

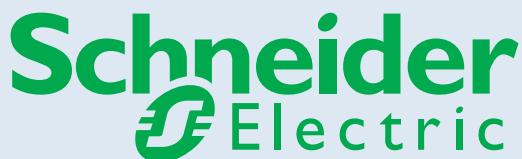


# NABCEP

## Continuing Education CONFERENCE

March 29-April 1, 2015 / Albany, NY

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# NABCEP

## Continuing Education CONFERENCE

March 29-April 1, 2015 /Albany, NY

**On behalf** of the NABCEP Staff and Board of Directors, I'd like to personally welcome each of you to the Fourth Annual NABCEP Continuing Education Conference. It is fitting that we are holding this year's conference in Albany again, where we held the first NABCEP CE Conference in 2012. The Solar Industry has changed in many ways since then, and so have you. What hasn't changed is NABCEP's mission to work with renewable energy stakeholders to raise industry standards. Whether you are currently a NABCEP Certified Professional, an employee of a NABCEP Accredited Company, or an individual working towards that goal, you too are supporting NABCEP's mission and promoting consumer confidence. For that, we thank you.

Working closely with industry experts, we've created an interactive and informative conference for you this year that offers attendees valuable and up to date trainings, panel sessions and networking opportunities. Over the course of the next three days, you will be hearing from the solar industry's foremost experts, technical trainers, and product specialists. A wide variety of exhibitors representing every aspect of the solar industry are here to discuss their products and services. Many are providing technical training sessions during the morning on Monday and Tuesday. During the afternoons, you will have the opportunity to interact with panels on the most relevant, and potentially controversial, topics facing solar installation and technical sales professionals.

I encourage you to take advantage of the many resources and networking opportunities available at this year's conference. Importantly, our networking meals and frequent refreshment breaks create space for industry leaders and solar industry professionals to exchange ideas on technology trends and best practices. NABCEP is proud to be able to bring you all together, and we know that the conversations you have here will be some of the most relevant and interesting that you will have all year — until the next NABCEP CE Conference!

I would like to take a moment to thank our generous sponsors and all of the exhibitors for their contributions that make this event a success year after year. Their support is a tremendous vote of confidence for NABCEP's mission and allows us to hold this special event. They are here because you are here, and their support helps us keep the price affordable. Please join us in showing your appreciation by stopping by their exhibit booths to say thank you and learn about what they have to offer. We are especially grateful to Schneider Electric, who has signed up as NABCEP's 2015 Platinum Champion Sponsor. Thank you again for joining us this year. I'm sure that you will find this conference to be a rewarding experience. Please be sure to stop by the NABCEP booth and introduce yourself.

Sincerely,

Richard Lawrence, *Executive Director*



I would like to personally welcome you to the fourth annual North American Board of Certified Energy Practitioners (NABCEP) Continuing Education Conference. We are very pleased to be working with NABCEP this year to provide you with the very best education and tools to ensure your success for the many years ahead.

As the global specialist in energy management, Schneider Electric has over a 178 year history of innovation, international reach and corporate social responsibility. We've contributed to the transformation of multiple industries: from iron and steel to shipbuilding and transportation, electricity and now the solar industry.

In the last 18 months alone we have demonstrated our long-term commitment to the development of the solar industry in North America with the launch of several new innovative products and solutions to address the needs of all our customers for performance, reliability, ease of installation and service.

We are very proud of our new products which include the Conext XW+ and Conext SW for hybrid applications, Conext CL for decentralized commercial and PV power plants and the Conext ComBox and Conext Insight for remote monitoring of your distributed PV plants.

Reliability is at the core of Schneider Electric's offering to its customer. We are proud to provide our customers with robust long term and highly reliable solutions, understanding the special care needed in the solar industry.

Over the next three days you have a great opportunity network with and be trained from the very best in the solar industry and I'd like to thank each of you for attending this conference and bringing your expertise and your desire to learn to this great event.

I would also like to thank NABCEP for giving us the opportunity to partner with them this year as the platinum sponsor of this conference. It is with great honor that we are able to help further their mission to support the renewable energy and energy efficiency industries, professionals, and stakeholders.

I invite you all to attend our training sessions this week, or stop by our booth to learn more about our many exciting new products and solutions!

A handwritten signature in black ink, appearing to read "Serge Goldenberg". The signature is fluid and stylized, with a large initial "S" and a long, sweeping underline.

**Serge Goldenberg**

Senior Vice President  
Schneider Electric Solar Business

<http://solar.schneider-electric.com>



“Providing Mitsubishi Electric products is an integral part of our philosophy to match our top-quality service offering with the highest quality equipment.”

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-Michael Ito  
Alternate Energy Inc., Hawai'i



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# Conference Schedule

Sunday - March 29, 2015

5:00 - 9:00 pm - Registration: Hotel Lobby

7:00 - 9:00 pm - NABCEP Hospitality Meet and Greet in "The Lodge"

Monday - March 30, 2015

7:30 - 8:30 am - Continental Breakfast

1.5 hrs. of Training (Up to 8 Parallel Sessions)

CLASSROOMS	Town Hall	King Street 2	King Street 4	King Street 6	King Street 8	High St. Rm. 24	High St. Rm. 26	The Lodge
8:30 - 10:00 am	Optimize Your Solar Business with SolarEdge <b>SolarEdge</b>	SMA's Sunny Boy TL US with Secure Power Supply: A Seriously Smart Home Energy Solution <b>SMA</b>	Meeting New Arc Fault Detection and Rapid Shutdown Requirements <b>Solctira</b>	Commercial System Design with C250 <b>Enphase</b>	Installing Apollo II PV Shingles <b>CertainTeed</b>	Deep-Cycle Battery Technologies & System Sizing for Renewable Energy Applications <b>Trojan Battery</b>	ICC Certification, Why It Matters <b>DPW Solar</b>	Solar Array Design for Commercial Buildings <b>ISA Corp</b>

10:00 - 10:15 am MORNING BREAK - **EXHIBIT HALL**

10:15 - 11:45 am	Aquious Hybrid Ion (AHI) Battery Product Training Seminar <b>Aquion Energy</b>	ABB Residential Inverter Solutions <b>ABB</b>	A Systems Approach to Hybrid Alant Architecture <b>Schneider Electric</b>	Jumpstart Activations with Installer Toolkit <b>Enphase</b>	Solar Roofing Best Practices <b>Quick Mount PV</b>	Stion CIGS Frame-less Module Installation Training <b>Stion</b>	Designing a TS4 Smart Module System <b>Gexpro, Tigo &amp; JA Solar</b>	PV Racking Including Intergrated Bonding <b>Unirac</b>
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11:45 - 12:45 pm NETWORKING LUNCH - Sponsor **Quick Mount PV®** / **EXHIBIT HALL**  
RESPECT THE ROOF

CLASSROOMS	Town Hall	King Street 2 & 4	King Street 6 & 8	High Street Rm 24 & 26	The Lodge
12:45 - 2:45 pm	Plug-in Vehicles and PV Sponsor: <b>Schneider Electric</b> Moderator: Nicholas Carter, PhD, NPC Solar Schneider Electric, TBD	AC VsDC Coupling Sponsor: <b>Trojan</b> Moderator: Don Warfield, NABCEP Board <b>Invited Panel:</b> Trojan Battery, Kalyan Jana SMA, Michael Mahon Morningstar, Brad Berwald Schneider Electric, Sandra Herrera	Grounding & Bonding Considerations Sponsor: <b>Wiley</b> Moderator: Roy Butler, Midnite Solar <b>Invited Panel:</b> Burndy, LLC, Sarah Parsons Quick Mount PV, TBD Schneider Electric, Roy Dyngen	PV System Design Tools Moderator: Andrew Truitt, Dividend Solar <b>Invited Panel:</b> Folsom Labs, Paul Grana PV Complete, Claudia Eyzaguirre Aurora Solar, Kareen Dabbagh Solar Census, Aaron Woro	

2:45 - 3:00 pm AFTERNOON BREAK - Sponsor **SOLECTRIA** / **EXHIBIT HALL**  
A YASKAWA COMPANY

3:00 - 5:00 pm	Common Installation Mistakes Sponsor: <b>IBTS</b> Moderator: Sarah Raymer, SolPower People <b>Invited Panel:</b> IBTS, Rudy Saporite Cadmus, Shawn Shaw NREL, Sarah Kurtz	PV Fire Setbacks for Rooftop Solar Moderator: Jeff Spies, Quick Mount PV <b>Invited Panel:</b> Buckville Energy, Dan Fink ReVision Energy, Fortunate C. Mueller, P.E. International Code Council, Ron Piester	Rapid Shutdown & Solutions Sponsor: <b>SMA</b> Moderator: Rebekah Hren, SEI <b>Invited Panel:</b> SMA, Greg Smith Midnite Solar, Roy Butler Solar Edge, Luc Collin Enphase, Peter Soleil ABB, Jim Egan	Solar Finance Moderator: Catherine Kelso, Ambassador Energy Inc. <b>Invited Panel:</b> Dividend Solar, Chris Doyle Capital Fusion Partners, John Joshi PACE Now, Kristina Kilmovich Focusd Energy, Matt Keonig NY Green Bank, Sarah Davidson	
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5:00 - 9:00 pm NETWORKING RECEPTION/DINNER - Sponsor **MITSUBISHI ELECTRIC** / **EXHIBIT HALL**  
SOLAR INNOVATIONS

# Conference Schedule

Tuesday - March 31, 2015

7:30 - 8:30 am - Continental Breakfast

1.5 hrs. of Training (Up to 8 Parallel Sessions)

CLASSROOMS	Town Hall	King Street 2	King Street 4	King Street 6	King Street 8	High St. Rm. 24	High St. Rm. 26	The Lodge
8:30 - 10:00 am	Value Engineering Techniques <b>Folsom Labs</b>	Decentralized Commercial PV with the Sunny Tripower: More Power. More Flexibility. More Profit <b>SMA</b>	Magnum Battery Based Products and Applications <b>Magnum Energy</b>	Solar PV Equipment Choices — Risks and Rewards <b>Mitsubishi Electric</b>	Know Your Code: Solar Roof Mounts <b>IronRidge</b>	Energy Storage Systems - Sizing, Care, Troubleshooting Do's and Don'ts <b>Rolls Battery Engineering</b>	NEC and UL-1741 from PV Input to Battery: What You Need to Know <b>Outback Power</b>	Monitoring PV Systems with the eGauge 3 Series <b>eGauge Systems</b>

10:00 - 10:30 am MORNING BREAK - **EXHIBIT HALL**

10:30 - 12:00 pm	TriStar MPPT Charge Controller Design for Off-Grid and Grid-Tie Retrofit <b>Morningstar</b>	ABB Commercial Inverter Solutions <b>ABB</b>	Modular Design of Large Scale Hybrid Systems <b>Schneider Electric</b>	Solar PV Equipment Choices — Risks and Rewards <b>Mitsubishi Electric</b>	Quick Rock: Design & Installation <b>Quick Mount PV</b>	Energy Storage Systems - Sizing, Care, Troubleshooting Do's and Don'ts <b>Rolls Battery Engineering</b>	NEC and UL-1741 From PV Input to Battery: What You Need to Know <b>Outback Power</b>	WILEY WEEB® 101— Bonding, Grounding and Wire Management Boot Camp <b>Burndy, LLC</b>
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12:00 - 1:00 pm NETWORKING LUNCH - **EXHIBIT HALL**

CLASSROOMS	Town Hall	King Street 2 & 4	King Street 6 & 8	High Street Rm 24 & 26	The Lodge
1:00 - 3:00 pm	How PV Standards Maybe Useful to You <b>Sarah Kurtz, NREL Reliability Research</b>	Operations & Maintenance Strategies Sponsor: <b>enphase ENERGY</b> Moderator: Rebekah Hren, SEI and Brian Mehalic, SEI	AC/DC Arc Fault Protection Panel Sponsor: <b>SOLECTRIA</b> A YASKAWA COMPANY Moderator: Ward Bower, Ward Bower Innovations, LLC Invited Panel: Enphase, Peter Lum Solectria, Eric Every SolarEdge, Luc Collin Midnite Solar, Ryan Stankevitz	UL 1703 Fire Classification & UL 2703 The New ANSI Standard For Rack Mounted PV Systems Moderator: Jeff Spies, Quick Mount PV Invited Panel: UL, LLC, Christopher Flueckiger Unirac, Jason Mayfield, PE PanelClaw, Mark Gies Solar Census, Aaron Woro	

3:00 - 3:30 pm AFTERNOON BREAK- Sponsor **ABB** / **EXHIBIT HALL**




3:30 - 5:30 pm	Roofing for the Solar Installer Tony Diaz, Century Roof Solar	1000 V Systems Sponsor: <b>SMA</b> Moderator: Ryan Mayfield, Renewable Energy Associates Invited Panel: SMA America, Greg Smith Solectria, Eric Every Third Sun Solar, Geoff Greenfield Midnite Solar, Ryan Stankevitz	Net Metering & Interconnection Sponsor: <b>ABB</b> Moderator: Kristen Nicole, Women in Solar Energy Invited Panel: ABB, Larry Truong MA DOER, Mike Judge Chair of NY PUC, Audrey Zibelman JA Solar, Tom Thompson	Tips, Tools & Techniques Ken Gardner, Gardner Engineering	
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5:30 - 9:00 pm NETWORKING RECEPTION/DINNER - Sponsor **SMA** / **EXHIBIT HALL**

# Conference Schedule

Wednesday - April 1, 2015

7:30 - 8:30 am - Continental Breakfast

CLASSROOMS	Town Hall	King Street 2, 4 & 6	High Street Rm 24 & 26	The Lodge
8:30 am - 1:00 pm	<b>Economics of Solar: Making the Financial Case for Commercial &amp; Residential PV</b> Andy Black & Brian Bishop, OnGrid Solar Sponsor: <a href="#">Mitsubishi Electric</a> 	<b>PV and the 2015 NEC</b> Ryan Mayfield, Renewable Associates Sponsor: <a href="#">SMA</a> 	<b>Grid-Connected Battery-Based System Design and Installation</b> Sponsor: <a href="#">Rolls Battery Engineering</a> Rebekah Hren and Brian Mehalic, Solar Energy International 	
10:00 - 10:30 am	MORNING BREAK / <a href="#">EXHIBIT HALL</a>			
12:00 - 1:00 pm	NETWORKING LUNCH / <a href="#">EXHIBIT HALL</a>			
2:30 - 3:00 pm	AFTERNOON BREAK / <a href="#">EXHIBIT HALL</a>			
3:00 - 4:30 pm	<b>Economics of Solar: Making the Financial Case for Commercial &amp; Residential PV</b> Continued	<b>PV and the 2015 NEC</b> Continued	<b>Grid-Connected Battery-Based System Design and Installation</b> Continued	

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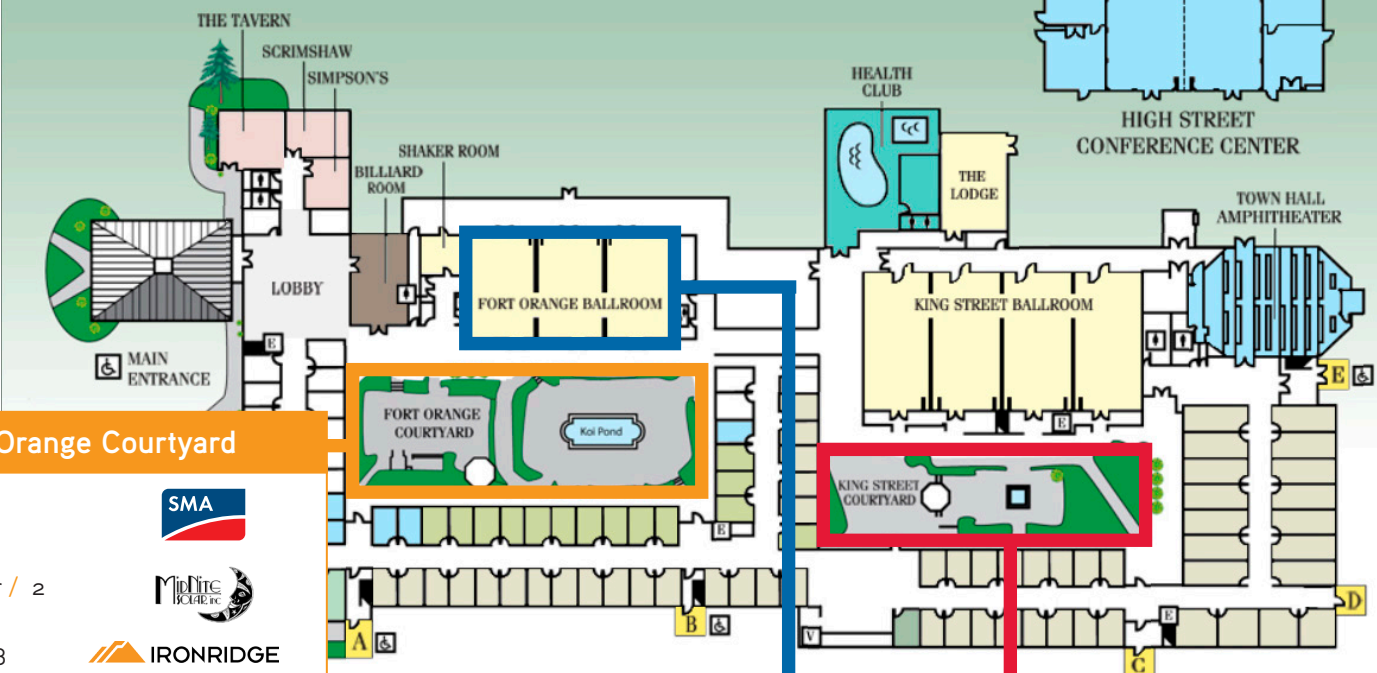
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# Conference Exhibitors



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Monday, March 30, 2015

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## Optimize Your Solar Business with Solar Edge

Cameron Stewart, Solar Edge

Monday 3.30.15  
8:30am - 10:00am  
Town Hall  
1.5 CEU credits

It's really not that hard to have a best in class solar solution. Join the team at Solar Edge and learn how easy it can be to optimize your next PV project. Get more energy, design flexibility, production data at the module level and a safer more reliable electrical system with Solar Edge's optimized inverter solutions.

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## SMA's Sunny Boy TL-US with Secure Power Supply: A Seriously Smart Home Energy Solution

Greg Smith, SMA

Monday 3.30.15  
8:30am - 10:00am  
King Street 2  
1.5 CEU credits

Easy design and fast installation make this the perfect solution for challenging rooftops. What more could you want from a string inverter? Upping the ante for residential solar, this groundbreaking inverter offers the industry's first Secure Power Supply, allowing it to produce power when the grid goes down *without* the use of batteries! After this introductory class, you will have a greater understanding of:

- Secure Power Supply capabilities and how it can make you more profitable
- Installation best practices for a worry-free site
- Simple array design allowing for different orientations, tilt and partial shading
- Easy plug-and-play communication and monitoring with our new Webconnect module SMA Rapid Shutdown Box

---

## Meeting New Arc Fault Detection and Rapid Shutdown Requirements

Eric Every, Solectria

Monday 3.30.15  
8:30am - 10:00am  
King Street 4  
1.5 CEU credits

Solectria Renewables will explore the primary considerations of achieving compliance with NEC 2014 for arc fault detection and rapid shutdown requirements. Even though Massachusetts is currently the only state that follows NEC 2014, many states are slated to adopt this code cycle by the end of 2015, such as Georgia, Texas, Colorado and New Mexico. Information in this webinar is also valuable for those having to comply with NEC 2011 arc fault detection

requirements. Topics discussed will include:

- Achieving AFDI and rapid shut down compliance for central inverters using string combiners
- Achieving AFDI and rapid shut down compliance for three-phase string inverters
- Arc fault detection technology basics
- Introduction to Solectria's new arc fault compliant string combiner (ARCCOM).

---

## Commercial System Design with C250

Peter Lum, Enphase

Monday 3.30.15  
8:30am - 10:00am  
King Street 6  
1.5 CEU credits

Do you want to get more technical details on the new Enphase Commercial System? Join us to learn about:

- The 4 dimensions of the Enphase Commercial Solution
- The C250 system components and how they work
- The best System Design practices for Commercial Projects
- Additional resources and training available for commercial system design.

---

## Installing Apollo II PV Shingles

Katy Collardson, CertainTeed

Monday 3.30.15  
8:30 - 10:00am  
King Street 8  
1.5 CEU credits

This course will cover the design and installation methods for CertainTeed's Apollo II Solar Shingles. Students will learn about the electrical characteristics of solar shingles and the way that modules will string together into an inverter. In addition, they will learn about setback requirements when installing the system on a roof and other considerations pertaining to the installation of a waterproof roofing and PV system. Finally, they will have an opportunity for a hands-on experience installing shingles on a demonstration deck.

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## Deep-Cycle Battery Technologies & System Sizing for Renewable Energy Applications

Kalyan Jana, Trojan Battery

Monday 3.30.15  
8:30am - 10:00am  
High Street #24  
1.5 CEU credits

Learn the basics of battery selection, system sizing and proper maintenance to get the most out of your deep-cycle battery investment, while

understanding the key differences between flooded and VRLA technologies. Trojan Battery manufactures a complete line of true deep-cycle products for the renewable energy industry, including our new Reliant™ AGM with C-Max Technology™ product line which is built in the USA.

---

## ICC Certification, Why It Matters

Steve Schumacher, DPW Solar

Monday 3.30.15  
8:30am - 10:00am  
High Street #26  
1.5 CEU credits

The PV industry has matured from an infant to unwieldy teenager. This course discusses the certification of PV racking products to meet International Building Codes and the value of certification as the industry continues to mature. The presenter will discuss product testing and the rigorous certification process by an internationally recognized organization that certifies products to meet the International Building Code.

---

## Solar Array Design for Commercial Buildings

Tony Zante, ISA Corporation

Monday 3.30.15  
8:30am - 10:00am  
The Lodge  
1.5 CEU credits

This course provides the tools to evaluate a commercial building for its solar capacity - based on its size, roof geometry including equipment shading effects, and its structure. Specific tools for this evaluation process are introduced including calculators for building weight, determination of solar accessible areas, comparison of solar capacity vs. array height, and soft costs associated with number of roof mounts. Alternatives for maximizing solar capacity on roofs are presented along with their relative costs. Procedures, check-off lists and spreadsheets for obtaining the necessary roof data for rack mounting, and for providing the critical information needed for structural analysis are presented. Description of raised/elevated racking for commercial buildings.

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## Aquions Hybrid Ion (AHI) Battery Product Training Seminar

Johnathan Matusky, Aquion Energy

Monday 3.30.15  
10:15 - 11:45am  
Town Hall  
1.5 CEU credits

Learn the fundamentals of chemistry, product design, and performance of the newest energy storage chemistry to be commercialized — aqueous hybrid ion. In this seminar, the presenter will provide an overview of how the chemistry works to store and discharge energy and provide corol-



Monday, March 30, 2015

laries to more commonly known energy storage chemistries such as lead acid. Learn the pros and cons of both chemistries in practical applications and how to know which chemistry to select depending on what the customer is interested in. The session will also cover installation and use of AHI batteries as well as safety and environmental considerations.

### ABB Residential Inverter Solutions

Geoff Owens, ABB

Monday 3:30-15  
10:15 - 11:45am  
King Street 2  
1.5 CEU credits

This training course will inform the attendee of the current ABB single phase residential product applications and installation practices. Topics covered will include product selection, configuration and installation applications. Best installation practices and fundamental troubleshooting will also be discussed.

### A Systems Approach to Hybrid Plant Architecture

Roy Dyngen, Schneider Electric

Monday 3:30-15  
10:15 - 11:45am  
King Street 4  
1.5 CEU credits

Benefits from using compatible products communicating over a common network vs. discreet component assemblies

This session will cover:

- Understanding products working in concert vs. tug of war (eg. Conext MPPT with Conext XW+ charger vs. brand A charger with brand B charge controller)
- Making logical system decisions based on device inputs (eg. Conext Battery Monitor with charge sources)
- System monitoring and control (eg. accurate reporting of sources and uses of power from Conext ComBox and Conext Insight)

### Jumpstart Activations with Installer Toolkit

Peter Lum, Enphase

Monday 3:30-15  
10:15 - 11:45am  
King Street 6  
1.5 CEU credits

The Enphase Installer Toolkit gives you the tools and information you need to perform an efficient and successful Enphase installation. Join us and learn about:

- How the Installer Toolkit helps to jumpstart the Enlighten activation process
- Why you would use AP (access point) mode on the Envoy
- How to connect to an Envoy using AP mode

- Setting up the Envoy and Wi-Fi stick for use with a wireless network for reporting to Enlighten

### Solar Roofing Best Practices

Susan Stark & Johan Alfsen, Quick Mount PV

Monday 3:30-15  
10:15am - 11:45am  
King Street 8  
1.5 CEU credits

Quick Mount PV is the leading manufacturer and educator for code compliant solar mounting solutions. This technical presentation covers roofing codes and proper product application in order to speed up installation time while maintaining a quality system on various roof types. There will also be a brief intro to rail-free racking systems.

### PV Racking Including Integrated Bonding

Jean Arya, Unirac

Monday 3:30-15  
10:15 - 11:45am  
The Lodge  
1.5 CEU credits

PV racking advancements in pitched roof, flat roof and ground mount applications have made

## Sell More Solar With Quick Mount PV

“ We use virtually every Quick Mount PV product for mounting rooftop solar systems. It’s a no-brainer for us. We tell our customers: You have a 30-year roof, why would you use a mount that only lasts 10 years?

And Quick Mount PV delivers not just the best product, but also the best training, technical, and sales support. We use Quick Mount’s website, literature and informative videos to help sell the customer on the value proposition.

No doubt about it - Quick Mount PV helps us sell more solar. ”

- A. Dean Rafaat

Owner, Wired into the Future Solar

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the installation become simpler and faster with the recent introduction of “integrated” bonding. We will discuss general racking basics (briefly) and then focus on simplifying the engineering behind good racking and the integrated bonding that makes life easier for installers.

## Designing a TS4 Smart Module System

Tom Thompson, Gexpro, Tigo & JA Solar

Monday 3:30-15  
10:15 - 11:45am  
High Street Rm # 26  
1.5 CEU credits

This course will introduce the revolutionary TS4 platform by Tigo, available now with JA Solar through Gexpro / Rexel. Come learn about the flexible module platform, offering longer strings, optimization, safety, monitoring or simply diodes - but with potential to upgrade. The course will focus on designing JA Smart Modules with the different TS4 options. Each option has its own features, and design criteria. Participants will get a detailed ‘How To’ including live software examples. The TS4 options that will be covered are:

- TS4-M: how to utilize module level monitoring for fastest commissioning, on site troubleshooting and most efficient O&M
- TS4-S: easily comply with NEC 690.12 Rapid Shutdown
- TS4-O: how to increase your addressable market by designing on challenging rooftops, decrease setback ratios, different orientations, etc.
- TS4-L: optimal solution for minimizing your operational cost. Design longer strings for fastest deployment, fewest changes and greatest flexibility.

## Stion CIGS Frame-less Module Installation Training

Jon Haeme, Stion

Monday 3:30-15  
10:15 - 11:45am  
High Street #24  
1.5 CEU credits

Learn how to design and install systems using CIGS frame-less modules. You will learn about the differences between c-Si and CIGS modules and how that applies to system design. The following topics and more will be covered:

- What is CIGS light soaking? How is this different from LID?
- Why does lower temperature coefficient matter?
- How do I handle and install frame-less modules?
- What types of inverters are compatible with CIGS modules?

- What type of mounting systems work best with frame-less modules?
- What are the advantages of field parallel wiring?
- What do I need to know when modeling Stion modules in PVsyst or PVWatts?

## Plug-in Vehicles and PV

Sponsor: Schneider Electric



Nicholas Carter, PhD, Owner, NPC Solar  
Suresh Jayanthi, Schneider Electric

Monday 3:30-15  
12:45pm - 2:45pm  
Town Hall  
2 CEU credits

Plug-in vehicles, both pure electric and plug-in hybrids, are growing their market share (sales were up over 22% in 2014), are cheaper to run and are a great fit with PV. Often a homeowner will buy a solar system after buying a plug-in vehicle or vice versa. PV installers need to know the energy requirements of plug-in vehicles in order to size owners' PV systems. PV installers also need to know vehicle charging needs, electric vehicle supply equipment (EVSE) choices and time-of-use utility rate schedules that may dramatically affect the running costs of charging a vehicle.

## AC VS DC Coupling

Sponsor: Trojan



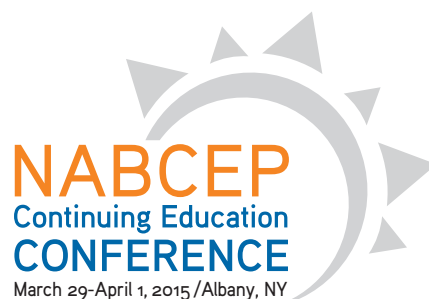
Moderator: Don Warfield, NABCEP Board

### Invited Panel:

Trojan Battery, Kalyan Jana  
SMA, Michael Mahon  
Morningstar, Brad Berwald  
Schneider Electric, Sandra Herrera

Monday 3:30-15  
12:45pm - 2:45pm  
King Street 2 & 4  
2 CEU credits

The incorporation of energy storage in grid-tied systems can take several forms. This panel will discuss the advantages and disadvantages of AC coupled systems versus DC coupled systems.



## Grounding & Bonding Considerations

Sponsor: Burndy, LLC



Moderator: Roy Butler, Midnite Solar

### Invited Panel:

Burndy, LLC, Sarah Parsons  
Quick Mount PV, TBD  
Schneider Electric, Roy Dyngen

Monday 3:30-15  
12:45pm - 2:45pm  
King Street 2 & 4  
2 CEU credits

As the PV industry continues to grow, so do the challenges for grounding and bonding for installers and equipment manufacturers. Compatibility issues between PV modules, racking, and inverters are all too common. Panelists from various inverter, racking and grounding hardware manufacturers will offer their perspective on the grounding and bonding issues unique to their products.

## PV System Design Tools

Moderator: Andrew Truitt, Dividend Solar

### Invited Panel:

Folsom Labs, Paul Grana  
Aurora Solar, Kareen Dabbagh  
PV Complete, Claudia Evzaguirre  
Solar Census, Aaron Woro

Monday 3:30-15  
12:45pm - 2:45pm  
High Street 24 & 26  
2 CEU credits

Design tools for PV systems have been around for over a decade, but as the solar industry has grown rapidly in recent years the number of design software options has grown with it. This session will explore a variety of software tools, with a focus on innovative cloud-based platforms.

## Common Installation Mistakes

Sponsor: IBTS



Moderator: Sarah Raymer,  
SolPower People

### Invited Panel:

NREL, Sarah Kurtz  
Cadmus, Shawn Shaw  
IBTS, Rudy Saporite III

Monday 3:30-15  
3:00pm - 5:00pm  
Town Hall  
2 CEU credits

In an industry sector that relies heavily on 'on the job training' and complicated yet limited installation manuals, we see the same installation

Monday, March 30, 2015

mistakes repeated far too often, and it is difficult to wrangle in the ripple effect. You are invited to observe a panel discussion designed to help you save money, time and headaches by avoiding these issues.

## Rapid Shutdown & Solutions

Sponsor: SMA



Moderator: Rebekah Hren, SEI

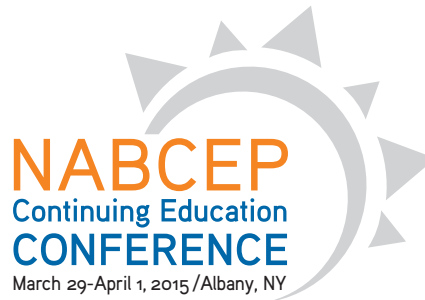
### Invited Panel:

SMA, Greg Smith  
Midnite Solar, Ryan Stankevitz  
SolarEdge, Cameron Steward  
Enphase, Nick Soleil  
ABB,

Monday 3:30-15  
3:00pm - 5:00pm  
King Street 6 & 8  
2 CEU credits

The 2014 National Electrical Code added rapid-shutdown function requirements for PV systems

on buildings, with the goal of protecting first responders from energized PV system conductors. This session first provides an overview of the intent of the NEC 690.12 requirements and the technical obligations facing PV installers of roof-mounted arrays. The panel brings manufacturers solutions to the table, focusing on the various practical solutions currently available – including inverter-based and balance-of-system options. Real-world examples of 2014 Code-compliant system installations that meet rapid-shutdown requirements will be illustrated and discussed.



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- ▶ Broadest Technology Portfolio
- ▶ Made in the USA 



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## PV Fire Setbacks For Rooftop Solar Installation

Moderator: Jeff Spies, Quick Mount PV

### Invited Panel:

ReVision Energy LLC, Fortunat C Mueller, P.E.  
International Code Council, Ron Piester  
Buckville Energy, Dan Fink

Monday 3:30-15  
3:00pm - 5:00pm  
King Street 2 & 4  
2 CEU credits

Installers in western states have already adapted to the 3 foot array setbacks on rooftop PV installations. Installers in the Northeast will now be facing the same requirement. Within the next 6-18 months, New York and many surrounding states will be updating to the 2012 or 2015 building codes ushering in the roof setbacks common to solar installations in the western US. Ron Piester New York Dept of State will provide understanding on implementation dates for the 2015 building code in New York and explain how local jurisdictions might interpret and implement this new code requirement. Fortunat Mueller will review the code requirements and impacts on solar installation companies, and Dan Fink will examine how firefighters view solar rooftops and what solar installers can do to minimize problems and maximize solar array size.

## Solar Finance

Moderator: Catherine Kelso, Ambassador Energy Inc.

### Invited Panel:

Dividend Solar, Chris Doyle  
Capital Fusion Partners, John Joshi  
PACE Now, Kristina Kilmovich  
Focusd Energy, Matt Keonig  
NY Green Bank, Sarah Davidson

Monday 3:30-15  
3:00pm - 5:00pm  
High Street 24 & 26  
1.5 CEU credits

Discussion of bank loans, PACE, lease and PPA options to finance PV systems, the pros and cons of each and how to choose the best option for your customer.

## Value Engineering Techniques

Paul Grana, Folsom Labs

Tuesday 3:31:15  
8:30am - 10:00am  
Town Hall  
1.5 CEU credits

As module and inverter costs level off, system engineers must look to other levers for driving down the installed cost of solar energy. By optimizing system design, engineers can improve yield and/or reduce cost — and also challenge commonly-accepted rules of thumb across the industry. This session will explain techniques and frameworks for optimizing system designs. These techniques include GCR/tilt optimizations, shade setback analysis, re-binning quantification, and azimuth optimization. The training will address common design rules, quantifying the problems that can be caused by these rules. The presentation will address both residential and commercial-scale systems. The presentation will also describe how to use common tools that can be used for analysis, including Excel and HelioScope.

## Decentralized Commercial PV with the Sunny Tripower: More Power. More Flexibility. More Profit.

Mike Mahon, SMA

Tuesday 3:31:15  
8:30am - 10:00am  
King Street 2  
1.5 CEU credits

Use the right tool for the job. The flexibility of a commercial-scale string inverter means more opportunities for installers and more options for their customers. The SMA Sunny Tripower line of three-phase, transformerless string inverters will scale from a 24kW application all the way to multi-megawatt designs. Megawatt-sized systems using the Sunny Tripower have sprouted up all across the continent since its release, opening the door for installers to grow their business. This seminar will cover the important aspects of using string inverters for commercial PV applications and will compare and contrast the traditional central inverter approach, including:

- When does it make sense to use a decentralized design?
- Why should I use the Sunny Tripower for my designs?
- How easy is it to design, install and monitor a Sunny Tripower?
- Why are grid management features important?

## Magnum Battery Based Products and Applications

Alan Santos-Buch, Magnum Energy

Tuesday 3:31:15  
8:30am - 10:00am  
King Street 4  
1.5 CEU credits

This discussion and power point will provide an overview of Magnum battery based power conversion devices used in various off grid and grid tied applications. The presentation will focus on systems design, product selection, and installation techniques. Topics also addressed will include remote control programming, interconnection system equipment variations, AC coupling applications, and troubleshooting faults in systems. Additionally, I will discuss new products expected for release soon which include the ACLD-40 (AC diversion controller for AC coupling applications) and the new PT100 Charge Controller.

## Know Your Code: Solar Roof Mounts

Daniel Felix, IronRidge

Tuesday 3:31:15  
8:30am - 10:00am  
King Street 8  
1.5 CEU credits

In the 1st part of this presentation we will review the different building codes related to solar and discuss how to design fully compliant systems. Topics include: waterproof attachment methods, roof structural considerations, electrical safety and grounding, and class A fire rating. In the 2nd half of this presentation, we will cover the key code requirement for solar roofs and review products and procedures to ensure you're installing code-compliant, long-lasting solar roof mount systems. Topics include: solar building requirements, IronRidge roof mount products, and IronRidge design assistant tool.

## Solar PV Equipment Choices – Risks and Rewards

Gian-Paolo Caminiti & Jim Kadakia, Mitsubishi Electric

Tuesday 3:31:15  
8:30am - 10:00am  
King Street 6  
1.5 CEU credits

Are you choosing the right equipment? What do you look for? Brand, price, warranty, wattage (is bigger really better?), tolerances, efficiency / fire / load ratings, certifications, materials used — the list seemingly goes on forever.

Join us in a discussion on how to sort through the massive amounts of information available and build your business by identifying relevant

technologies & trends in PV modules, inverters, and racking. Learn what to look for while avoiding distractions and you will streamline your PV equipment selection process, saving money now and trouble with deficient equipment and unhappy customers later.

## Energy Storage Systems - Sizing, Care, Troubleshooting Do's and Don'ts

Steve Higgins, Rolls Battery Engineering

Tuesday 3:31:15  
8:30am - 10:00am  
High Street #24  
1.5 CEU credits

Proper selection and sizing of battery banks for off-grid and grid-connected systems will be discussed, as well as inspection and installation, system setup, programming of charging set points, as well as ongoing battery maintenance and care to retain capacity and ensure long cycle life. Identifying charging issues, causes of capacity loss and other troubleshooting techniques will also be covered.

## NEC and UL-1741 from PV Input to Battery: What You Need to Know

Philip Undercuffler, Outback Power

Tuesday 3:31:15  
8:30am - 10:00am  
High Street #26  
1.5 CEU credits

The role of the combiner in PV system design is changing to include critical safety functions. That, plus the rapid increase in systems with battery-based energy storage is driving the need for safer, smarter and more flexible methods of combining and managing array output. In this session we will evaluate the options, key requirements and design considerations necessary to ensure a safe, reliable and compliant solution from roof to battery. Aspects addressed in this session include:

- Rapid Shutdown – in the event that the PV system has to be disabled (such as during a fire when first responders need rooftop access), how to ensure controlled DC PV conductors are “touch safe” quickly and safely.
- PV Arc Fault Circuit Interrupt – how to best select optimal locations for detecting and controlling PV arc faults, to improve detection while minimizing nuisance trips and false alarms.
- Load-break rated PV Combiner DC Disconnect – proper coordination of over current protection, disconnecting means and service access for PV circuits.
- Touch-safe design – how to reduce exposure to hazardous voltage and currents by careful selection and coordination of equipment.
- Certifications – ensuring a safe, compliant and reliable installation in a field where codes and standards are rapidly evolving.

## Monitoring PV Systems with the eGauge 3 Series

Ed Pantzar, eGauge Systems

Tuesday 3:31:15  
8:30am - 10:00am  
The Lodge  
1.5 CEU credits

An overview of the eGauge monitoring platform. Topics will include: system components, installation procedure, user interface features, consumption monitoring, and lead generation methods.

## TriStar MPPT Charge Controller Design for Off-Grid and Grid-Tie Retrofit

Brad Berwald, Morningstar

Tuesday 3:31:15  
10:30am - 12noon  
Town Hall  
1.5 CEU credits

Configurations discussed include single or multiple charge controllers configured for large off-grid power systems. The addition of load diversion controllers for wind or hydro systems. Design and configuration of the TS MPPT 600V will include installations of single or multiple units for both wind and solar applications as well as implementing the new high speed MPPT synchronization function. This allows for larger charging sources (PV or Wind) of up to 12kW to

be connected with a single input to charge a 48V DC battery bank.

Configuration and implementation of the new TS MPPT 600V Transfer version will be reviewed which allows for the simplified retrofit of battery backup into an existing Grid-Tie systems using a DC-coupled topology.

Remote communication and networking capabilities will be reviewed for all of the above implementations using the native Ethernet features of these products as well Morningstar's MS View remote logging and configuration software.

## ABB Commercial Inverter Solutions

Geoff Owens, ABB

Tuesday 3:31:15  
10:30am - 12noon  
King Street 2  
1.5 CEU credits

This training course will inform the attendee of the current ABB single phase commercial product applications and installation practices. Topics covered will include product selection, configuration and installation applications. Best installation practices and fundamental troubleshooting will also be discussed.

## Modular Design of Large Scale Hybrid Systems

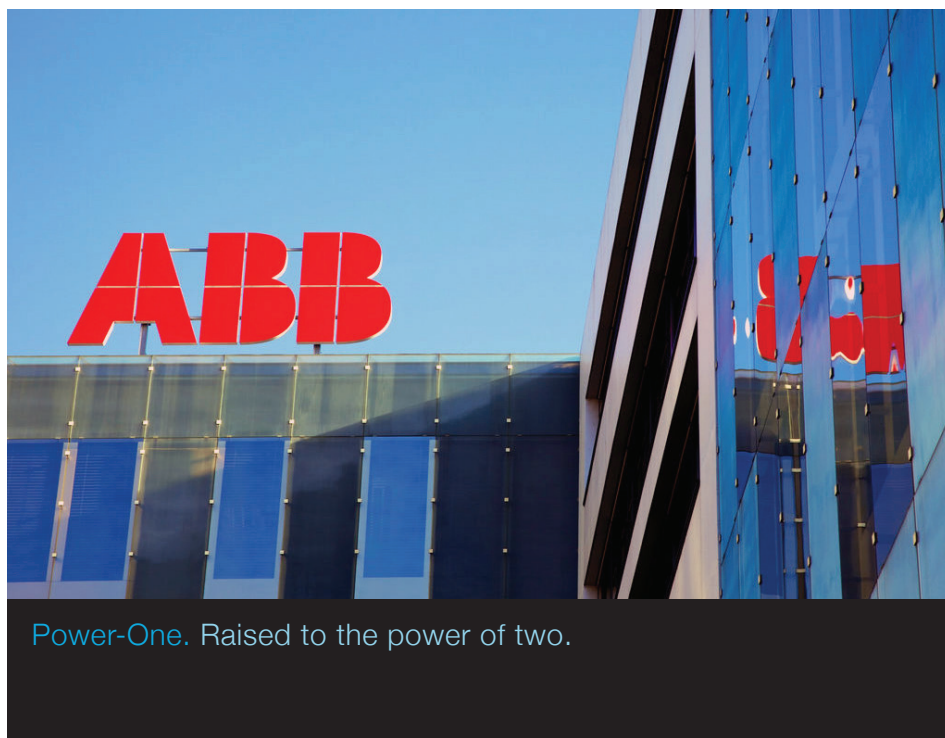
Roy Dyngen, Schneider Electric

Tuesday 3:31:15  
10:30am - 12noon  
King Street 4  
1.5 CEU credits

Architecture considerations for hybrid systems employing multiple inverters

Objectives:

- Modular, scalable design using inverter blocks (multi-cluster design)
- Effective battery bank design for large systems
- Criticality of managing storage in large systems (using the Conext Battery Monitor)
- Benefits of combining and managing AC sources in central panel
- Design compatibility with AC coupled, DC coupled or both
- Centralized monitoring and control of all components through single interface (using the Conext ComBox)



Power-One is now officially known as ABB. But this is much more than just a name change. One of the most innovative inverter manufacturers in the world now has the engineering, infrastructure and financial clout of a Fortune 500 company. The benefits to our customers and the solar industry as a whole should be felt for years to come. ABB now has one of the industry's most comprehensive offerings of solar inverters for residential, commercial and utility-scale pv installations. For more information please visit: [www.abb.com/solarinverters](http://www.abb.com/solarinverters)



## Solar PV Equipment Choices – Risks and Rewards

Gian-Paolo Caminiti & Jim Kadakia,  
Mitsubishi Electric

Tuesday 3:31:15  
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1.5 CEU credits

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## Quick Rack: Design & Installation

Susan Stark & Johan Alfsen, Quick Mount PV

Tuesday 3:31:15  
10:30am - 12noon  
King Street 8  
1.5 CEU credits

Quick Mount PV is the leading manufacturer and educator for code compliant solar mounting solutions. This technical presentation covers roofing codes and proper product application in order to speed up installation time while maintaining a quality system on various roof types. There will also be a brief intro to rail-free racking systems.

## Energy Storage Systems – Sizing, Care, Troubleshooting Do's and Don'ts

Steve Higgins, Rolls Battery Engineering

Tuesday 3:31:15  
10:30am - 12noon  
High Street #24  
1.5 CEU credits

Proper selection and sizing of battery banks for off-grid and grid-connected systems will be discussed, as well as inspection and installation, system setup, programming of charging set points, as well as ongoing battery maintenance and care to retain capacity and ensure long cycle life. Identifying charging issues, causes of capacity loss and other troubleshooting techniques will also be covered.

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- Touch-safe design – how to reduce exposure to hazardous voltage and currents by careful selection and coordination of equipment.
- Certifications – ensuring a safe, compliant and reliable installation in a field where codes and standards are rapidly evolving.

## Wiley WEEB® 101 – Bonding, Grounding and Wire Management Boot Camp

Harley Haney, Burndy, LLC

Tuesday 3:31:15  
10:30am - 12noon  
The Lodge  
1.5 CEU credits

A deep dive, technical discussion and interactive experience with proper installation of WEEB® washers for compliance with NEC requirements. Project applications from residential to utility scale will be covered with best practices and where to install WEEB® washers and lugs. Product samples will be handed out and various racking/module frame assemblies will be passed around for an up-close inspection and better understanding. In addition, wire management will be covered since inspectors will be clamping down on using better methods for these long term applications.

## How PV Standards May Be Useful to You

Sarah Kurtz & Dirk Jordan, NREL

Tuesday 3:31:15  
1:00pm - 3:00pm  
Town Hall  
2 CEU credits

Learn from the bigger PV experience. With more than 0.1 TW of PV deployed around the world, we will present summaries for annual yield relative to projected yield, causes for lost production, degradation rates, and the effects of climate on all of these and will solicit inputs from participants to see if their experience is consistent with the larger experience. While the vast majority of PV modules do very well in the field, there are some failures that require non-standard tests to detect. We will discuss how new standards are being designed to address these problems and will seek participants' input on how these may be most useful.

## Operations & Maintenance Strategies

Sponsor: Enphase



Rebekah Hren & Brian Mehlic, SEI

Tuesday 3:31:15  
1:00pm - 3:00pm  
King Street 2 & 4  
2 CEU credits

The goal of PV system operations and maintenance (O&M) is insuring predictable ROI, PV system longevity, and peak productivity. O&M is one of the fastest growing segments of the PV industry, and for good reasons: preventive maintenance helps lower costs; averts potential system downtime; maintains equipment warranties; and improves system efficiency and energy output. O&M strategies and procedures will be covered, along with tools and techniques for troubleshooting.

## AC/DC Arc Fault Protection

Sponsor: Solectria



Moderator: Ward Bower,  
Ward Bower Innovations, LLC

### Invited Panel:

Enphase, Peter Lum  
Solectria, Eric Every  
Solar Edge, Luc Collin  
Midnite Solar, Ryan Stankevitz

Tuesday 3:31:15  
1:00pm - 3:00pm  
King Street 6 & 8  
2 CEU credits

The panel made up of representatives from PV manufacturing industry who will discuss the

Tuesday, March 31, 2015

range of arc-fault protection methodologies and devices for PV systems with a little background on the origins of arc-fault protection. Arc Fault protection began as ac-arc-fault interruption in the NEC for bedrooms and is now required in varying degrees for ac and dc PV by the NEC. Panel members will present arc-fault mitigation perspectives on PV systems that utilize large central inverters, microinverters, dc-dc converters and optimizers during 20 minute presentations. Please take notes on your perspectives as the session progresses for use in the discussion following the presentations.

## UL 1703 Fire Classification & UL 2703, The New ANSI Standard For Rack Mounted PV Systems

Moderator: Jeff Spies, Quick Mount PV

### Invited Panel:

UL, LLC, Christopher Flueckiger  
Unirac, Jason Mayfield, PE  
PanelClaw, Mark Gies

Tuesday 3:31:15  
1:00pm - 3:00pm  
High Street Rms 24 & 26  
2 CEU credits

The new UL 1703 fire classification listing is already required for racking systems in California and will impact numerous other states as they adopt 2012 or 2015 building codes. UL 2703 is the newly ANSI accredited racking standard that addresses bonding and grounding, mechanical loading, and corrosion for modules and racking. UL 2793 is already required in LA county with many jurisdictions to follow. This panel will address how these standards work, and the impact they will have on racking and module manufacturers, building officials and installers.

## Roofing for the Solar Installer

Moderator: Tony Diaz, Century Roof and Solar

Tuesday 3:31:15  
3:30pm - 5:30pm  
Town Hall  
2 CEU credits

This course addresses the historical issues and challenges of adding solar equipment to both flat and slope roof platforms. It will share the best practices known with the most recent advancements in mounting equipment combined with the proven techniques and workmanship delivered every day by Tony Diaz and Century Roof and Solar.

## 1000 V Systems

Sponsor: SMA



Moderator: Ryan Mayfield,  
Renewable Energy Associates

### Invited Panel:

SMA America, Greg Smith  
Solectria, Eric Every  
Third Sun Solar, Geoff Greenfield  
Midnite Solar, Ryan Stankevitz

Tuesday 3:31:15  
3:30pm - 5:30pm  
King Street 2 & 4  
2 CEU credits

The jump from 600 Vdc to 1,000 Vdc impacts every stage of the PV system design and installation. Integrators need to be aware of multiple changes in their design and installation methods to provide safe and reliable installations. This panel will focus on the impacts of 1,000 Vdc on the major components and how manufacturers are reacting to provide solutions to this market segment. Changes to system designs and installation practices as well as safety issues for the installation crews and the host site will be covered.

## Net Metering & Interconnection

Sponsor: ABB



Moderator: Kristen Nicole,  
Women in Solar Energy

### Invited Panel:

ABB, Larry Truong  
MA DOER, Mike Judge  
Chair of NY PUC, Audrey Zibelman  
JA Solar, Tom Thompson

Tuesday 3:31:15  
3:30pm - 5:30pm  
King Street 6 & 8  
2 CEU credits

## Tips, Tools, and Techniques

Ken Gardner, Gardner Engineering

Tuesday 3:31:15  
3:30pm - 5:30pm  
High Street 24 & 26  
2 CEU credits

Ken Gardner shares lessons learned from on-the-job experience and best practices compiled from a variety of industry leaders over the years. This presentation covers: tools used in the solar industry; residential and commercial solar installation examples; transformerless inverter installations; off-grid and grid-tie with battery backup considerations; load side connections; and ballasted roof top and ground-mounted systems.

Wednesday, April 1, 2015

## 2015 NEC Requirements for PV Systems

Sponsor: SMA



Ryan Mayfield,  
Renewable Associates

Wednesday 4:1:15  
8:30pm - 4:30pm  
King Street 2, 4 & 6  
6 CEU credits

Designed specifically for PV professionals, this course will cover the major Code articles affecting PV installations, focusing on the 2015 NEC. Upon successful completion of this course, participants will have the ability to recognize and implement new Code Requirements for PV systems.

## Grid-Connected Battery-Based System Design and Installation

Sponsor: Rolls Battery Engineering



Wednesday 4:1:15  
8:30pm - 4:30pm  
High Street 24 & 26  
6 CEU credits

Battery-based PV system design and installation is a complex task. This class focuses on system sizing and selecting components for residential grid-tied (multimode) applications. Load analysis techniques, inverter and controller selection criteria, battery maintenance, and NEC 2015 requirements for battery-based systems will be presented.

## Economics of Solar: Making the Financial Case for Commercial & Residential PV

Sponsor:  
Mitsubishi Electric



Andy Black & Brian Bishop, OnGrid Solar

Wednesday 4:1:15  
8:30pm - 4:30pm  
Town Hall  
6 CEU credits

A detailed study of Commercial and Residential PV Economic Analysis including system costs, incentives and electric rate structures variables as inputs to five financial analysis methods, including Simple Payback, Total Lifecycle Payback, ROI, Internal Rate of Return (IRR), Modified IRR, and Appraisal Resale Value.

# Conference Presenters

## **Alan Santos-Buch, Magnum Energy**

Alan Santos-Buch is the Director of Renewable Energy at Magnum Energy. He provides technical sales, training and support for dealers, distributors and installers in the Americas. Previously, as a managing partner at Solar Power Fit, LLC (SPF), Alan developed Power Purchase Agreements (PPA's) with commercial building owners who agreed to host their PV systems. He obtained his NABCEP entry level PV passing score.

## **Andrew Truitt, Dividend Solar**

After completing his B.S. in Physics at UC Santa Cruz and his M.Sc. in Renewable Energy Systems Technology at Loughbrough University in the U.K., Andrew Truitt started his career in solar in 2004 as a PV installer in Berkeley, California. In 2006 he joined Standard Solar in Maryland, and then relocated to Colorado in 2010 and started Truitt Renewable Energy Consulting (TREC). In addition to TREC, Andrew is currently the Director of PV Operations at Dividend Solar and Senior Consultant at Acuity Power Group. A NABCEP Certified PV Installation Installer Professional since 2007, Andrew currently sits on the NABCEP Board of Directors.

## **Andy Black, OnGrid Solar**

Andy Black is CEO of OnGrid Solar. OnGrid provides financial analysis and sales software to solar installers to help them close more sales (www.ongrid.net/payback). Andy specializes in the financial payback of solar electricity systems. He holds a Masters in Electrical Engineering and a Certificate in Marketing. He is a NABCEP Certified PV Installation Installer Professional. Andy is a recent Director of CalSEIA, the NorCal Solar Energy Association, and the American Solar Energy Society.

## **Brad Berwald, Morningstar**

Brad has held both positions of Technical Sales Manager, Senior Sales Engineer at Morningstar. Morningstar is a global supplier of charge control systems for stand alone solar power applications. We distribute our components throughout the globe and work in industrial, residential and developing world applications.

## **Brian Mehalic, SEI**

is a NABCEP Certified PV Installation Professional and ISPQ-certified PV instructor with more than a decade of experience designing, installing, servicing, and inspecting all types and sizes of PV systems. He is a curriculum developer and instructor for Solar Energy International and North Carolina State University, a frequent contributor to SolarPro and Home Power, and an independent consultant.

## **Cameron Stewart, SolarEdge**

Cameron Stewart's mission is to educate PV installers and Authorities Having Jurisdiction about the safety and benefits of SolarEdge's products. Prior to joining SolarEdge, Stewart has held a myriad of positions in the solar industry. For example, he was a training specialist with Power-One/ABB, field supervisor at American Solar Electric, and at SOLON Stewart serviced and diagnosed problems with utility scale systems. Stewart holds a B.S. in Chemistry from Arizona State University and earned a OSHA 10 certification.

## **Catherine Kelso, Ambassador Energy Inc.**

Catherine Kelso is the Director of Training for Ambassador Energy. She has 10 years of off-grid and grid-tie solar experience, the NABCEP PV Installation Professional, PV Technical Professional Sales Certifications, and is working on an electrical engineering degree. Catherine trains solar crews in the field and conducts classroom training from entry level to advanced NEC code courses for Ambassador Energy, Mount San Jacinto College, Mission Career College and The Veteran Asset.

## **Daniel Felix, IronRidge**

Dan Felix is a Training Manager with IronRidge where he develops training classes and programs, develops best use practices of the IR product lines, and works with IR Product Development for new products. As Western US Project Manager for Nation Wide Solar Integrator, Dan built and managed large commercial and utility scale solar projects in western US. Prior to that Dan managed and operated Erickson Construction Electrical Division, overseeing large commercial solar projects in Northern CA.

## **Dirk Jordan, NREL**

Dirk has been with NREL for over 6 years. Responsibilities include: Assess and validate Photovoltaic module and systems performance. Increase bankability by quantifying performance and stability for various technologies in different climates. Quantify outdoor measurement uncertainties and risk to increase investor's confidence.

## **Don Warfield, Chairperson, NABCEP**

Don Warfield has been working in the photovoltaics business for the past 35 years. Starting in product development and aerospace manufacturing, Don has spent the past two decades involved in module product development and applications engineering of PV modules and their associated BOS components, ranging through initial design, certifications, manufacturing, installation and customer training. He currently works for Ameresco Solar. Don serves on the STP for UL1703 and UL1741, and working groups 2, 3 & 6 (modules, BOS and systems) of the IEC's technical committee 82. He is currently the Chairperson of the NABCEP Board of Directors.

## **Ed Pantzar, e-Gauge Systems**

Ed Pantzar is an account manager for eGauge Systems who specializes in the technical sale of complex energy consumption and production-measurement projects. Ed began his career as a monitoring professional after studying Physiology at the University of Colorado, Boulder. The demand for monitoring of residential and commercial PV systems has given Ed an opportunity to grow with the balance of systems market since 2012. Ed enjoys educating others about electrical energy and ways to improve efficiency.

## **Eric Every, Solectria**

Eric Every joined the Solectria Renewables team in 2011 as the Northeast Applications Engineer. Eric holds a degree in electrical engineering from the University of Massachusetts - Amherst. Since 2011, Eric has instructed over 200 hours of NABCEP Regional CE courses, managed Solectria's Megawatt Solar Station projects for multi-MW projects, and is instrumental in assisting customers with projects to achieve compliance with grid code and utility-requirements.

## **Geoff Owens, ABB**

Geoff is a Technical Training Specialist with ABB since October 2014. He is a 21-year military veteran with over 4,500 hours teaching experience in various technical fields. In addition to teaching, Geoff has vast experience in training administration, technical writing, quality management (ISO 9001), industrial safety, as well as system design, construction, testing, troubleshooting, integration, and certification. Prior to working at ABB, Geoff has experience in solar energy in the military working within various DoD satellite programs and then as a civilian contractor working with multi-sensor imaging systems. Originally a Chicago-area native, he now resides in Phoenix.

## **Gian-Paolo (GP) Caminiti, Mitsubishi Electric**

GP has been with Mitsubishi Electric since 2009 and is the head of our Business Development and Regional Sales in the eastern US. Prior to his engagement with Mitsubishi, GP was co-founder of his own company for renewable energy systems, including storage, by marrying solar PV with low-pressure hydrogen storage and reconversion through fuel-cell integration. He has worked extensively in international business development, specializing in salesforce development, executive coaching & strategic business development, and was based in Europe (Germany) for many years. This is where he got his start in the solar industry, moving his company to the US in 2001.

## **Greg Smith, SMA**

Greg Smith is a technical training specialist for the SMA Solar Academy, where he develops curriculum and performs on-site seminars and webinars about SMA products, code compliance and installation best practices. Smith, who holds a master's degree from Central Michigan University, spent 20 years in the U.S. Navy, most recently as a submarine sonar technician and master training specialist.

## **Harley Haney, Burndy, LLC**

Harley Haney is the Solar Segment Sales Manager at Burndy and has over 20 years experience in product safety and regulatory compliance. His responsibilities include engineering applications, product design, project management and business development in the PV arena. Harley has technical expertise in Codes and Standards and is an active member on five of UL's Standards' committees including UL 1703 for PV Modules, UL 2703 for PV Racking Systems and UL 3703 for trackers focusing on bonding and grounding requirements. Prior to his role at Burndy, Mr. Haney held positions at Wiley Electronics, Mitsubishi and UL and has earned a Bachelor's degree in Electrical Engineering as well as a Master's degree in Business Administration.

## **Jean Arya, Unirac**

Jean Arya has served as a Unirac Technical Support Representative for the past seven years, providing assistance to field service engineers, installers, dealers and distributor partners. With more than fifteen years of renewable energy experience, Jean has been involved in jobs interfacing with utility outreach to homeowners; PV design and sales; and even hosted an energy-themed local TV show. The self-proclaimed "racking nerd" enjoys explaining technical subjects to non-technical people as well as learning from her customers.

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# Conference Presenters

continued

## **Jeff Spies, Quick Mount PV**

Jeff Spies is the Senior Director of Business Development at Quick Mount PV, serves as NABCEP Secretary and leads 2 committees for the UL2703 standards test panel. He has been on the forefront of solar training since his entry into the PV industry in 2007. Thousands of contractors and installers have attended his popular online and live trainings. He is a regular speaker at major industry trade shows and has authored several technical articles for major trade publications. Jeff holds a B.S. in Mechanical Engineering and worked in sales, marketing, and technical training in the industrial automation field prior to moving into solar.

## **Jim Kadakia, Mitsubishi Electric**

Jim Kadakia is a Senior Engineering Manager in the Photovoltaic Division of Mitsubishi Electric US, Inc. He is responsible for technical aspects of the US photovoltaic module business, including warranty-related matters, code compliance, and engineering system design and development for residential and commercial applications, including complete AC/DC solutions. Jim has a Masters degree in Electrical Engineering and is a professional engineer (Electrical – State of California). For more than 30 years he has led technical teams in product development and project management as related to inverters, electrical systems, motor controllers, UPS, power electronics, refinery electrical systems, turbines, battery back-up for traffic intersections and cell towers, and PV system design.

## **Johan Alfsen, Quick Mount PV**

Johan Alfsen is Director of Training at QuickMount PV and has been in the solar industry since 2004 when he became an installer in the San Francisco Bay Area. In his roles as speaker, trainer, and author of various articles on roof penetrations and code compliance for residential solar installations, Johan has become known industry wide for his passionate advocacy of solar roofing best practices. He sits on the Board of Directors for Roof Integrated Solar Energy (RISE) as well as the PV Installation Professional Resource Guide Committee for the North American Board of Certified Energy Practitioners (NABCEP) and was recently certified by the Tile Roofing Institute (TRI).

## **Jon Haeme, Stion**

Jon Haeme is the Senior Technical Support Manager for Stion, a US manufacturer of CIGS thin film PV modules. He has over 20 years experience in the Solar PV industry working on everything from small off-grid installations up to 100 MW utility scale projects. Previous experience includes 3 ½ years with Trina Solar as a Technical Support Manager and 15 years as a self-employed licensed electrician, with 9 years as a NABCEP Certified PV Installation Professional in Illinois. He lives with his wife and son in a passive solar, strawbale home, powered by a PV/wind, battery backup system, located in East Central Illinois.

## **Jonathan Matusky, Aquion Energy**

Mr. Jonathan Matusky is a Product Manager at Aquion Energy. Mr. Matusky has been employed at Aquion since May 2011, fulfilling various roles on the Product Management team. Mr. Matusky is deeply involved in working with customers in their sizing,

designing, and installation of Aquion's Aqueous Hybrid Ion (AHI™) battery systems. Mr. Matusky holds a Master of Business Administration from the Tepper School of Business at Carnegie Mellon University as well as undergraduate degrees in Materials Science & Engineering as well as Engineering & Public Policy from Carnegie Mellon University.

## **John Sutton, ABB**

John has been in the electrical industry for over 20 years. He is a licensed electrical contractor who is OSHA 30 certified. He ran his own electrical contracting business for over ten years. He is also a licensed burglar alarm contractor. John started working with solar pv systems around 2010. He has installed and commissioned approximately 35 MW of solar. John is a Certified NABCEP PV Installation Professional. Currently, John is a technical training specialist with ABB.

## **Kalyan Jana, Trojan Battery**

Kalyan Jana is a senior applications engineer at Trojan Battery, bringing more than 25 years of battery development and engineering experience to his position. His strong background in lead acid battery engineering and design strengthens the scope of Trojan's product development team. Jana will focus on providing technical support for Trojan's AGM product line and will be instrumental in supporting the company's growth initiative for India.

## **Katy Collardson, CertainTeed**

Katy Collardson is Technical Supervisor, CertainTeed Solar. A NABCEP Certified PV Installation Professional, Katy has worked in the solar industry since 2006 as an installer, designer, project manager and trainer. She has a B.A. in German from Colorado College and an MBA, with a Certificate in Sustainable Technology, from ASU.

## **Ken Gardner, Gardner Engineering**

Ken Gardner shares lessons learned from on-the-job experience and best practices compiled from a variety of industry leaders over the years. This presentation covers: tools used in the solar industry; residential and commercial solar installation examples; transformerless inverter installations; off-grid and grid-tie with battery backup considerations; load side connections; and ballasted roof top and ground-mounted systems.

## **Kristen Nicole, (WISE) Women in Solar Energy**

Kristen Nicole is a solar industry and power systems professional. Her research focus has been on strategies to address the power systems integration and variability challenges associated with solar energy and other renewable technologies. She has contributed to national efforts in grid integration research, including the application of solar resource forecasting in transmission systems and new power electronic technologies and applications for distribution system and microgrid integration. Kristen attended Boston University as an undergraduate and The George Washington University for her MBA.

## **Michael Bishop, OnGrid**

Michael has been with OnGrid since 2006, where he's led software development since 2007 and business development since 2012. Michael loves teaching solar economics, and will co-teach with Andy Black at NABCEP's upcoming conference. Michael got his start in solar as an installer at a worked-owned cooperative in Santa Cruz, CA. He's excited to help lead the solar industry into the mainstream. He strongly supports a thriving network of community-based solar companies, that hang their hats on exceptional quality of service. Michael is proud to be actively involved with the SfunCube co-working space and accelerator in Oakland, CA (where OnGrid is based).

## **Mike Mahon, SMA**

Mike Mahon is a technical training specialist with the SMA Solar Academy, delivering in-person training and webinars covering SMA products and the basics of photovoltaic's. Prior to joining SMA in 2011, Mike taught NABCEP Entry Level Exam preparation and PV installation and design classes for private firms and non-profit organizations. Mike holds a PhD in chemical engineering and a master's degree in electrical engineering, and has worked in the energy industry since 1998.

## **Nicholas Carter, PhD, NPC Solar**

Nicholas Carter, owner of npc Solar, is a NABCEP PV Certified Installation Professional (since 2007) whose recent clients include LG solar (MonoX ACE AC module), Quickmount PV (QuickRack rail-free mounting system), Kaco (Ultraverter) and Montante Solar (commercial PV in New York). He has served on the board of the Electric Auto Association and as North San Francisco Bay EAA chapter president, has driven electric since 2002 and appeared briefly in the movie "Who Killed the Electric Car". Dr Carter and his wife drive a Nissan LEAF and PHEV Prius and have a 3kW PV system.

## **Paul Grana, Folsom Labs**

Paul Grana is a founder of Folsom Labs, the leading provider of cloud-based design and engineering software for solar PV developers. He is responsible for sales, marketing, and training activities at Folsom Labs. Previously, Paul ran product management and technical marketing at Tigo Energy. He was also the co-author on the GTM Research industry report on Microinverters and Optimizers, has written a number of articles on system design and optimization, and has been awarded a patent relating to combiner box design. Paul holds a BS in Mathematics from the University of Chicago, and an MBA from Harvard Business School.

## **Peter Lum, Enphase**

Peter Lum is a technical training professional with over 20 years of technical experience in hi-tech and renewable energy. Peter develops and delivers training at Enphase Energy as the senior trainer has also managed and delivered technical training at Fat Spaniel Technologies. He also is a Assistant Professor in the California college system where he teaches Solar technology, Design, and Sales.

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# Conference Presenters continued

## **Philip Undercuffler, Outback Power**

Philip Undercuffler is the Director of Strategic Platforms for OutBack Power Technologies, and in his role works to meet the requirements of today's and tomorrow's customers for powerful, innovative grid-hybrid and off-grid energy solutions, in addition to participating in the development of policy, codes and standards for grid-connected energy storage. Mr. Undercuffler brings nearly 20 years of experience in the renewable energy field, having served most recently as Product Manager for Conergy, USA. Prior to that, he led a sales team focused on serving the battery based standalone, grid-interactive and industrial markets, and as a Technical Services Manager for Conergy. Mr. Undercuffler has additional experience as an electrical contractor and journeyman electrician with Positive Energy, a specialty electrical contractor focused on the solar market, and has lived with his family off-of-the-grid for 17 years.

## **Rebekah Hren, SEI**

Rebekah Hren is a North Carolina licensed electrical contractor and NABCEP Certified PV Installation Professional. She has well over a decade of experience in the solar industry, and since 2009 has worked with O2 Energies to develop, construct, and maintain more than 35 MW of solar farms. Rebekah is an author for SolarPro and Home Power Magazines and is a Code Official Trainer for the U.S. Department of Energy Solar Instructor Training Network. Rebekah currently works for Solar Energy International as an instructor, curriculum developer, and professional services contractor.

## **Roy Butler, Midnite Solar**

Roy Butler has over 18 years of design and installation experience which covers grid-tie and off-grid wind electric, solar electric and solar water pumping systems. Although he still installs systems, he currently devotes much of his time to teaching and developing curricula for small wind installer courses.

## **Roy Dyngen, Schneider Electric**

Roy Dyngen has a degree in electronics and 20 years of experience educating solar installers on the latest grid-tie and hybrid application. Over the course of his career Roy has worked for Trace Engineering, Xantrex Technology, Outback Power, SMA America and now Schneider Electric where he is the Senior Technical Trainer for their hybrid applications.

## **Ryan Mayfield, Renewable Energy Associates**

Ryan Mayfield has been working in the renewable energy field since 1999 and is the President of Renewable Energy Associates, a Corvallis, Oregon, consulting firm providing design, support and educational services for electrical contractors, architectural and engineering firms, manufacturers and government agencies. Ryan serves as Photovoltaic Systems Technical Editor for SolarPro magazine, regularly writes feature articles in SolarPro and Home Power magazines and wrote PV Design and Installation for Dummies. Ryan was

also a contributor and video team member for Mike Holt's Understanding the NEC Requirements for Solar Photovoltaic Systems.

## **Sarah Kurtz, NREL**

Sarah Kurtz obtained her PhD in 1985 from Harvard University and has worked since then at the National Renewable Energy Laboratory, in Golden, CO. She is known for her contributions to developing multijunction, GaInP/GaAs solar cells, supporting the Concentrator Photovoltaic (PV) industry, and, more recently, her work with PV performance and reliability. Her work has been recognized with a jointly received Dan David Prize in 2007 and the Cherry Award in 2012. Currently, she is managing the PV Reliability Group at NREL and working to facilitate the growth of the PV industry through improved understanding of the performance and reliability of PV.

## **Sarah Raymer, SolPower People**

Director of Education and Training Services, develops curriculum for and teaches on site and online courses. She played a leading role in developing the SPV911 Solar Energy Systems and Fire Safety training provided to 1000's of firefighters through out the US, and was the lead developer of the Advanced PV Systems and the NEC course.

## **Susan Stark, Quick Mount PV**

Sue started her career in solar in 2008, managing a commercial integrator and increasing revenue by 500% in two years. Sue has earned four Certificates from Solar Energy International (SEI), including the Solar Professionals Trainer Certificate. She also obtained her NABCEP PV Technical Sales Professional Certification in 2013. Before entering the solar industry, Sue was the co-owner of a Construction and Safety Equipment Distributor.

## **Steve Higgins, Rolls Battery Engineering**

Steve Higgins, Technical Services Manager for Rolls Battery Engineering, has spent the last two decades working in Renewable Energy business helping with the design, sales and troubleshooting of battery-based systems all over the world. During this time, Steve has been working to educate Installers and Integrators on inverter repair, proper system sizing and system design, operation, maintenance and troubleshooting of battery-battery based Renewable Energy systems.

## **Steve Schumacher, DPW Solar**

Steve Schumacher has been employed in the PV industry since 1991 in various capacities. His experience includes production management, providing Off- and On-grid PV system design and installation, PV mounting system design, PV system sales, account management, and most recently as the National Sales Manager for DPW Solar. System installations have taken him around the world to install PV, wind, and hydro power systems. Steve has been employed by DPW Solar for over 18 years. He has experience includes developing customer focused PV racking solutions from basic to very complex.

## **Tom Thompson, JA Solar**

Tom is president of the Massachusetts solar trade group, SEBANE.org, and past President of NYSEIA. In addition, JA is a Platinum member of SEIA, providing a platform for policy dialogue on the state level in all such markets in the USA.

## **Tony Diaz, Century Roof and Solar**

Tony Diaz of Century Roof and Solar is a 14 year veteran in the solar industry! Tony is a licensed roofing and electrical contractor with the state of California. Tony has been in both the Roofing and Electrical sectors of the construction industry for over 28 years and founded, owned and operated Century Roof and Solar for the past 19 years. Tony is a NABCEP Certified PV Installation Professional, as well as a NABCEP Continuing Education provider. His other certifications include Rise (Certified Solar Roofing Professional) from the National Roofing Contractors Association. Tony is a contract instructor for Solar Energy International and holds a level 1 license from the Infrared Training Institute.

## **Tony Zante, ISA Corporation**

Tony Zante is President and CEO of ISA Corporation, a solar manufacturing and distribution firm specializing in manufacturing solar mounting equipment for roof and ground applications. Mr. Zante has developed and is currently manufacturing specialized solar mounting products for commercial buildings. Mr. Zante also provides engineering services to help contractors with their solar installations including structural analysis and support, solar thermal engineering designs, and engineered solutions for ground mounts and carports. Mr. Zante has developed and co-patented a number of solar products including single axis trackers and tilttable ground mounts. Mr. Zante holds patents and pending patents for solar clamping systems, tilttable racking systems, trellis racking systems, and tilttable ground mount systems.

## **Ward Bower, Ward Bower Innovations, LLC**

Ward retired from Sandia National Laboratories after 48 years of technical service. He is president of Ward Bower Innovations LLC based in Albuquerque, NM. He led inverter, controller and balance-of-system R&D work since 1978. He is a Principal Member of CMP4 for the National Electrical Code®, a member of UL Standards Technical Panels UL1703 for PV modules, UL1741 for inverters, converters and controllers, and UL1699b for dc arc-fault detection. He is chairman of Subgroup D for testing and certification for smart grid interoperability. He is a member of the IEEE Standards Coordinating Committee (SCC21) for PV board member of NABCEP.

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