

This course will include a \$200 discount for Sean's NABCEP Associate PV Boot Camp which will qualify you for the NABCEP Associate Exam.

Topics covered include Energy Storage Systems (ESS), PV Markets & Applications, Electrical Basics, PV Equipment, PV System Mechanical Design & Installation, PV System Sizing, PV System Electrical Design & Installation.

## Jack's Solar Garden Tour

**11:00am - 12:45pm | Off-Campus**  
Have you heard of agrivoltaics but are not sure how it works? Interested in seeing it first hand?  
At five acres and 1.2 MW, Jack's Solar Garden (JSG) is the nation's largest agrivoltaic research site and you are invited to visit! Come join Jack's Solar Garden owner, Byron Kominek, and the Colorado Agrivoltaic Learning Center's Program Director, Andy Bingle, to discover what is happening at Jack's Solar Garden and the implications a site like Jack's Solar Garden has on the expanding field of agrivoltaic research. Learn more at jackssolargarden.com.

The tour is not ADA accessible. There will be one porta potty onsite. If there is a threat of lightning, the tour will be canceled. There is no indoor section of the tour, the tour will be completely outside.

The schedule for the tour will be the following: Loading on the bus at 10:45am, leaving by 11am, tour from 11:15-12:15, load back on the bus and then back to campus by 12:45pm for lunch.

## ASES Membership Meeting & Lunch

**12:30pm - 2:15pm | Center Ballroom**  
**Moderator:** Carly Rixham, ASES  
**Speakers:** Carly Cipolla, Director of Operations, ASES; Carly Rixham, Executive Director, ASES; Joshua Peterson, ASES Board

*Treasurer; Narelle Kipple, Membership & Programs Coordinator; Robert Foster, ASES Board Chair; Sarah Townes, CFO & ZEN Director at ASES*

The 2021 ASES Membership Meeting will include an update on the organization from the ASES staff and board. The meeting will conclude with an update on SOLAR 2022 from Ashok Ghosh of NMSEA.

## Energy Storage, PV & NEC Workshop (NABCEP Registered)

**2:30pm - 4:30pm | West Ballroom**  
This workshop will be jam-packed with NEC insight and interpretation. Sean White teaches PV courses around the world and has authored many technical PV books. Solar Photovoltaic Basics 2nd Ed., Energy Storage Basics, Solar PV Engineering and Installation 2nd Ed., Solar PV Technical Sales and PV and the NEC 2nd Ed. Sean will fill you up with as much information as possible in the time given, while entertaining you. This year Sean will focus more on Energy Storage Systems (ESS) than he has in the past.

Did you know that the NEC allows us to backfeed your house with electric vehicles (EVs) and that it is just the EV manufacturers holding us back? Be ready for when EV manufacturers let us do what they already should have.

This course will count for NABCEP continuing education requirements in every category and will also count for prerequisites for NABCEP Certification.

This course will also include a \$200 discount for Sean's advanced online PV classes and a printable color digital certificate included with course, along with PDF files of the presentation. Your instructor is based in the US and teaches classes internationally.

## NREL Virtual Tour

**2:30pm - 4:30pm | Online**  
Reserve your spot today for the National Renewable Energy Laboratory (NREL) campus virtual tour on August 6 from 2:30-4 p.m. MDT. This tour will provide a behind the scenes look at how NREL is transforming energy through research, development, commercialization, and deployment of renewable energy and energy efficiency technologies.  
All non-U.S. citizens are required to obtain advance approval and must submit a Foreign National Data Card (FNDC) for review. After registration, NREL staff will contact non-U.S. citizens with additional instructions to register. Tickets must be purchased by June 25 if you would like to join this virtual tour.



# JOIN US ONLINE

Thank you for joining us in Boulder, CO!

We want to ask all of the in-person attendees to join us online too so you can engage and network with our virtual attendees, speakers and sponsors. You can also use the online platform to ask questions online during the live sessions.

### Join the ASES SOLAR 2021 virtual platform using the following methods:

- Download the Brella app and participate on the virtual platform right from your smartphone or tablet. Simply log in using your unique URL sent to your email.
- Join the virtual platform from a browser and login using your unique URL sent to your email.

Visit [ases.org/brella](https://ases.org/brella) for more information and instructions on how to join the action online.

Posters will be on display Tuesday-Thursday in the Center Ballroom and on the online platform. Poster Sessions will be held on **Wednesday, August 4, 2021 from 4:00pm -5:30pm.**

Posters

**Mahelet Fikru**, *Missouri University of Science and Technology*  
"Residential Solar Photovoltaic in the United States:  
From Intentions to Adoptions"

**William Leighty**, *The Leighty Foundation*  
"Alternatives to Electricity Systems for Total De-carbonization  
and De-GHG-emission of the Entire Human Enterprise:  
Hydrogen and Ammonia Pipeline Systems"

**William Leighty**, *The Leighty Foundation*  
"Will Deep Hot Dry Rock Geothermal (DHDRG) Displace  
Solar and Wind ?"

**Eric Peterman**, *GRNE Solar*  
"Combining Solar and EV's"

**Debbie Coleman**, *Sun Plans Inc.*  
"Every Building is a Solar Building"

**Debbie Coleman**, *Sun Plans Inc.*  
"Quantifying Passive Solar Gain with PVWatts®  
Calculator"

**John Martin**, *Appalachian State University, Thomas  
Edison University*  
"Digital Energy: the Future of Power"

**John Martin**, *Appalachian State University, Thomas  
Edison University*  
"Integrated Utility Unit"

**Patrick Thompson**, *CloudBank*  
"Mitigating the Effects of Snow and Ice on Solar  
Array Performance"

**Yacob Hiben**, *Mekelle University*  
"A review on design, operation, integration, and  
techno-economic modeling aspects of solar thermal  
system for industrial heating and cooling processes"

**Nora Cuvelier**, *University of Texas at El Paso*  
"Solar Energy Education Initiatives to Support  
Sustainability in Bilingual Communities"

**Roger Davenport**, *Butler Sun Solutions*  
"Solar Cooking with PV Power"

**Jonathan Clemens**, *Olympic Energy Systems, Inc.*  
"True Sustainability with Low Embodied Energy"

**Talal Balaa**, *GeoAIM*  
"The thermodynamics and feasiblity for Solar Based,  
Portable EV Charging"

**Anand Raj**, *University of Texas at El Paso*  
"Studying the Impact of a University on Economic  
Sustainability: Case Study of the El Paso Region"

**Donald Clark**, *Crowder College*  
"Sustainable Marketing"

**Joshua Peterson**, *University of Oregon*  
"Evaluation of the Diffuse and Ground Reflected Irradiance  
to the Spectral Modeling of Solar Reference Cells"

**Walter Gerstle**, *University of New Mexico*  
"Thermal Energy Storage for the Electric Grid"

**Brian Roppe**, *NV5 Engineering*  
"Catalina Island - A Holisitc Approach"

**Juliette Nanos**, *CU Boulder Undergraduate*  
"Unlocking the Intersection Between Sustainable Building  
Retrofit Programs and United States Governmental Programs"

**Michael Sell**, *Saint Francis University Institute for Energy*  
"Sustainable Energy on Wheels: The Tiny Classroom Project"

**James Orenstein**, *Trinity River Community Solar Systems Inc  
(TRCSS)*  
"Community Energy Trading in TX: Potential Revenue Streams  
for Helping Make Community Solar Sustainable"

**Brian McGowan**, *Swing Green*  
"Water heating efficiency for electrify everything"

**Narayanan Komerath**, *Taksha Institute*  
"Credit for Reducing Sunshine"

**Will Heegaard**, *Footprint Project*  
"Scaling Mobile Hub-and-Spoke Solar for Disaster Resilience"

**Jennifer Scheib**, *University of Colorado Boulder*  
"Solar Decathlon"

**Chris Allo**, *ElektrikGreen, Inc.*  
"Hydrogen: A Cleaner Option for Residential & Commercial  
Energy Storage"

**Kristal Virgil**, *Groundswell*  
"DC Solar for All: Setting the Bar in Subscriber Services"

**Liz Veazey**, *Solar United Neighbors*  
"Solarizing FL: The Campaign to Legalize PPAs in the  
Sunshine State"

**Peter Golding**, *University of Texas at El Paso*  
"Global Research and Development in Salinity Gradient  
Solar Ponds"

**Alan Bigelow**, *Science Director At Solar Cookers International*  
"Solar Cookers International Enhances The Global Solar  
Cooking Movement Through Advocacy, Research, And  
Strengthening Capacity"

**Gopalakrishnan Ramaswami**, *Advanced Integrated Analytical  
and Test Services*  
"Technical and Economic Performance Analysis of a Rooftop  
Residential PV -Grid System at Florida"

### 2021 ASES AWARD WINNERS

**John Burke**  
*Rebecca Vories Award*

**William Callahan**  
*John and Barbara Yellott Award*

**Qiuhua Duan**  
*John and Barbara Yellott Award*

**Paul Fenn**  
*Leadership in Solar Policy and Market  
Transformation Award*

**Alfredo Fernandez-Gonzalez**  
*Leadership in Solar Architecture and  
Design Award*

**Dr. Jan Kleissl**  
*Charles Greeley Abbot Award*

**Fayeann Lawrence**  
*Women in Solar Energy (WISE) Award*

### NEW ASES FELLOWS

**Everett Barber**  
**Lucas Dixon**  
**Robert Foster**  
**David Hill**  
**Orlo Stitt**  
**Tom Stoffel**

**Tony Seba**  
*Solar Transformation Recognition by the Board of Directors*

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# EXPERIENCE SOLAR

In Your Community

## NATIONAL SOLAR TOUR

October 2-3, 2021

Live/Virtual Experience



**ASES National Solar Tour is the largest grassroots solar, renewable energy, and sustainable living event in the nation.**

Join us on October 2-3, 2021 as hundreds of people across the nation show off their solar homes and businesses. During this two-day event, solar owners and supporters will have a chance to connect, ask and answer questions, and participate in a nationwide in-person and virtual solar experience.

Signup Deadline: **August 15, 2021**

 [nationalsolartour.org](https://nationalsolartour.org)

## We Thank Our Sponsors



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