The Premier Event Dedicated to
TRANSFORMATIONAL ENERGY SOLUTIONS

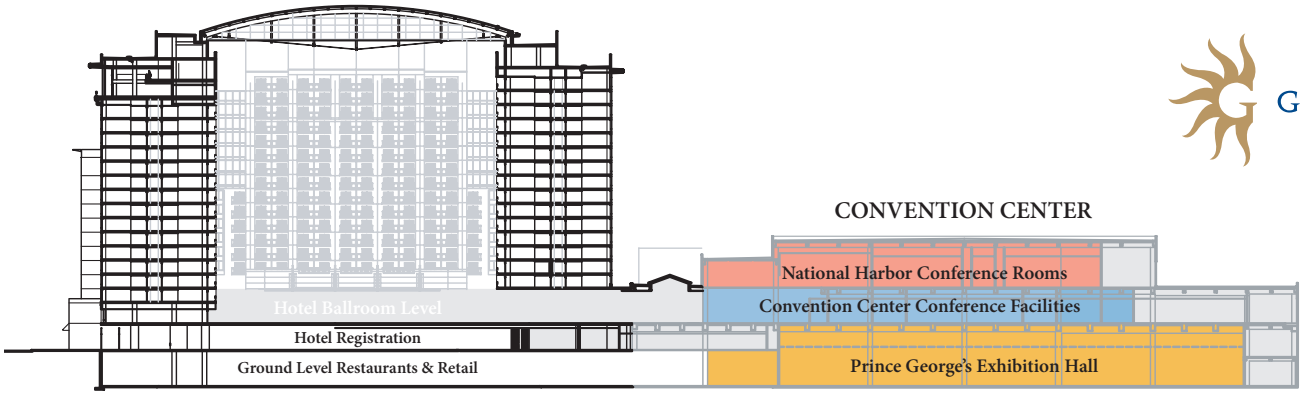
2015 PROGRAM GUIDE

energy innovation summit

February 9–11, 2015

Gaylord National Convention Center
Washington, D.C.

Gaylord National Floorplan



GAYLORD NATIONAL®
RESORT & CONVENTION CENTER
on the Potomac

★ CONVENTION CENTER ★

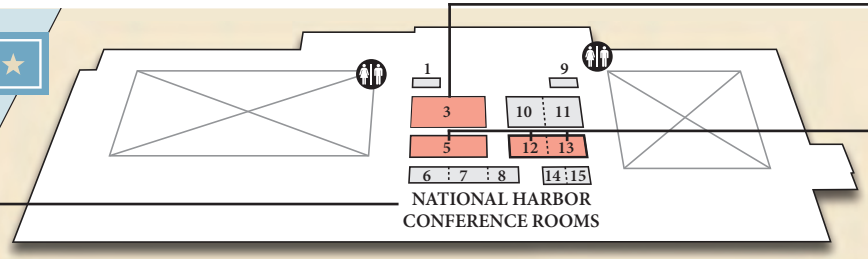
Open Meeting Rooms
See page 4 for the details.

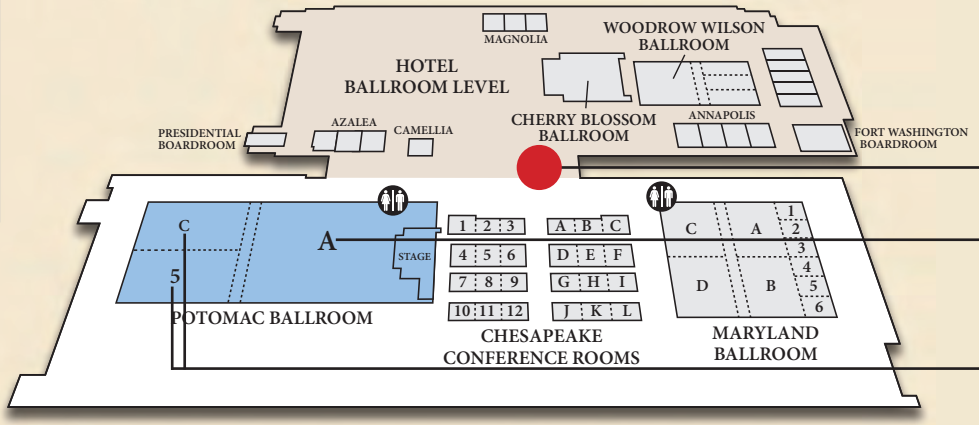
Monday – Wednesday
- Chesapeake 5

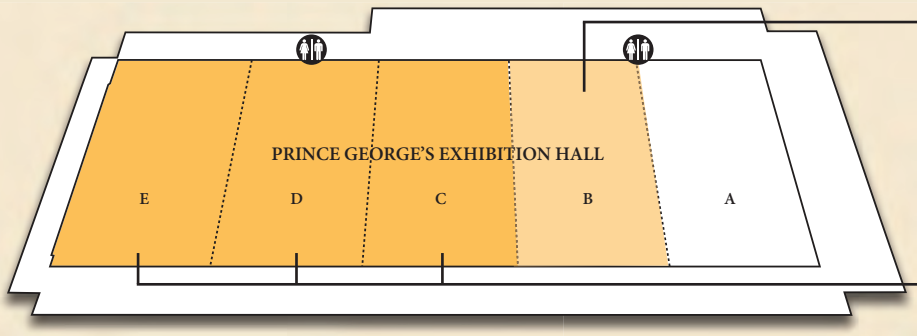
Monday & Wednesday
- National Harbor 6
- National Harbor 8

Tuesday & Wednesday
- National Harbor 10
- National Harbor 11
- National Harbor 12
- National Harbor 13

Potomac River







National Harbor 3
Panel Session Room

National Harbor 5, 12, and 13
Student Program Room

Summit Registration & Information Desk

Monday: 7:00 a.m.-6:00 p.m.
Tuesday: 7:00 a.m.-6:00 p.m.
Wednesday: 7:00 a.m.-2:00 p.m.

Potomac A
General Session &
Panel Session Room

Potomac C
Potomac 5
Panel Session Rooms

Prince George's Exhibit Hall B
Government Agency Networking Program and Lunch (Monday)

Prince George's Exhibit Hall C-E
Technology Showcase

Tuesday (Showcase: 12:00-3:30 p.m.)
Breakfast: 7:30-9:30 a.m.
Lunch Served: 12:00-1:30 p.m.
Reception: 5:00-7:30 p.m.

Wednesday (Showcase: 12:15-2:30 p.m.)
Breakfast: 7:30-9:30 a.m.
Lunch Served: 12:30-1:30 p.m.

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The 2015 Summit goes mobile. Get it now.

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Plug **www.tripbuildermedia.com/apps/arpae2015** into your phone's browser. This link will automatically detect your phone type and take you to the right place to download the app.

Or, just snap this QR Code & download the app now!

Maximize your time at the Summit by utilizing the Energy Innovation Summit Mobile App. Easily share contact information, search for fellow attendees in specific fields, view the exhibitors and partners and more!

Summit Mobile App Partner: BASF We create chemistry

SECTION 1

ABOUT THE SUMMIT

"Two things I loved about the Summit:
1. Sessions specifically for entrepreneurs (IP, strategic partnering, etc.), and
2. Unbelievable numbers and quality of potential partners and collaborators."

— John Breshears, Architectural Applications

General Information

Questions?

For questions or special needs, please visit the Summit Registration Desk during the open hours and someone will assist you. Summit Registration is open during the following times:

Monday: 7:00 a.m. – 6:00 p.m.
Tuesday: 7:00 a.m. – 6:00 p.m.
Wednesday: 7:00 a.m. – 2:00 p.m.

Summit Badges

Summit badges must be worn at all times while attending sessions or special events. Your badge contains a QR code that is readable by the Summit mobile app. Allowing your badge to be scanned by an attendee or exhibitor will provide them with standard business card information including your name, title, organization, address, phone, fax, and email.

As a reminder, please protect your identity – remove your Summit badge before leaving the hotel.

Summit Twitter Hashtag

The 2015 Energy Innovation Summit uses Twitter to encourage interaction and collaboration among speakers, attendees, and the public. The Summit's official Twitter hashtag is **#ARPAE15**. Please include it in your tweets as you share thoughts, speaker quotes, and other Summit information.

Agenda Changes and Mobile App

Any changes to the Summit agenda will be posted on the mobile app, Summit website, and a digital monitor located near the Registration Desk.

To download the mobile app, visit **www.arpae-summit.com/app** on your phone's browser or snap the QR Code below. Enhanced networking functions require the mobile app to ask for your email and password. Use the email and password you supplied during the Summit registration. If you have forgotten your password, the mobile app will allow you to retrieve your password.

Mobile App Partner: BASF We create chemistry

General Information

Wireless Access

Summit attendees may enjoy complimentary wireless access in all meeting rooms and public spaces. Be aware before connecting to this wireless network that it is public and unsecured.

In Public Areas

In public space areas such as the lobby, lower atrium, and guestrooms you will see a prompt for "Gaylord Hotels." You will be prompted to add your hotel room number or log-in as a guest.

In Convention Center Areas

Please log into the "ARPAE" wireless network. Use the following password to log in:

Username: ARPAE
Password: Summit

Open Meeting Rooms

Open meeting rooms are available for ad hoc meetings. If you would like to reserve any of the following rooms for a meeting, please post your information on the sign outside the door. These rooms are available on a first-come, first-served basis.

Monday – Wednesday

- Chesapeake 5 (U-Shaped setup for 30, screen and projector provided in room)

Monday & Wednesday

- National Harbor 6 (Theater setup for 50, no AV)
- National Harbor 8 (Theater setup for 50, no AV)

Tuesday – Wednesday

- National Harbor 10 (Classroom setup for 80, no AV)
- National Harbor 11 (Classroom setup for 80, no AV)
- National Harbor 12 (Theater setup for 80, no AV)
- National Harbor 13 (Theater setup for 80, no AV

Note Regarding Partners

The U.S. Department of Energy (DOE) does not endorse or appear to endorse private entities. DOE is in no way involved in the solicitation of supporters. All supporter opportunities were solicited by eventPower.

Presentation Access After the Summit

The Keynote sessions will be posted by Monday, March 2, 2015. Please visit **www.arpae-summit.com/Press/Media-Gallery** to view them.

Photography and Video Recording

Sessions at the Summit are being recorded. Also note that videotaping and photographing of general attendees may take place at the Summit. DOE and eventPower reserve the right to copy, edit, exhibit, publish, and/or distribute photos and videos of attendees. As an attendee you waive the right to inspect or approve the finished product wherein your likeness, name, image, and sound of voice appears. No compensation is given for participation.

Only approved media may video or photograph sessions. Due to strict copyright enforcement, sessions may not be photographed, videotaped, or recorded without express permission of Summit management. Those who do not comply will be escorted from the premises without refund.

Notice Concerning ARPA-E Funding Opportunity Announcements (FOAs)

For Active (formally released) FOAs, including OPEN 2015: ARPA-E personnel may not respond to questions regarding active FOAs, nor discuss current or planned applications submitted in response to active FOAs. Inquiries about active FOAs must be submitted in writing to the ARPA-E Contracting Officer at ARPA-E-CO@hq.doe.gov.

Limited Exception for IDEAS, as stated in the IDEAS FOA: Prior to submitting a Concept Paper to this FOA, Applicants may contact an ARPA-E Program Director or ARPA-E Fellow to discuss their research concept and its potential responsiveness to this FOA. For more information on ARPA-E FOAs, please visit https://arpa-e-foa.energy.gov/#Foalda8bdd9ec-2cb7-4349-8184-4dde00c77663.

About the Technology Showcase

The Technology Showcase at the 2015 ARPA-E Energy Innovation Summit presents America's next generation of transformational energy technologies. Showcase participants include ARPA-E-funded project teams as well as a highly selective group of researchers and technologists from other companies and organizations.

The Technology Showcase Features:

- Breakthrough technology developments
- Expert entrepreneurs and researchers ready to collaborate
- Tangible innovations on display
- Decision makers looking to invest

Technology Showcase Hours of Operation

Tuesday:

7:30 a.m. – 9:30 a.m.
(Continental Breakfast offered from 7:30 a.m. – 9:30 a.m.)

12:00 p.m. – 3:30 p.m.
(Lunch offered from 12:00 p.m. – 1:30 p.m.)

5:00 p.m. – 7:30 p.m.
(Reception from 5:00 p.m. – 7:30 p.m.)

Wednesday

7:30 a.m. – 9:30 a.m.
(Continental Breakfast offered from 7:30 a.m. – 9:30 a.m.)

12:15 p.m. – 2:30 p.m.
(Lunch from 12:30 p.m. – 1:30 p.m.)

National Venture Capital Association Networking Event

Tuesday, 8:00-9:00 a.m.

Investors and Technology Showcase exhibitors are invited to network and discuss potential commercialization opportunities. Meet in the Technology Showcase Partner Pavilion on the far right side.

Networking Event Partner: NATIONAL VENTURE CAPITAL ASSOCIATION
Funding innovation. Empowering entrepreneurs.

About the Technology Showcase

Tuesday Tech Demos

Battery Breakdown: 1:30-1:45 p.m., ARPA-E Booth 629

LITECAR Challenge Briefing: 2:30-2:45 p.m., Local Motors Booth 249

Summit attendees have an opportunity to see industry experts provide brief demonstrations of their innovation solutions inside the Technology Showcase, followed by Q&A with those in attendance. See Summit Agenda for details and times.

State & Global Networking Event

Tuesday, 5:30-6:30 p.m.

Connect with representatives from various U.S. state-level organizations and agencies seeking to assist startups and spinouts on their path to market, as well as international organizations and foreign government agencies seeking investment and partnership opportunities with U.S. technologists and startup companies.

Representatives are available in an open, reception-style forum.

Expert Sessions

Tuesday, 6:30-7:30 p.m. | Next to the ARPA-E Booth

Summit attendees have an opportunity to engage with notable energy industry experts in a small group setting. Experts deliver a brief presentation and then engage in Q&A with those in attendance. Meet at the roundtables outside the ARPA-E booth.

Women in Energy Breakfast

Wednesday, 7:30-9:00 a.m.

Join ARPA-E Deputy Director Dr. Cheryl Martin and other prominent industry leaders at the ARPA-E booth for a special networking event with women in the energy sector.

This event is open to all.

Networking Event Partner: AWIS ASSOCIATION FOR WOMEN IN SCIENCE

The Corporate Acceleration Program

The Corporate Acceleration Program (CAP) is a unique matchmaking opportunity between corporate partners, investors, and Technology Showcase exhibitors. CAP brings together organizations that develop breakthrough energy technology with potential investors and partners. If you have questions about the CAP program, please visit the CAP Help Desk located in the back of the Technology Showcase.

About the Gaylord National

GAYLORD NATIONAL®
RESORT & CONVENTION CENTER
on the Potomac


2015 Energy Innovation Summit Venue - Gaylord National

Hotel Concierge Services (Hotel Lobby)

Sunday – Thursday	7:00 a.m.-10:00 p.m.
Friday – Saturday	7:00 a.m.-11:00 p.m.

- City Attraction Guides
- Restaurant Reservations

Consider it Done

The "Consider It Done" button, located on all guest phones, is part of the commitment made by the hotel's STAR employees to meet the diverse needs of every hotel guest. By pressing "Consider It Done," guests can ask questions or request a wide range of services.

Technology/Business Center (Main Floor of Convention Center)

FedEx Office Print & Ship Center ® is centrally located on the main floor of the Convention Center.

Hours of Operation:

Open every day, 6:00 a.m. to 9:00 p.m. | 24-hour Internet access | 24-hour self-service printing and copying

Medical Emergency

Gaylord National® Resort and Convention Center maintains a 24/7 security staff trained in basic first aid, CPR, and the use of the automated external defibrillators on the property. In the case of a life threatening event please dial "911" immediately. You may also contact Gaylord National® Safety Services at (301) 965-4500 or extension 333 on any hotel phone.

Gaylord Guest Amenities Included in Guest Room Charge

- High-speed Internet access in guest room
- Twenty-four hour access to fitness center
- Access to indoor junior olympic-sized pool
- Local, toll-free and domestic long-distance phone calls
- Two bottles of water per room, per day
- Daily newspaper at the elevator landing on guest room floors
- Coupon booklet with savings at the resort

Parking

Parking is available at a reduced rate of $16 per day to Summit attendees.

Overnight Guest:

Park in the self-parking garage and the discount will be applied to your guestroom folio.

Daily Guest:

Park in the self-parking garage and make sure to ask for a validation ticket at the Summit registration desk. When leaving the parking garage, please provide your validation ticket.

Gaylord National, Interior Atrium

WE AGREE.

Solving energy challenges takes the right combination of technology and breakthrough thinking. At Chevron, we're constantly applying technology in innovative ways to expand what's possible. Like designing next-generation software to better analyze well data. Or improving 3-D models to add unprecedented detail to seismic imaging. Advancements like these will keep the world moving forward for decades to come.

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SECTION 2

AGENDAS

"I've attended the last three Summits. If I could attend only one conference, this would be it. This is the one stop shop to see where technology is headed and how policy and research are working/not working together."

— 2014 Summit Attendee

Summit Agenda at a Glance

MONDAY, FEBRUARY 9

7:00 a.m.-6:00 p.m.	Summit Registration and Information Desk Hours			*Potomac Foyer*
	MORNING SESSIONS			
8:30-9:30 a.m.	Want to Join Us at ARPA-E?			*Potomac C*
	Lessons Learned in Technology Development: Pivoting Your Technology to a New Business Model			*Potomac 5*
9:30-9:45 a.m.	Networking Break			*Potomac Foyer*
9:45-10:45 a.m.	Understanding Current Defense Funding Priorities			*Potomac C*
	Lessons Learned in Technology Development: Finding Funding Beyond ARPA-E			*Potomac 5*
10:45-11:00 a.m.	Networking Break			*Potomac Foyer*
	SUMMIT KICKOFF			
11:00-11:20 a.m.	Opening Keynote Presentation			*Potomac A*
11:20-11:50 a.m.	Fireside Chat with Janet Napolitano • *Moderator: Steve Clemons, Editor-at-Large, The Atlantic* • *The Honorable Janet Napolitano, President, University of California*			*Potomac A*
11:50 a.m.-12:00 p.m.	Military Comment • *John Conger, Performing the Duties of the Assistant Secretary of Defense (Energy, Installations, and Environment)*			*Potomac A*
	GOVERNMENT AGENCY NETWORKING PROGRAM AND LUNCH			*Prince George's Hall B*
12:00-2:00 p.m.	See page 47-48 for the participating government agencies and see pages 82-88 to learn their focus areas. Lunch served from 12:00–1:00 p.m.			
	AFTERNOON SESSIONS			
2:00-3:00 p.m.	It's About the Story You Tell: Translating Your Technology for Press and Investors *Potomac A*	ARPA-E Program Director/Fellow Fast Pitch *Potomac C*	Energy Storage: Moving Beyond the Tipping Point *Potomac 5*	ARPA-E Program Director/Fellow Fast Pitch *National Harbor 3*
3:00-3:15 p.m.	Networking Break			*Potomac Foyer*
3:15-4:15 p.m.	ARPA-E Program Director/Fellow Fast Pitch *Potomac A*	In Search of a "Secure" Energy Future - Are Distributed Energy Resources (DERs) More or Less Enabling? *Potomac C*	ARPA-E Program Director/Fellow Fast Pitch *Potomac 5*	A Lesson from Solar: Applying Financing Models to Drive New Technologies *National Harbor 3*
	NETWORKING SESSIONS			
4:15-5:00 p.m.	Attendees have the opportunity to meet in smaller, focused technology networking sessions. See pages 16 for the list of events/locations.			
5:00-6:00 p.m.	Opening Networking Reception			*Potomac Foyer*
	EVENING SESSION			
6:00-7:30 p.m.	Future Energy Pitching Session (See pages 50-53 for details)			*Potomac A*

TUESDAY, FEBRUARY 10

7:00 a.m.-6:00 p.m.	Summit Registration and Information Desk Hours			*Potomac Foyer*
	TECHNOLOGY SHOWCASE			
7:30-9:30 a.m.	Continental Breakfast			*Technology Showcase*
8:00-9:00 a.m.	NVCA Investor Networking Breakfast			*Technology Showcase*
	MORNING SESSIONS			
9:30-9:35 a.m.	ARPA-E Awardee Video			*Potomac A*
9:35-9:50 a.m.	Fireside Chat with Dr. Ellen Williams • *Moderator: Phyllis Cuttino, Director, Clean Energy Initiative, The Pew Charitable Trusts* • *Dr. Ellen Williams, Director, ARPA-E*			*Potomac A*
9:50-10:00 a.m.	Congressional Comment			*Potomac A*
10:00-10:40 a.m.	Fireside Chat with Doyle Beneby and Ahmad Chatila • *Moderator: Amy Harder, Energy Reporter, Wall Street Journal* • *Doyle N. Beneby, President and Chief Executive Officer, CPS Energy* • *Ahmad Chatila, President and Chief Executive Officer, SunEdison*			*Potomac A*
10:40-10:55 a.m.	Networking Break			*Potomac Foyer*
10:55-11:00 a.m.	ARPA-E Awardee Video			*Potomac A*
11:00-11:15 a.m.	ARPA-E Highlights • *Dr. Cheryl Martin, Deputy Director, ARPA-E*			*Potomac A*
11:15-11:20 a.m.	Video Comment by Bill Gates			*Potomac A*
11:20 a.m.-12:00 p.m.	Fireside Chat with John Wall and Paul Yarka • *Moderator: Steve Clemons, Editor-at-Large, The Atlantic* • *Dr. John C. Wall, Vice President and Chief Technical Officer, Cummins Inc.* • *Paul Yarka, Vice President, Innovation and New Ventures, Flextronics*			*Potomac A*
	TECHNOLOGY SHOWCASE			
12:00-3:30 p.m.	Technology Showcase			*Technology Showcase*
12:00-1:30 p.m.	Lunch			*Technology Showcase*
1:30-1:45 p.m.	Battery Breakdown Demonstration			*ARPA-E Booth 629*
2:30-2:45 p.m.	LIghtweighting Technologies Enabling Comprehensive Automotive Redesign (LITECAR) Challenge Briefing			*Local Motors Booth 249*
2:30-3:30 p.m.	Let's Debate: Is Natural Gas a Bridge to a Low Carbon Future?			*Potomac A*
3:30-4:00 p.m.	Coffee Break			*Potomac Foyer*
	AFTERNOON SESSIONS			
4:00-5:00 p.m.	How Corporates and Investors Place a Monetary Value on All Your Hard Work *Potomac A*	The Next Agricultural Revolution *Potomac C*	Wide Band-gap Technologies: Changing People's Lives Now and into the Future *Potomac 5*	Energy Innovation at the State Level: What's Happened and What's to Come? *National Harbor 3*
	TECHNOLOGY SHOWCASE			
5:00-7:30 p.m.	Technology Showcase and Reception			*Technology Showcase*
5:30-6:30 p.m.	State & Global Networking Event (See page 49 for details)			*Technology Showcase*
6:30-7:30 p.m.	Expert Sessions (Next to ARPA-E Booth 629)			*Technology Showcase*

Summit Agenda at a Glance

WEDNESDAY, FEBRUARY 11			
7:00 a.m.-2:00 p.m.	Summit Registration and Information Desk Hours		*Potomac Foyer*
	TECHNOLOGY SHOWCASE		
7:30-9:30 a.m.	Technology Showcase and Continental Breakfast		*Technology Showcase*
7:30-9:00 a.m.	Women in Energy Breakfast		*ARPA-E Booth 629*
	MORNING SESSIONS		
9:30-10:10 a.m.	Fireside Chat with Secretary Ernest Moniz and Ratan Tata • *Dr. Ernest Moniz, Secretary, United States Department of Energy* • *Ratan Tata, Chairman Emeritus, Tata Sons*		*Potomac A*
10:10-10:20 a.m.	Congressional Comment		*Potomac A*
10:20-10:50 a.m.	Fireside Chat with Lyndon Rive • *Moderator: Nancy E. Pfund, Founder and Managing Partner, DBL Investors* • *Lyndon Rive, Founder and Chief Executive Officer, SolarCity*		*Potomac A*
10:50-11:05 a.m.	Networking Break		*Potomac Foyer*
11:05-11:10 a.m.	ARPA-E Awardee Video		*Potomac A*
11:10-11:30 a.m.	Partners in Disruption: Why Utilities will Scale Clean Energy • *Alex Laskey, President and Chief Executive Officer, Opower*		*Potomac A*
11:30-11:35 a.m.	Congressional Comment		*Potomac A*
11:35 a.m.-12:15 p.m.	Fireside Chat with Hank Paulson • *Moderator: Mark Tercek, President and CEO, The Nature Conservancy* • *The Honorable Henry M. "Hank" Paulson Jr, Founder and Chairman, Paulson Institute*		*Potomac A*
	TECHNOLOGY SHOWCASE		
12:15 - 2:30 p.m.	Technology Showcase and Lunch (Lunch served from 12:30-1:30 p.m.)		*Technology Showcase*
	AFTERNOON SESSIONS		
2:30-3:30 p.m.	Grid Decentralization: Is it Coming? And How Do We Get There? *Potomac A*	Carbon Capture, Utilization and/or Storage: What's Happening Now and What's to Come *Potomac C*	Our Technology Works and Customers are Lining up! Now What? *Potomac 5*
	SUMMIT CLOSE		
3:45-4:00 p.m.	Summit Closing Remarks		*Potomac A*
4:00-4:45 p.m.	Closing Networking Reception		*Potomac Foyer*

Student Program Agenda at a Glance

MONDAY

12:30-1:15 P.M. STUDENT PROGRAM KICKOFF - WELCOME

Student Networking Lunch..... National Harbor 5

1:15-2:00 P.M. BREAKOUT SESSIONS

Breakout One:
So You Want to Work in Energy? ..... National Harbor 12

Breakout Two:
Resources for Expanding Energy Activities on Your Campus
(Facilitated by Spark Clean Energy) ..... National Harbor 13

2:00-2:30 P.M. ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge Briefing ... National Harbor 5

4:15-5:00 P.M. STUDENT NETWORKING SESSION

Student Networking Reception..... National Harbor 5

TUESDAY

12:00-12:30 p.m.
Student Networking Lunch..... National Harbor 5

12:30-1:30 P.M. ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge
Work Time..... National Harbor 5

5:00-6:45 P.M. STUDENT SHOWCASE TOURS

5:00-5:45 p.m.
Showcase Tour 1..... ARPA-E Booth 629 in Technology Showcase

6:00-6:45 p.m.
Showcase Tour 2..... ARPA-E Booth 629 in Technology Showcase

WEDNESDAY

8:15-9:30 A.M. ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge
Presentations..... National Harbor 5

12:30-1:30 P.M. STUDENT PROGRAM CLOSING

Recruiter Meet and Greet Reception..... National Harbor 5

MONDAY, FEBRUARY 9

7:00 a.m.-6:00 p.m.

Registration and Information Desk Hours ..... Potomac Foyer

8:30-11:00 a.m.

MORNING SESSIONS

Open to all attendees and occurs before the official start of the Summit.

8:30-9:30 a.m.

Want to Join Us at ARPA-E? ..... Potomac C

There are a variety of limited term positions at ARPA-E from Program Directors to Technology to Market Advisors to Fellows. Each one is unique in how it contributes to the overall mission of ARPA-E. Join this conversation to learn more about each of these positions and ask questions of those currently holding them.

- *Moderator: Dr. Eric Rohlfing, ARPA-E Deputy Director for Technology*
- *Dr. Paul Albertus, ARPA-E Fellow*
- *Kacy Gerst, ARPA-E Technology-to-Market Advisor*
- *Dr. Pat McGrath, ARPA-E Program Director*

8:30-9:30 a.m.

Lessons Learned in Technology Development: Pivoting Your Technology to a New Business Model.....Potomac 5

Hear from panelists who successfully pushed ARPA-E projects toward commercialization. Learn how project teams engaged customers, obtained new information, validated (or discredited) hypotheses, and developed useful cost models. Panelists also discuss how these activities enabled ARPA-E teams to pivot business models and follow a more productive path to market, or in some instances, realize that there was not a pivot to make.

- *Moderator: Dr. Cheryl Martin, ARPA-E*
- *Dr. Doug Kirkpatrick, Sunfolding*
- *Leila Madrone, Sunfolding*
- *Craig Walker, United Technologies Research Corporation*

9:30-9:45 a.m.

Networking Break..... Potomac Foyer

Partners: ABB, Inc. and BASF Corporation

Continued to next page >>

MONDAY (CONTINUED)

9:45-10:45 a.m.

Understanding Current Defense Funding Priorities.....Potomac C

The Department of Defense invests $12 billion annually in science and technology. Panelists discuss the subsets of energy technologies that are of interest and describe the preferred tech maturity at entry and exit for their programs. Participants gain an understanding of available Defense funding opportunities and how to position themselves for success when pursuing such opportunities.

- *Moderator: Jen DiMascio, Aviation Week*
- *Erin Fitzgerald, Office of the Assistant Secretary of Defense for Research and Engineering, Basic Research*
- *Dr. James Galvin, Department of Defense Environmental Security Technology Certification Program (ESTCP)*
- *John Jennings, Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OEPP)*

9:45-10:45 a.m.

Lessons Learned in Technology Development: Finding Funding Beyond ARPA-E.....Potomac 5

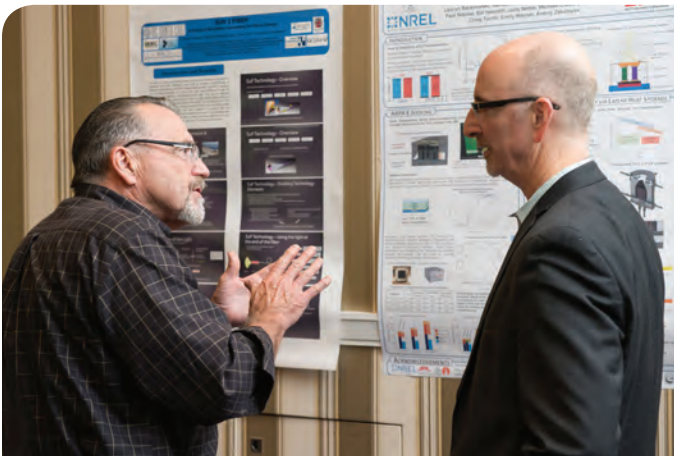
ARPA-E challenges awardees to think about strategic market opportunities and follow-on funding sources. Several sources of funding exist: e.g. the military, venture capital, strategics, public markets, start-up revenue, and other government agencies, to name but a few. Hear from awardees who have successfully obtained post-ARPA-E award funding. Panelists discuss the key strategies, challenges, and trade-offs in securing follow-on funding from a variety of different sources.

- *Moderator: Nate Gorence, ARPA-E*
- *Dr. Cody Friesen, Arizona State University*
- *Brian Janous, Microsoft*
- *Dr. Avideh Zakhor, University of California, Berkeley*

10:45-11:00 a.m.

Networking Break..... Potomac Foyer

Partners: ABB, Inc. and BASF Corporation



MONDAY (CONTINUED)

11:00 a.m.-12:00 p.m.
SUMMIT KICKOFF

11:00-11:20 a.m.
Opening Keynote Presentation ..... **Potomac A**

11:20-11:50 a.m.
Fireside Chat with Janet Napolitano ..... **Potomac A**

- *Moderator: Steve Clemons, Editor-at-Large, The Atlantic*
- *The Honorable Janet Napolitano, President, University of California*

11:50 a.m.-12:00 p.m.
Military Comment ..... **Potomac A**

- *John Conger, Performing the Duties of the Assistant Secretary of Defense, Energy, Installations, and Environment, United States Department of Defense*

12:00-2:00 p.m.
GOVERNMENT AGENCY NETWORKING PROGRAM AND LUNCH

12:00-1:00 p.m.
Lunch ..... **Prince George's Hall B**

12:30-2:00 p.m.
Government Agency Networking Program..... **Prince George's Hall B**

Connect with leaders and program directors from federal government agencies. See page 47-48 for a listing of participating government agencies.

Continued to next page >>

MONDAY (CONTINUED)

2:00-3:00 p.m.

AFTERNOON SESSIONS

It's About the Story You Tell: Translating Your Technology for Press and Investors ..... Potomac A

In today's sound bite world, the difference success and failure often depends on the Story you tell and how well you tell it. Learn how to translate abstract concepts into concrete metaphors, craft sound bites, and prepare for media interviews and investor meetings.

- *Introduction: Dr. Cheryl Martin, ARPA-E*
- *Richard Hayes, "A Scientist's Guide To Talking With The Media: Practical Advice from the Union of Concerned Scientists"*

ARPA-E Program Director/Fellow Fast Pitch ..... Potomac C

Join ARPA-E Program Directors and Fellows as they provide a rapid-paced succession of exciting current program concepts as well as some completely new, "out-of-the-box" ideas. Then engage in the conversation during a lively Q&A session.
NOTE: The description above applies to all ARPA-E Program Director/ Fellow Fast Pitch sessions happening at the same time. This includes the 3:15-4:15 p.m. sessions.

- *Dr. Patrick McGrath, "Can We Have Better Catalysis without Better Catalysts?"*
- *Dr. David Brown, "Engineering Agriculture for Profitable Carbon Capture"*
- *Dr. Mike Haney, "Can Integrated Micro-optics Transform Flat Panel Solar Cells?"*
- *Dr. Ramon Gonzalez, "Can Biological Conversion of Methane Facilitate Small Scale Deployment?"*
- *Dr. James Klausner, "Transforming Energy Efficient and Clean Metal Production and Recycling"*

Energy Storage: Moving Beyond the Tipping Point ...Potomac 5

Is energy storage at its tipping point? This panel explores the status and outlook from both the agnostic by-the-numbers approach and from the perspective of those participating across the entire stakeholder map in order to elucidate what it will take to push this long sought and highly anticipated technology beyond the tipping point.

- *Moderator: Katie Fehrenbacher, GigaOM*
- *Greg Callman, Supercharger Deployment and Stationary Storage, Tesla*
- *Glen Merfeld, GE Global Research*
- *Brian Warshay, Bloomberg New Energy Finance*
- *John Zahurancik, AES Energy Storage*

ARPA-E Program Director/Fellow Fast Pitch .... National Harbor 3

- *Dr. Tim Heidel, "Optimization of Electricity Transmission Networks to Facilitate Renewables Integration"*
- *Dr. Paul Albertus, "Moving Ions, Moving Energy: Opportunities in Ion Conducting Layers"*
- *Dr. Jason Rugolo, "A Unified Transportation and Electricity Infrastructure"*
- *Dr. Joe Cornelius, "Accelerating Energy Crop Development"*
- *Dr. Sonja Glavaski, "From Local to Global: Distributed Energy Resources Integration"*

3:00-3:15 p.m.

Networking Break..... Potomac Foyer

Partners: ABB, Inc. and BASF Corporation

MONDAY (CONTINUED)

3:15-4:15 p.m.

AFTERNOON SESSIONS

ARPA-E Program Director/Fellow Fast Pitch ..... Potomac A

- *Dr. Howard Branz, "No Photon Left Behind: Advanced Optics for Solar Energy and Buildings"*
- *Dr. Mike Kane, "Big Data—Big Decisions—Big Energy Savings"*
- *Dr. Ping Liu, "Heating and Cooling People Locally to Save Building Energy Use"*
- *Dr. Eric Schiff, "Could Advanced Technology Get Us to 'Yes' for Efficiency Upgrades of Single Pane Windows?"*
- *Dr. Jonathan Burbaum, "How Could We Improve the Energy Efficiency of Personal Transportation?"*

In Search of a "Secure" Energy Future - Are Distributed Energy Resources (DERs) More or Less Enabling? ..... Potomac C

By increasing our deployment of solar, small wind, fuel cells and generators, in conjunction with energy storage from batteries, are we increasing or decreasing our vulnerability to physical attacks, cyber attacks, and severe weather events? Analysis suggests that properly designed microgrids that include distributed energy resources (DERs) increase the resiliency of the microgrid region. Significant questions remain regarding the threshold of DER penetration at which security and resiliency may be enhanced or degraded. Join thought leaders on both sides of the issues to discuss the ramifications of a more distributed energy future.

- *Moderator: Martha Broad, MIT Energy Initiative*
- *Erich Gunther, EnerNex*
- *Bert Haskell, Pecan Street*
- *Darrell Massie, Intelligent Power & Energy Research Corporation (IPERC)*

ARPA-E Program Director/Fellow Fast Pitch .....Potomac 5

- *Dr. Chris Atkinson, "Advanced Technology Engines and Powertrains: What are the Limits to Efficiency?"*
- *Dr. Ashwin Salvi, "Oxygen Combustion for Improved Efficiency and Emissions"*
- *Dr. Ji-Cheng (JC) Zhao, "A Natural Gas Generator for Every Home"*
- *Dr. Bryan Willson, "Disruptive Approaches for Methane Emission Detection and Measurement"*
- *Dr. John Lemmon, "Distributed Generation and Storage, Delivering Energy When and Where It's Needed"*

A Lesson from Solar: Applying Financing Models to Drive New Technologies ..... National Harbor 3

Innovative financing has been one of the central drivers of the current boom in solar PV deployment. Hear from clean energy startups that are using financial innovations to drive sales. Panelists discuss current developments in financing innovation for new energy products and services as well as the challenges startups face in adopting these powerful tools.

- *Moderator: Liam Denning, Wall Street Journal*
- *Michael Brylawski, Vision Fleet*
- *Randy Palombi, Stem*
- *Sara Ross, Sungage Financial*

Continued to next page >>

MONDAY (CONTINUED)

4:15-6:00 p.m.

NETWORKING EVENTS

From 4:15-5:00 p.m.— *Attendees have the opportunity to meet in smaller, focused technology networking sessions.*

From 5:00-6:00 p.m.— *Join fellow attendees for light snacks and refreshments.*

4:15-5:00 p.m.

Natural Gas Industry Networking Event..... Potomac 5 Foyer

Partner: American Gas Association (AGA)

4:15-5:00 p.m.

Semiconductor Industry Networking Event..... National Harbor Foyer

Partner: Semiconductor Industry Association (SIA)

4:15-5:00 p.m.

Energy Storage Industry Networking Event .... National Harbor 10

Partner: Energy Storage Association (ESA)

5:00-6:00 p.m.

Opening Networking Reception ..... Potomac Foyer

*Please note refreshments will end at 5:45 p.m.

6:00-7:30 p.m.

EVENING SESSION

Future Energy Pitching Session ..... Potomac A

Join entrepreneurs, researchers, and private investors in the energy industry to develop and commercialize radical solutions to the world's energy challenges. This session features seven early-stage energy technology startups presenting to a panel of top strategic and venture capital investors. See pages 50-53 for details.

Pitching Session Partner: Shell
Hosted By: Ultra Light Startups

TUESDAY, FEBRUARY 10

7:00 a.m.-6:00 p.m.
Registration and Information Desk Hours ..... **Potomac Foyer**

7:30-9:30 a.m.
TECHNOLOGY SHOWCASE

7:30-9:30 a.m.
Continental Breakfast ..... **Technology Showcase**

8:00-9:00 a.m.
NVCA Investor Networking Breakfast ..... **Technology Showcase**

Investors and Technology Showcase exhibitors are invited to attend this networking event hosted by the National Venture Capital Association. Located in the right front corner of the Technology Showcase.

Partner: National Venture Capital Association (NVCA)

9:30 a.m.-12:20 p.m.
MORNING SESSIONS

9:30-9:35 a.m.
ARPA-E Awardee Video ..... **Potomac A**

9:35-9:50 a.m.
Fireside Chat with Dr. Ellen Williams ..... **Potomac A**

- *Moderator: Phyllis Cuttino, Director, Clean Energy Initiative, The Pew Charitable Trusts*
- *Dr. Ellen Williams, Director, ARPA-E*

9:50-10:00 a.m.
Congressional Comment ..... **Potomac A**

10:00-10:40 a.m.
Fireside Chat with Doyle Beneby and Ahmad Chatila.... **Potomac A**

- *Moderator: Amy Harder, Energy Reporter, Wall Street Journal*
- *Doyle N. Beneby, President and Chief Executive Officer, CPS Energy*
- *Ahmad Chatila, President and Chief Executive Officer, SunEdison*

10:40-10:55 a.m.
Networking Break..... **Potomac Foyer**

Partners: ABB, Inc. and BASF Corporation

10:55-11:00 a.m.
ARPA-E Awardee Video ..... **Potomac A**

11:00-11:15 a.m.
ARPA-E Highlights ..... **Potomac A**

- *Dr. Cheryl Martin, Deputy Director, ARPA-E*

11:15-11:20 a.m.
Video Comment by Bill Gates..... **Potomac A**

Continued to next page >>

TUESDAY (CONTINUED)

11:20 a.m.-12:00 p.m.
Fireside Chat with John Wall and Paul Yarka ..... Potomac A

- *Moderator: Steve Clemons, Editor-at-Large, The Atlantic*
- *Dr. John C. Wall, Vice President and Chief Technical Officer, Cummins Inc.*
- *Paul Yarka, Vice President, Innovation and New Ventures, Flextronics*

12:00-3:30 p.m.
TECHNOLOGY SHOWCASE

12:00-3:30 p.m.
Technology Showcase Open ..... Technology Showcase
Coffee available in Technology Showcase from 1:30-2:30 p.m.

12:20-1:30 p.m.
Lunch in the Technology Showcase..... Technology Showcase
Partner: ABB, Inc.

1:30-1:45 p.m.
Battery Breakdown Demonstration ..... ARPA-E Booth 629 in Technology Showcase
Come see what an EV battery system looks like from the bottom up. Experts from Ricardo will break down different types of EV batteries to show how individual components come together to form a complete battery system. Space is limited. (Experts on hand until 2:30 p.m.)

2:30-2:45 p.m.
LITECAR Challenge Briefing ..... Booth 249
ARPA-E has teamed up with Local Motors on the LIghtweighting Technologies Enabling Comprehensive Automotive Redesign (LITECAR) Challenge. Come hear about the Challenge and how you can submit your idea for a chance at $150,000 in total cash prizes. (Experts on hand until 3:30 p.m.)

2:30-3:30 p.m.
Let's Debate: Is Natural Gas a Bridge to a Low Carbon Future? ..... Potomac A
The low cost and abundance of natural gas is considered an enabler by many; providing an economically viable 'bridge' to a lower-carbon energy future. However, for others, natural gas is derailing investment in even lower carbon options. Panelists debate the critical issues of expanded natural gas use and whether natural gas will ultimately be a bridge, a detour, or a destination.

- *Moderator: Monica Trauzzi, E&E Publishing/E&E TV*
- *Dr. Steven J. Davis, University of California, Irvine*
- *Fred Krupp, Environmental Defense Fund*
- *Michael Levi, Council on Foreign Relations*
- *The Honorable Dave McCurdy, American Gas Association*

3:30-4:00 p.m.
Coffee Break ..... Potomac Foyer

TUESDAY (CONTINUED)

4:00-5:00 p.m.

AFTERNOON SESSIONS

How Corporates and Investors Place a Monetary Value on All Your Hard Work ..... Potomac A

Estimating the value of your IP and company can be more art than science, and it can have massive implications for future funding rounds. Gain insight into IP valuation best practices, strategies, and decisions from corporate specialists and startup execs. A must-attend for anyone looking to license or sell their technology.

- *Moderator: Jeff McAulay, EnerNOC*
- *Colleen Calhoun, GE Energy Ventures*
- *Anita Choi, Morrison & Foerster LLP*
- *Mark Platshon, BMW i-Ventures*

The Next Agricultural Revolution: Can Mass Adoption of New Technologies Increase Global Biomass Production while Reducing Resource Consumption?..... Potomac C

In the future, farmers will be challenged to produce more biomass to feed the world's growing population, and to convert it into renewable fuels. Many biomass technologies that can drive efficiency are in various stages of development. Panelists discuss why these technologies have not been more broadly adopted and how to drive adoption.

- *Moderator: David Biello, Scientific American*
- *Amol Deshpande, Farmers Business Network*
- *Dr. Mike Edgerton, Monsanto*
- *Dr. Carl Wellington, Carnegie Mellon University National Robotics Engineering Center*

Wide Band-gap Technologies: Changing People's Lives Now and into the Future.....Potomac 5

Wide band-gap (WBG) technologies changed the way we see the world almost two decades ago with the introduction of blue LEDs into the dashboard of the Volkswagen Beetle. Panelists explore how WBG technology will shape our future by reducing energy-related emissions and making energy more affordable.

- *Moderator: Kevin Bullis, MIT Technology Review*
- *Danielle Merfield, GE Global Research*
- *Dr. John Palmour, Power and RF, Cree, Inc.*
- *Jim Speck, University of California, Santa Barbara*

Energy Innovation at the State Level: What's Happened and What's to Come?..... National Harbor 3

In the last several years, many states have taken steps to accelerate clean energy technology deployment. Panelists share their technology development programs from inception, to what those programs have produced, how technologists can get involved, and future projections.

- *Moderator: David Ferris, E&E Publishing*
- *Alicia Barton, Massachusetts Clean Energy Center (MassCEC)*
- *Rob Oglesby, California Energy Commission*
- *Speaker TBD, New York State*

Continued to next page >>

TUESDAY (CONTINUED)

5:00-7:30 p.m.

TECHNOLOGY SHOWCASE

5:00-7:30 p.m.

Technology Showcase and Reception ..... Technology Showcase

5:30-6:30 p.m.

State & Global Networking Event..... Technology Showcase

Connect with representatives from various U.S. state-level organizations and agencies seeking to assist startups and spinouts on their path to market, as well as international organizations and foreign government agencies seeking investment and partnership opportunities with U.S. technologists and startup companies. Representatives are available in an open, reception-style forum. Located in the far right corner of the Technology Showcase.

6:30-7:30 pm.

Expert Sessions ..... ARPA-E Booth 629 in Technology Showcase

Summit attendees will have an opportunity to engage with notable energy industry experts in a small group setting. Experts will deliver a brief presentation and then engage in Q&A with those in attendance.

WEDNESDAY, FEBRUARY 11

7:00 a.m.-2:00 p.m.
Registration and Information Desk Hours ..... Potomac Foyer

7:30-9:30 a.m.
TECHNOLOGY SHOWCASE

7:30-9:30 a.m.
Technology Showcase and Continental Breakfast ..... Technology Showcase

7:30-9:00 a.m.
Women in Energy Breakfast..... ARPA-E Booth 629 in Technology Showcase
(This event is open to all)
Join ARPA-E Deputy Director Dr. Cheryl Martin and other industry leaders for a special networking event with women in the energy sector.
Partner: Association for Women in Science (AWIS)

9:30a.m.-12:15 p.m.
MORNING SESSIONS

9:30-10:10 a.m.
Fireside Chat with Secretary Ernest Moniz and Ratan Tata ..... Potomac A
- *Dr. Ernest Moniz, Secretary, United States Department of Energy*
- *Ratan Tata, Chairman Emeritus, Tata Sons*

10:10-10:20 a.m.
Congressional Comment ..... Potomac A

10:20-10:50 a.m.
Fireside Chat with Lyndon Rive..... Potomac A
- *Moderator: Nancy E. Pfund, Founder and Managing Partner, DBL Investors*
- *Lyndon Rive, Founder and Chief Executive Officer, SolarCity*

10:50-11:05 a.m.
Networking Break..... Potomac Foyer
Partners: ABB, Inc. and BASF Corporation

11:05-11:10 a.m.
ARPA-E Awardee Video ..... Potomac A

11:10-11:30 a.m.
Partners in Disruption: Why Utilities will Scale Clean Energy ..... Potomac A
- *Alex Laskey, President and Chief Executive Officer, Opower*

11:30-11:35 a.m.
Congressional Comment ..... Potomac A

11:35 a.m.-12:15 p.m.
Fireside Chat with Hank Paulson ..... Potomac A
- *Moderator: Mark Tercek, President and CEO, The Nature Conservancy*
- *The Honorable Henry M. "Hank" Paulson Jr, Founder and Chairman, Paulson Institute*

Continued to next page >>

WEDNESDAY (CONTINUED)

12:15-2:30 p.m.
TECHNOLOGY SHOWCASE

12:15-2:30 p.m.
Technology Showcase and Lunch ..... Technology Showcase
Lunch served from 12:30-1:30 p.m.

2:30-3:30 p.m.
AFTERNOON SESSIONS

Grid Decentralization: Is it Coming? And How Do We Get There? ..... Potomac A

In at least one fundamental way, the electric grid has not changed for decades: Power predominantly flows from large, centralized generation facilities to consumers. What's next? To what extent might grid operations move away from the traditional centralized paradigm to a highly distributed world? What are the technologies that would enable such a future?

- *Moderator: Jeff St. John, Greentech Media*
- *Jeff Bladen, Market Design, Miso Energy*
- *Doug Kim, Southern California Edison*
- *Jeff Taft, Pacific Northwest National Laboratory*

Partner: Booz Allen Hamilton

Carbon Capture, Utilization and/or Storage: What's Happening Now and What's to Come..... Potomac C

To say that capturing carbon at industrial scale is challenging, is an understatement. Learn about the key challenges of testing, scaling, and verifying carbon capture, utilization, and storage technologies. Also hear from technologists who have reimagined ways to capture and use carbon dioxide and about the progress they have made to realize these opportunities.

- *Moderator: Tore Amundsen, Gassnova SF*
- *Dr. Larry Baxter, Brigham Young University*
- *Bon Calayag, ATK Defense Group*
- *Dr. Steven Kaye, Cyclotron Road*

Our Technology Works and Customers are Lining up! Now What? ..... Potomac 5

To have impact in the market, it is not merely enough to achieve technical targets, develop a viable product, and establish early customers. The next—and perhaps even bigger—challenge remains: how to scale up successfully. In this panel, hear a variety of technologists share their lessons learned, the key decisions they made and the resources they used to get their technologies to the next level.

- *Moderator: Will Coleman, OnRamp Capital*
- *Phil Giudice, Ambri*
- *Edward Johnston, Gas Technology Institute*
- *John Lebo, QM Power*

Summit Agenda: **WEDNESDAY**

WEDNESDAY (CONTINUED)
3:45-4:45 p.m. **SUMMIT CLOSE**
3:45-4:00 p.m. Summit Closing Remarks ..... Potomac A
4:00-4:45 p.m. Closing Networking Reception ..... Potomac Foyer

Student Program

The Student Program at the Energy Innovation Summit is a unique opportunity for graduate-level student energy leaders to network with each other as well as engage in interactive discussions and create future career opportunities.

MONDAY, FEBRUARY 9

12:30-1:15 p.m.
STUDENT PROGRAM KICKOFF - WELCOME

Student Networking Lunch..... National Harbor 5
Meet your peers and future collaborators.

1:15-2:00 p.m.
BREAKOUT SESSIONS

Breakout One:
So You Want to Work in Energy? ..... National Harbor 12
Hear career snapshots from a diverse group of panelists from different fields in the energy industry. Panelists briefly describe their careers and share advice for graduates looking to move into their respective fields.

- *Moderator: Martin LaMonica, Energy and Environment Editor, The Conservation*
- *Rita Hansen, Chief Executive Officer, Onboard Dynamics, Inc.*
- *Dr. Anna Stephanopolou, Professor, University of Michigan*
- *Jason Wible, Engineer, 308 Grace Street*

Breakout Two:
Resources for Expanding Energy Activities on Your Campus (Facilitated by Spark Clean Energy) ..... National Harbor 13
Hear about best practices, tools, and models to promote and expand energy-related activities during your academic tenure and beyond. Participants discuss methods for engaging diverse teams to accelerate collaboration between energy stakeholders both on and off-campus.

- *Mark Silberg, Executive Director, Spark Clean Energy*

2:00-2:30 p.m.
ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge Briefing..... National Harbor 5
Are you ready to participate in the inaugural Student Technology Showcase Challenge? The Challenge provides in-depth exposure to the technologies in the Technology Showcase, while encouraging students to think about solving a real-world technology challenge. The top six teams are selected to give a five-minute presentation to a panel of ARPA-E judges. Prizes to be awarded to the top team.

4:15-5:00 p.m.
STUDENT NETWORKING EVENT

Student Networking Reception..... National Harbor 5

Student Program Agenda

TUESDAY, FEBRUARY 10

12:00-12:30 p.m.

Student Networking Lunch..... National Harbor 5

12:30-1:30 p.m.

ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge Work Time..... National Harbor 5

This time is set aside for participants to meet in their teams and produce a two-slide presentation due by Tuesday, 7:30 p.m. ARPA-E Fellows are available for teams to pitch ideas, ask questions, and receive feedback.

5:00-6:45 p.m.

STUDENT SHOWCASE TOURS

5:00-5:45 p.m.

Showcase Tour 1..... ARPA-E Booth 629 in Technology Showcase

Take a guided tour through the Summit Technology Showcase led by ARPA-E Deputy Director, Dr. Cheryl Martin. Each tour is capped at 25 students and is first-come, first-served.

6:00-6:45 p.m.

Showcase Tour 2..... ARPA-E Booth 629 in Technology Showcase

Take a guided tour through the Summit Technology Showcase led by ARPA-E Deputy Director, Dr. Cheryl Martin. Each tour is capped at 25 students and is first-come, first-served.

WEDNESDAY, FEBRUARY 11

8:15-9:30 a.m.

ARPA-E TECHNOLOGY SHOWCASE CHALLENGE

ARPA-E Technology Showcase Challenge Presentations..... National Harbor 5

The top six student teams present five-minute presentations to a panel of ARPA-E judges. Prizes to be awarded to the top team.

Partner: Spark Clean Energy

12:30-1:30 p.m.

STUDENT PROGRAM CLOSING

Recruiter Meet and Greet..... National Harbor 5

The Recruiter Meet and Greet is a great opportunity for graduate students to network over lunch with companies looking for talent, and for companies to meet the next generation of energy leaders.

Participating companies: 3M | Alveo Energy | APEI | Baldor | BASF Corporation | Dais Analytic Corporation | EPRI | Fraunhofer | Greentown Labs, Inc. | Lawrence Berkeley National Laboratory | Lockheed Martin | Oak Ridge National Laboratory | Palo Alto Research Center | Proton Onsite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SECTION 3

SESSION DESCRIPTIONS

"This unique forum will help facilitate the partnerships necessary to bring game-changing technologies to market quickly, which is critical to securing America's global technology leadership and creating new jobs."

—Steven Chu, Former Secretary, U.S. Department of Energy

Want to Join Us at ARPA-E?

Monday | 8:30-9:30 a.m. | Potomac C

Panel Description:

There are a variety of limited term positions at ARPA-E, from Program Directors to Technology-to-Market Advisors to Fellows. Each one is unique in how it contributes to ARPA-E's overall mission. Join this conversation to learn more about each of these positions and ask questions of those currently holding them.

Panelists:

MODERATOR

DR. ERIC ROHLFING
Deputy Director for Technology, Advanced Research Projects Agency-Energy (ARPA-E)

KACY GERST
Technology-to-Market Advisor, Advanced Research Projects Agency-Energy (ARPA-E)

DR. PAUL ALBERTUS
Fellow, Advanced Research Projects Agency-Energy (ARPA-E)

DR. PAT MCGRATH
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

Lessons Learned in Technology Development: Pivoting Your Technology to a New Business Model

Monday | 8:30-9:30 a.m. | Potomac 5

Panel Description:

ARPA-E works hard to ensure that funded technologies are oriented toward commercial applications and ready for market transitions. To this end, ARPA-E requires each project to undertake a robust set of technology-to-market tasks, including in-depth customer exploration, competitive analysis, and cost modeling. Frequently, these activities lead to surprising discoveries that reshape value propositions and challenge a previously perceived path to market.

In this discussion, hear examples from panelists who successfully pushed ARPA-E projects towards commercialization. Learn how project teams engaged customers, obtained new information, validated (or discredited) hypotheses, and developed useful cost models. Panelists also discuss how these activities, taken together, enabled ARPA-E teams to pivot business models and follow a more productive path to market, or, in some instances, realize that there was not a pivot to make.

Panelists:

MODERATOR

DR. CHERYL MARTIN
Deputy Director, Advanced Research Projects Agency-Energy (ARPA-E)

LEILA MADRONE
Founder and Chief Executive Officer, Sunfolding

DR. DOUG KIRKPATRICK
Co-Founder and Chief Executive Officer, BlackPak Inc.

CRAIG WALKER
Director, United Technologies (UTC) Climate, Controls & Security Program Office, United Technologies Research Corporation

Understanding Current Defense Funding Priorities

Monday | 9:45-10:45 a.m. | Potomac C

Panel Description:

The Department of Defense (DoD) has developed a complex acquisition system that helps the U.S. maintain technological superiority over potential adversaries. Due to the complexity of many modern Defense systems, DoD's $12 billion annual science and technology investment is managed via discrete classes of funding vehicles. As an emerging technology moves through the various stages of technical maturity, it must transition across these funding vehicles. Panelists discuss the subsets of energy technologies that are of interest to their respective agencies and describe the preferred tech maturity at entry and exit for their programs. Participants gain an understanding of available Defense funding opportunities in energy technology and how to position themselves for success when pursuing such opportunities.

Panelists:

MODERATOR

JEN DIMASCIO
Manager, Worldwide Defense, Space, and Security, Aviation Week

DR. JAMES GALVIN
Program Manager for Energy and Water, Department of Defense Environmental Security Technology Certification Program (ESTCP)

ERIN FITZGERALD
Program Director for Social Sciences, Office of the Assistant Secretary of Defense for Research and Engineering, Basic Research

JOHN JENNINGS
Director for Innovation, Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OEPP)

Lessons Learned in Technology Development: Finding Funding Beyond ARPA-E

Monday | 9:45-10:45 a.m. | Potomac 5

Panel Description:

ARPA-E takes its mission of transitioning ideas to the marketplace very seriously. From the moment that ARPA-E makes an award, we challenge awardees to think about strategic market opportunities and follow-on funding sources. In fact, one of the most important questions that ARPA-E poses to project teams—and reiterates frequently over the tenure of our award—is what happens the month after our funding ends. Where will future funding come from? There isn't a one-size-fits-all answer. Several sources of funding exist: e.g. the military, venture capital, strategics, public markets, start-up revenue, and other government agencies, to name but a few. But securing funding following an ARPA-E award is seldom easy. In this discussion, the audience hears from awardees who have successfully obtained post-ARPA-E award funding. Panelists discuss the key strategies, challenges, and trade-offs in securing follow-on funding from a variety of different sources.

Panelists:

MODERATOR

NATE GORENCE
Technology-to-Market Advisor, Advanced Research Projects Agency – Energy (ARPA-E)

BRIAN JANOUS
Director of Energy Strategy, Microsoft

DR. CODY FRIESEN
Fulton Engineering Professor of Innovation, Arizona State University

DR. AVIDEH ZAKHOR
Professor, University of California, Berkeley

It's About the Story You Tell: Translating Your Technology for Press and Investors

Monday | 2:00-3:00 p.m. | Potomac A

Panel Description:

In today's sound bite world, the difference between success and failure sometimes depends on the story you tell and how well you tell it. Scientists and technologists often struggle to tell a concise and compelling story that reporters and investors can latch on to. They may hesitate to generalize for fear of distorting the truth, or be otherwise uneasy with anyone seeking an eye-catching lead. Yet, by avoiding potential misrepresentations, scientists also sacrifice opportunities to generate critical exposure for their innovative ideas. In this session, researchers learn how to translate abstract concepts into concrete metaphors, craft sound bites, and prepare for media interviews and investor meetings. Author and science communication expert Richard Hayes shows how it is possible for the discoveries that tend to hibernate in lecture halls and academic journals to reach a broader audience in a way that is both accurate and effective.

All attendees of this session will have an opportunity to sign up for personalized, one-on-one, on-camera coaching with a professional media trainer. Coaching sessions will occur on Monday and Tuesday and are on a first-come, first-served basis. For additional information on these personalized coaching sessions and to sign up, you MUST attend this panel session.

INTRODUCTION

DR. CHERYL MARTIN
Deputy Director, Advanced Research Projects Agency-Energy (ARPA-E)

PRESENTER

RICHARD HAYES
Author, "A Scientist's Guide To Talking With The Media: Practical Advice from the Union of Concerned Scientists"

ARPA-E Program Director/Fellow Fast Pitch

Monday | 2:00-3:00 p.m. | Potomac C

Panel Description:

Join ARPA-E Program Directors and Fellows as they provide a rapid-paced succession of exciting current program concepts as well as some completely new, "out-of-the-box" ideas. Then engage in the conversation during a lively Q&A session.

Topics Discussed:

"Can We Have Better Catalysis without Better Catalysts?"

"Engineering Agriculture for Profitable Carbon Capture"

"Can Integrated Micro-optics Transform Flat Panel Solar Cells?"

"Can Biological Conversion of Methane Facilitate Small Scale Deployment?"

"Transforming Energy Efficient and Clean Metal Production and Recycling"

Panelists:

DR. PATRICK MCGRATH
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. MIKE HANEY
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. DAVID BROWN
Fellow, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JAMES KLAUSNER
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. RAMON GONZALEZ
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

Energy Storage: Moving Beyond the Tipping Point

Monday | 2:00-3:00 p.m. | Potomac 5

Panel Description:

Energy storage is a key enabling technology for both electrification of transportation, as well as a low CO_2 / renewables enabled grid. Recent events suggest that energy storage may be at the tipping point, where low cost technologies drive solutions in markets which now have both U.S. and global commitments. There is a lot of information and detail on energy storage, but still it is difficult to really understand where the technology is headed, at what speed, what governs this progression, and if it will ever really be as significant as many project. This panel explores the status and outlook from both an agnostic by-the-numbers approach as well as from the perspective of those participating across the entire stakeholder map in order to elucidate what it will take to push this long-sought and highly anticipated technology beyond the tipping point.

Panelists:

MODERATOR

KATIE FEHRENBACHER
Senior Writer, GigaOM

BRIAN WARSHAY
Analyst, Bloomberg New Energy Finance

GREG CALLMAN
Supercharger Deployment and Stationary Storage, Tesla

JOHN ZAHURANCIK
President, AES Energy Storage

GLEN MERFELD
Platform Leader, Energy Storage Technologies, GE Global Research

ARPA-E Program Director/Fellow Fast Pitch

Monday | 2:00-3:00 p.m. | National Harbor 3

Panel Description:

Join ARPA-E Program Directors and Fellows as they provide a rapid-paced succession of exciting current program concepts as well as some completely new, "out-of-the-box" ideas. Then engage in the conversation during a lively Q&A session.

Topics Discussed:

"Optimization of Electricity Transmission Networks to Facilitate Renewables Integration"

"Moving Ions, Moving Energy: Opportunities in Ion Conducting Layers"

"A Unified Transportation and Electricity Infrastructure"

"Accelerating Energy Crop Development"

"From Local to Global: Distributed Energy Resources Integration"

Panelists:

DR. TIM HEIDEL
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. SONJA GLAVASKI
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. PAUL ALBERTUS
Fellow, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JASON RUGOLO
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JOE CORNELIUS
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

ARPA-E Program Director/Fellow Fast Pitch

Monday | 3:15-4:15 p.m. | Potomac A

Panel Description:

Join ARPA-E Program Directors and Fellows as they provide a rapid-paced succession of exciting current program concepts as well as some completely new, "out-of-the-box" ideas. Then engage in the conversation during a lively Q&A session.

Topics Discussed:

"No Photon Left Behind: Advanced Optics for Solar Energy and Buildings"

"Big Data—Big Decisions—Big Energy Savings"

"Heating and Cooling People Locally To Save Building Energy Use"

"Could Advanced Technology Get Us to 'Yes' for Efficiency Upgrades of Single Pane Windows?"

"How Could We Improve the Energy Efficiency of Personal Transportation?"

Panelists:

DR. HOWARD BRANZ
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. PING LIU
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JONATHAN BURBAUM
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. ERIC SCHIFF
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. MIKE KANE
Fellow, Advanced Research Projects Agency-Energy (ARPA-E)

In Search of a "Secure" Energy Future— Are Distributed Energy Resources (DERs) More or Less Enabling?

Monday | 3:15 - 4:15 p.m. | Potomac C

Panel Description:

Electric grid resiliency and security are hot topics in light of recent severe weather events and cyber-physical threats to existing infrastructure. The United States, and to even a greater extent other countries, is on a path of increasing distributed energy resource (DER) penetration. By increasing our deployment of solar, small wind, fuel cells, and generators, in conjunction with energy storage from batteries, are we increasing or decreasing our vulnerability to physical attacks, cyber attacks, and severe weather events? Analysis suggests that properly designed microgrids that include DERs will increase the resiliency of the microgrid region. Significant questions remain regarding the threshold of DER penetration (25%, 50%, higher?) and/or microgrid scale (home, business, community) at which security and resiliency may be enhanced or degraded relative to low DER penetration levels. Additionally, the challenges associated with the stability of the grid and an enhanced dependence on fuel distribution infrastructure at high DER penetration need to be considered. This panel brings together thought leaders on both sides of the issue to discuss the ramifications of a more distributed energy future.

Panelists:

MODERATOR

MARTHA BROAD
Executive Director, MIT Energy Initiative

BERT HASKELL
Chief Technology Officer, Pecan Street

ERICH GUNTHER
Chairman and Chief Technology Officer, Co-Founder, EnerNex

DARRELL D. MASSIE
Founder and Chief Executive Officer, Intelligent Power & Energy Research Corporation (IPERC)

ARPA-E Program Director/Fellow Fast Pitch

Monday | 3:15 - 4:15 p.m. | Potomac 5

Panel Description:

Join ARPA-E Program Directors and Fellows as they provide a rapid-paced succession of exciting current program concepts as well as some completely new, "out-of-the-box" ideas. Then engage in the conversation during a lively Q&A session.

Topics Discussed:

"Advanced Technology Engines and Powertrains: What are the Limits to Efficiency?"

"Oxygen Combustion for Improved Efficiency and Emissions"

"A Natural Gas Generator for Every Home"

"Disruptive Approaches for Methane Emission Detection and Measurement"

"Distributed Generation and Storage, Delivering Energy When and Where It's Needed"

Panelists:

DR. CHRIS ATKINSON
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. BRYAN WILLSON
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JOHN LEMMON
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. JI-CHENG (JC) ZHAO
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

DR. ASHWIN SALVI
Fellow, Advanced Research Projects Agency-Energy (ARPA-E)

A Lesson from Solar: Applying Financing Models to Drive New Technologies

Monday | 3:15 - 4:15 p.m. | National Harbor 3

Panel Description:

Innovative financing has been one of the central drivers of the current boom in solar photovoltaic (PV) deployments. Several companies—such as SolarCity, Sunrun, and Sungevity—pioneered third-party ownership with PPA and lease financing structures to bring solar power to thousands. Flash forward several years and there are even more solar companies offering even more financing products, all of which are driving record growth. Other clean energy companies have taken notice. Today, several energy efficiency providers and energy storage vendors are using similar financing structures to sell new products and services.

In this panel, hear from clean energy start-ups that are using financial innovations to drive sales. Panelists discuss current developments in financing innovation—PPAs, leases, loans, on-bill repayment, to name a few—for new energy products and services as well as the challenges start-ups face in adopting these powerful tools.

Panelists:

MODERATOR

LIAM DENNING
Co-Editor, Heard on the Street, Wall Street Journal

RANDY PALOMBI
Vice President, Sales, Stem

MICHAEL BRYLAWSKI
Chief Executive Officer, Vision Fleet

SARA ROSS
Co-Founder and Chief Executive Officer, Sungage Financial

Let's Debate: Is Natural Gas a Bridge to a Low Carbon Future?

Tuesday | 2:30-3:30 p.m. | Potomac A

Panel Description:

The low cost and abundant nature of natural gas is considered an enabler by many; providing an economically viable 'bridge' to a lower-carbon energy future. However, for others, the same natural gas is derailing investment in even lower carbon options. Come hear a debate of the critical issues of expanded natural gas use and whether natural gas will ultimately be a bridge, a detour, or a destination.

Panelists:

MODERATOR

MONICA TRAUZZI
Managing Editor & Host, E&E Publishing/ E&E TV

THE HONORABLE DAVE MCCURDY
President and Chief Executive Officer, American Gas Association

DR. STEVEN J. DAVIS
Assistant Professor, University of California, Irvine

MICHAEL LEVI
David M. Rubenstein Senior Fellow for Energy and the Environment and Director of the Maurice K. Greenberg Center for Geoeconomic Studies, Council on Foreign Relations

FRED KRUPP
President, Environmental Defense Fund

How Corporates and Investors Place a Monetary Value on All Your Hard Work

Tuesday | 4:00-5:00 p.m. | Potomac A

Panel Description:

Estimating the appropriate valuation of your IP and your company can be more of an art then a science and have massive long-term implications on future funding rounds. How do you know that your company and IP isn't being overvalued or undervalued? What valuation approaches do corporates and investors use on pre-revenue startups? In this discussion, corporate specialists and startup executives will share their insight into best practices for, and realities of, IP valuation strategies and decisions. Replete with tips, best practices, and relatable experiences, this panel is a must-attend for anyone interested in licensing or selling their technology.

Panelists:

MODERATOR

JEFF MCAULAY
Senior Manager of Strategic Partnerships, EnerNOC

ANITA CHOI
Attorney, Morrison & Foerster LLP

COLLEEN CALHOUN
Senior Executive Director, GE Energy Ventures

MARK PLATSHON
Senior Advisor and Managing Director, BMW i-Ventures

The Next Agricultural Revolution: Can Mass Adoption of New Technologies Increase Global Biomass Production while Reducing Resource Consumption?

Tuesday | 4:00-5:00 p.m. | Potomac C

Panel Description:

Over thousands of years, agriculture has been repeatedly transformed by technological advances, which improve agricultural productivity. In the coming decades, farmers will be challenged to produce even more biomass to feed the world's growing population and to convert it into renewable fuels—all in the face of limited land, water, and energy resources. Many technologies that can drive efficiency in biomass production are in various stages of development, including genetic engineering, robotics, and big data. However, these technologies have not yet been implemented in agriculture on the global scale needed to address future biomass demand. In this session, panelists discuss why these technologies haven't been more broadly adopted thus far, and how to drive better adoption in the future.

Panelists:

MODERATOR

DAVID BIELLO
Editor, Scientific American

DR. MIKE EDGERTON
Technology Lead for Sugarcane, Monsanto

AMOL DESHPANDE
Chief Executive Officer and Founder, Farmers Business Network

DR. CARL WELLINGTON
Senior Commercialization Specialist, Carnegie Mellon University National Robotics Engineering Center

Wide Band-gap Technologies: Changing People's Lives Now and into the Future

Tuesday | 4:00-5:00 p.m. | Potomac 5

Panel Description:

Wide band-gap (WBG) technology has been studied for over half a century. It started changing the way we see the world almost two decades ago with the introduction of blue LEDs into the dashboard of the new Volkswagen Beetle. This panel session discusses how WBG technology has changed the way we light our buildings and streets, watch movies, and communicate through mobile technology. Panelists explore how WBG technology will shape our future by reducing energy-related emissions and making energy more affordable through high-efficiency power conversion and the proliferation of LED illumination.

Panelists:

MODERATOR

KEVIN BULLIS
Senior Editor, Energy, MIT Technology Review

JIM SPECK
Professor, University of California, Santa Barbara

DR. JOHN PALMOUR
Co-Founder and Chief Technology Office, Power and RF, Cree, Inc.

DANIELLE MERFIELD
Technology Director, GE Global Research

Energy Innovation at the State Level: What's Happened and What's to Come?

Tuesday | 4:00-5:00 p.m. | National Harbor 3

Panel Description:

States have always played a significant role in driving energy innovation from the bottom up. However, over the last several years with Federal energy policy at a relative standstill, many states have taken even more ambitious steps to accelerate clean energy technology deployment. Efforts to reform the utility model, procure grid-scale electricity storage, and establish green banks are but a few examples. Although many states continue to refine and expand such programs, several "laboratories of democracy" have begun to produce real, if preliminary, data from their clean tech experiments.

Hear from representatives from leading states about the energy technology programs they have underway. Panelists discuss what these programs have produced thus far, how technologists can get involved, and what to expect in the future.

Panelists:

MODERATOR

DAVID FERRIS
Reporter, E&E Publishing

ROB OGLESBY
Executive Director, California Energy Commission

ALICIA BARTON
Chief Executive Officer, Massachusetts Clean Energy Center (MassCEC)

SPEAKER TBD
New York State

Grid Decentralization: Is it Coming? And How Do We Get There?

Wednesday | 2:30 -3:30 p.m. | Potomac A

Panel Description:

In at least one fundamental way, the electric grid has not changed for decades: power predominantly flows from large, centralized generation facilities to consumers. This is slowly beginning to evolve as the penetration of distributed generation increases. For the first time, economics and efficiency could point towards more distributed generation instead of centralized plants. But what's next? To what extent might grid operations move away from the traditional centralized paradigm to a highly distributed world? What are the technologies that would enable such a future? Do these technologies currently exist and just need to be deployed, or do we need a technological revolution? What would be better, worse, or just different about such a world?

Panelists:

MODERATOR

JEFF ST. JOHN
Journalist,
Greentech Media

DOUG KIM
Director of Advanced Technology, Southern California Edison

JEFF BLADEN
Executive Director - Market Design, Miso Energy

JEFF TAFT
Chief Architect for Electric Grid Transformation, Pacific Northwest National Laboratory

Session Partner: Booz | Allen | Hamilton
strategy and technology consultants

Carbon Capture, Utilization and/or Storage: What's Happening Now and What's to Come

Wednesday | 2:30 -3:30 p.m. | Potomac C

Panel Description:

To say that capturing carbon at industrial scale—whether for long-term storage or immediate use—is challenging, is an understatement. The cost of carbon dioxide (CO_2) capture remains significant, testing and scale-up present numerous challenges, and market utilization opportunities generally must compete with established commodities. In 2010, APRA-E launched a targeted carbon capture and storage program, IMPACCT, aimed at lowering the costs of post-combustion capture technologies. ARPA-E's OPEN 2012 portfolio also included several carbon capture, utilization, and storage (CCUS) projects. To date, a handful of teams from these programs have made significant technical and commercial progress. Going forward, the Agency remains acutely interested in a range of CCUS pathways.

Learn about the key challenges of testing, scaling and verifying CCUS technologies. Also hear from technologists who have reimagined ways to capture and use CO_2 and about the progress they have made to realize these opportunities.

Panelists:

MODERATOR

TORE AMUNDSEN
Chief Executive Officer, Gassnova SF

BON CALAYAG
Senior Program Manager, Missile Products, ATK Defense Group

DR. LARRY BAXTER
Professor, Brigham Young University

DR. STEVEN KAYE
Project Lead - Mosaic Materials Project, Cyclotron Road

Our Technology Works and Customers are Lining up! Now What?

Wednesday | 2:30 -3:30 p.m. | Potomac 5

Panel Description:

To have impact in the market, it is not merely enough to achieve technical targets, develop a viable product, and establish early customers. The next—and perhaps even bigger—challenge remains: how to scale up successfully. Producing the first 10 units is fundamentally different from making the next 10,000 which is profoundly different from producing a million. Do I build myself or use contract manufacturing? Are there creative ways to fund new assets and a growing team? What resources can help me execute more effectively? Achieving scale requires making sound strategic decisions and accessing new knowledge, personnel and assets. There isn't a one-size-fits-all approach, but, with the right resources and team in place, you stand a better chance to satisfy those clamoring customers. In this panel, hear a variety of technologists share their lessons learned, the key decisions they made and the resources they used to get technologies to the next level.

Panelists:

MODERATOR

WILL COLEMAN
Founder, OnRamp Capital

EDWARD JOHNSTON
Vice President of Research Operations, Gas Technology Institute

PHIL GIUDICE
Chief Executive Officer, President, and Board Member, Ambri Inc.

JOHN LEBO
Chief Operations Officer, QM Power

Government Agency Networking Program

Monday | 12:30 - 2:00 p.m. | Prince George's Hall B

Connect with leadership and program directors from the nation's top federal agencies focused on energy innovation. Representatives from federal government agencies are available in an open, reception-style forum to discuss their research interests, services, and funding opportunities.

The participating agencies are listed below.

See pages 82-88 to learn their focus areas.

U.S. DEPARTMENT OF DEFENSE AGENCIES

Air Force Energy Office (SAF/IE)

Marine Corps Expeditionary Energy Office (E20)

Navy Energy (OPNAV N45)

Navy Military Sealift Command Operational Logistics (OPLOG) Energy Conservation (ENCON)

Office of Naval Research (ONR)

Office of the Deputy Assistant Secretary of the Navy, Energy

Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OSD/OEPP)

Special Operations Command-Tactical Assault Light Operator Suit (USSOCOM-TALOS)

Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP)

Continued to next page >>

Government Agency Networking Program

U.S. DEPARTMENT OF ENERGY AGENCIES

Energy Information Administration (EIA)

Loan Programs Office (LPO)

Office of Electricity Delivery and Energy Reliability (OE)

Office of Energy Efficiency and Renewable Energy (EERE)

Office of Fossil Energy (FE)

Office of Nuclear Energy (NE)

Office of Science (SC)

OTHER U.S. FEDERAL AGENCIES

National Aeronautics and Space Administration (NASA)
Goddard Space Flight Center

National Institute of Standards and Technology (NIST)

National Science Foundation (NSF)

Department of Transportation (DOT)/Volpe, The National Transportation Systems Center

State & Global Networking Event

Tuesday | 5:30 - 6:30 p.m. | Technology Showcase

Connect with representatives from various U.S. state-level organizations and agencies seeking to assist startups and spinouts on their path to market, as well as international organizations and foreign government agencies seeking investment and partnership opportunities with U.S. technologists and startup companies. Representatives are available in an open, reception-style forum.

Download the mobile app to see the full list of state and global organizations participating. See page 3 for download instructions.

The event will take place in the front, right-hand side of the Technology Showcase.

Future Energy Pitching Session

Monday | 6:00 p.m. – 7:30 p.m. | Potomac A

Attend the Future Energy Pitching Session and vote for your favorite startup.

Future Energy is a community for entrepreneurs, researchers, and investors in the energy and cleantech industries to commercialize radical solutions to the world's energy challenges. The Future Energy community collaborates through in-person startup pitch events in key innovation centers across the U.S. and accompanying online communities for national and international participation.

This session features seven (7) early-stage energy technology startups presenting to a panel of top strategic and venture capital investors. Investors provide feedback and actionable advice to the presenters, and the audience members vote for their favorite startup.

Participating Companies (in alpha order):

Accio Energy

www.accioenergy.com

Presenter: Jennifer Baird

Accio Energy is redefining offshore wind power generation with 50% lower costs and a 20% higher capacity factor with many siting advantages.

AmberWave

www.amberwave.com

Presenter: Anthony Lochtefeld

A high efficiency thin mono-Si solar cell that will enable superior rooftop-integrated PV products, lowering PV system BOS costs.

Axiom Exergy
www.axiomexergy.com
Presenter: Anthony Diamond

The Refrigeration Battery™ is a low-cost, behind-the-meter energy storage system that can reduce a supermarket's utility bills by up to 20%.

EnZinc
www.enzinc.com
Presenter: Michael Burz

EnZinc offers Radical Energy Storage Devices from Zinc Metal Sponges. **ARPA-E Awardee.**

Indoor Reality
Presenter: Avideh Zakhor

We provide fast, automated energy audits of commercial and industrial buildings using a human wearable backpack system.

SAFCell, Inc.
www.safcell.com
Presenter: Calum Chisholm

SAFCell, Inc. has developed a new class of intermediate temperature power and hydrogen generators for portable and stationary applications. **ARPA-E Awardee.**

SLIPS Technologies
www.slipstechnologies.com
Presenter: Daniel Behr

SLIPS is a robust and self-healing super-slippery surface that is highly repellent to virtually anything (fluids, ice, biofouling, etc.). **ARPA-E Awardee.**

2015 Moderator:

GRAHAM LAWLOR
Ultra Light Startups

Graham Lawlor is the founder of the Ultra Light Startups, which helps Fortune 100 companies and government institutions connect with startups based on their strategic and financial objectives. Ultra Light is the largest monthly startup-investor pitch event community in both New York and Boston, and it has also held events in Toronto, London, Cleveland, and Austin. Since 2008, over 700 startups have pitched at Ultra Light Startups events. Graham is a frequent guest speaker, moderator, interviewer, and press source on startups and online business.

Continued to next page >>

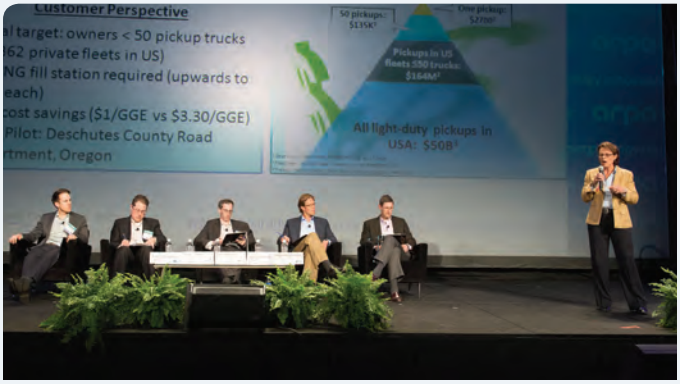
2015 Investor Panelists:

COLLEEN CALHOUN
GE Ventures

Colleen Calhoun leads a team focused on investing in and scaling startup energy businesses inside and outside of GE. Calhoun works closely with GE's Global Research Center, Power & Water, Oil & Gas, Energy Management and Transportation businesses. Prior to her current role Calhoun was the Leader of Marketing & Strategic Initiatives for GE's Power & Water business. In that role, she was focused on growth strategies and initiatives, which include adjacencies, emerging market opportunities, new products and investment areas for GE's thermal power, renewables, nuclear, aero derivatives and water businesses. Calhoun joined GE in 1994 and has managed teams in London, Sydney, Singapore, New Delhi, Dubai, Houston and Stamford in their evaluation and completion of energy investments. She is a specialist in investment risk management and certified as a master black belt in GE's Six Sigma quality program.

NEAL M. DIKEMAN
Shell Technology Ventures

Neal M. Dikeman is a Senior Venture Principal at Shell Technology Ventures. Prior to working at Shell he was founding partner of cleantech merchant bank Jane Capital Partners, where he served as advisor on corporate venture and alternative energy to a number of multinationals and R&D labs, including Meridian Energy, Ltd, ConocoPhillips, and Macquarie Bank. At Jane Capital he also cofounded and led the launch of a number of energy tech startups in smart grid, power, alternative energy, and IT. Formerly, Neal led M&A at Globalgate, Inc., and was an Associate at private equity fund Doyle & Boissiere LLC. He began his career with the energy group of Bankers Trust, working on M&A and financings in the oil & gas and energy service sectors. Neal currently serves on the board of American Electric Technologies, Inc. (NASDAQ:AETI), a provider of power delivery solutions to the petrochemical sector, is Chairman of Greenhome LLC and CleanTech.org, and is chief blogger of Cleantechblog.com.



CODY NYSTROM
SJF Ventures

Cody Nystrom is a Managing Director at SJF Ventures, a growth capital fund that provides equity to high growth, positive impact companies within the fields of resource efficiency, smart infrastructure and tech-enabled services. Cody represents SJF on the boards of Validic (mobile health), Versify Solutions (software for power generation assets), Community Energy, Inc. (renewable energy developer) and Vital Farms (pasture-raised eggs and poultry). Cody was previously at Ewing Bemiss & Co., an investment bank based in Richmond, Virginia that provides M&A and other financial advisory services to middle-market companies, primarily in the energy and environment fields. Cody serves or has served on advisory committees for the Virginia Commonwealth Energy Fund, Lighthouse Labs, SXSW Eco, Health 2.0 and the Venture Forward mentoring group at University of Virginia.

ZACK SCHILDHORN
Lux Capital

Zack Schildhorn is a Partner with Lux Capital, based in the Firm's New York office. Zack has been working with Lux since 2006, focusing on marketing, operations, and investments at the intersection of the digital and physical worlds. Zack led Lux's investments in Shapeways, Sols Systems, and Moment and helped source the firm's investment in Matterport. He has also worked extensively with a number of Lux portfolio companies including Transphorm, Kurion, and Siluria. Before joining Lux, Zack worked as an expedition photographer on the Colorado Plateau. He created his own curriculum at Cornell University to study materials science and business entrepreneurship, graduating in 5 years with a B.S. in engineering and an MBA. Zack is a regular contributing editor for Forbes and has been an invited speaker and guest lecturer at Cornell University, Drexel University, NYU, and the University of Pennsylvania.

FUTURE ENERGY PITCHING SESSION PARTNER

Shell GameChanger

HOSTED BY

FUTURE ENERGY powered by Ultra Light Startups

Shape the Future of Energy through Innovation






Energy is vital to our daily lives. It helps us produce food, fuel transport and power communication channels across the world. Over the coming decades, more people will gain access to energy and enjoy higher standards of living. But these developments could place greater pressure on our world's resources, such as energy, fresh water and food. At the same time, climate change remains a serious concern. At Shell, we use human ingenuity, innovation and technology to unlock the energy our customers need to power their lives in the years ahead, while aiming to limit our impact on the environment.

We are looking for innovative ideas to more affordably, efficiently and cleanly develop and use today's energy resources, or unlock the clean energy resources of tomorrow.

Submit your proposal to Shell GameChanger at www.shell.com/gamechanger

Personal Agenda

Use this page to create your own personal agenda.

MONDAY

TIME	SESSION	LOCATION

TUESDAY

TIME	SESSION	LOCATION

WEDNESDAY

TIME	SESSION	LOCATION

Session Notes

SECTION 4

SUMMIT PARTNERS & TECHNOLOGY SHOWCASE

"The best national networking of any event I attend each year and the speakers and panels help me to get a broader perspective of federal priorities and national trends in the future of energy technology."

— David Kenney, Oregon BEST

2015 Summit Partners

Platinum Partner

BASF
We create chemistry

Gold Partners

BOSCH
Invented for life

LOCKHEED MARTIN

THE PEW CHARITABLE TRUSTS

SIEMENS

Silver Partners

APPLIED MATERIALS

Chevron

GE

SOLARRESERVE

United Technologies Research Center

Future Energy Pitching Session Partner

Shell GameChanger

Bronze Partners

AGA American Gas Association

BRIGHT CAPITAL

Exponent

MACCOR
Battery & Cell Test Equipment Worldwide

MDB CAPITAL GROUP

Mobile App Partner

BASF
We create chemistry

2015 Summit Partners

Lanyard Partner

SOLARRESERVE®

Tuesday Lunch in the Technology Showcase Partner

ABB

Technology Development Partners

Argonne NATIONAL LABORATORY

Battelle *The Business of Innovation*

CalCharge

Carnegie Mellon University Scott Institute for Energy Innovation

Technology Centre Mongstad

Berkeley Lab | cyclotronroad

EPRI Electric Power Research Institute

LACI

Massachusetts Clean Energy Center

NIST National Institute of Standards and Technology U.S. Department of Commerce

NREL

nyserda Energy, Innovation, Solutions.

Oregon BEST

Pacific Northwest National Laboratory *Proudly Operated by Battelle Since 1965*

parc A Xerox Company

Sandia National Laboratories

SLAC National Accelerator Laboratory

SyracuseCoE center of excellence

Texas A&M AgriLife Research

UL CONN CENTER FOR RENEWABLE ENERGY RESEARCH

VirginiaTech *Invent the Future*

Patron Partner

cps ENERGY

Coffee Break Partners

ABB

BASF We create chemistry

Session/Panel Partner

Booz | Allen | Hamilton

strategy and technology consultants

Magnet Partner

AMERICAN ELEMENTS THE MATERIALS SCIENCE COMPANY

Showcase Supporters

AV

CTC Concurrent Technologies Corporation

FLUENT

LM LOCAL MOTORS

Motion Battery

OSHKOSH DEFENSE

RICARDO

environmental control | security

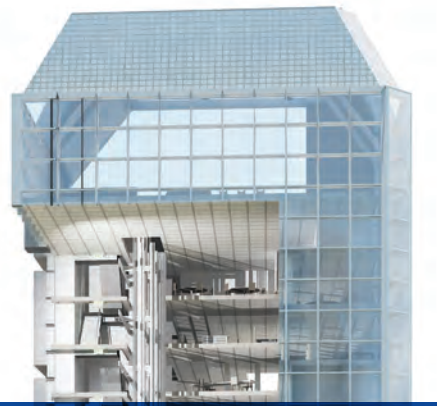
United Technologies Research Center

SIKORSKY

UTC BUILDING & INDUSTRIAL SYSTEMS
- OTIS
- UTC CLIMATE, CONTROLS & SECURITY

UTC PROPULSION & AEROSPACE SYSTEMS
- PRATT & WHITNEY
- UTC AEROSPACE SYSTEMS

UNITED TECHNOLOGIES RESEARCH CENTER



Innovative Integrated Technologies

United Technologies Research Center (UTRC) partners with United Technologies business units and external research organizations to develop and demonstrate innovative building technologies that improve building energy use, comfort, and security.

www.utrc.utc.com

2015 Summit Partners

Government Agency Partners

—U.S. Department of Defense Agencies—

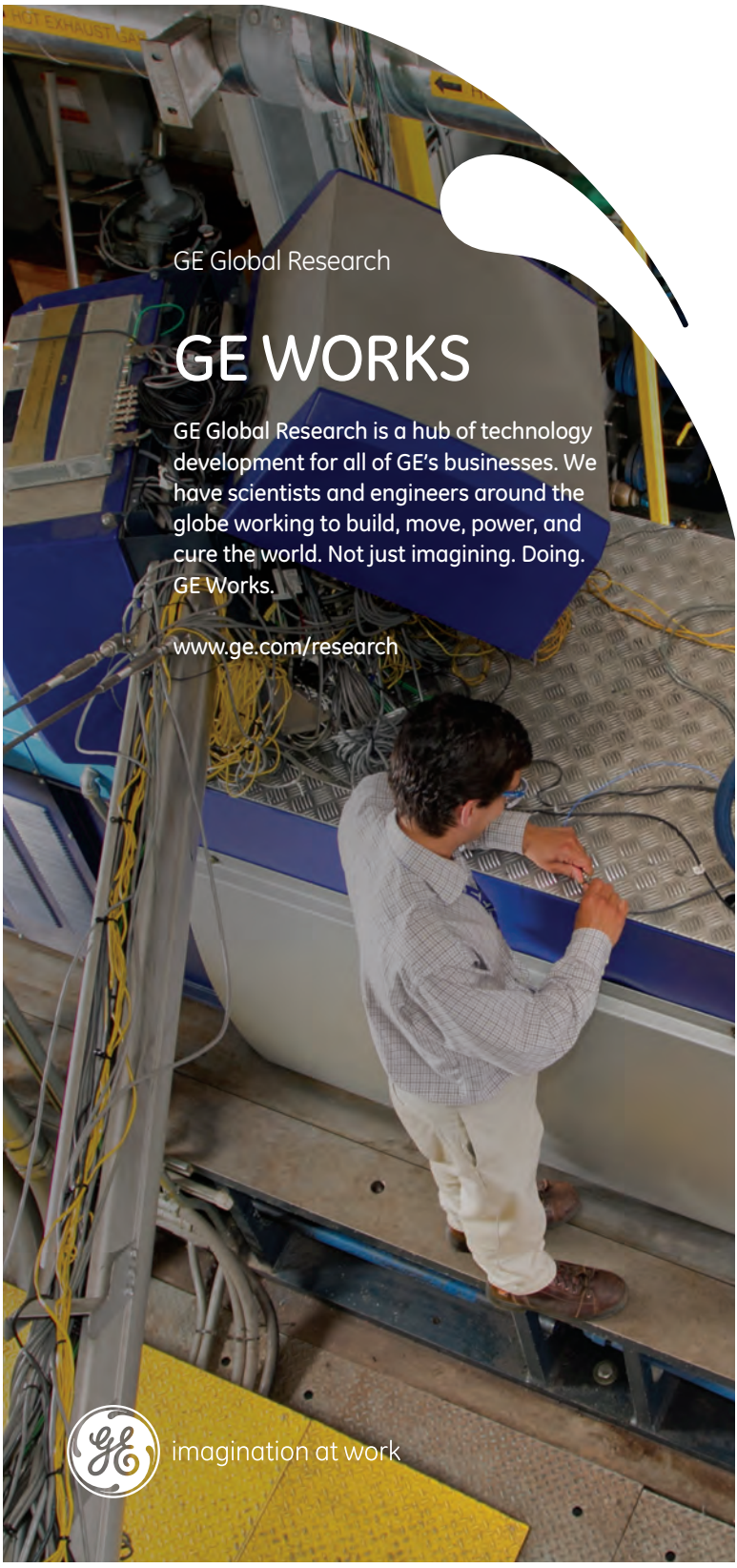
—U.S. Department of Energy Agencies—

—Other U.S. Federal Agencies—

Supporting Partners

Media Partners

Student Challenge Competition Partner



GE Global Research

GE WORKS

GE Global Research is a hub of technology development for all of GE's businesses. We have scientists and engineers around the globe working to build, move, power, and cure the world. Not just imagining. Doing. GE Works.

www.ge.com/research

imagination at work

PLATINUM PARTNER

BASF Corporation.....Booth 504

MOBILE APP & COFFEE BREAK PARTNER

www.basf.com

At BASF, we create chemistry – and have been doing so for 150 years. Our portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. As the world's leading chemical company, we combine economic success with environmental protection and social responsibility. Through science and innovation, we enable our customers in nearly every industry to meet the current and future needs of society. Our products and solutions contribute to conserving resources, ensuring nutrition and improving quality of life. We have summed up this contribution in our corporate purpose: We create chemistry for a sustainable future. BASF had sales of about $90 billion in 2013 and over 112,000 employees as of the end of the year.

GOLD PARTNERS

Bosch.....Booth 607

www.bosch.us

The Bosch Group is a leading global supplier of technology and services. In 2013, its roughly 281,000 associates generated sales of $53.5 Billion. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 360 subsidiaries and regional companies in some 50 countries. If its sales and service partners are included, then Bosch is represented in roughly 150 countries. This worldwide development, manufacturing, and sales network is the foundation for further growth. In 2013, the Bosch Group invested some $5.2 Billion in research and development and applied for approximately 5,000 patents. This is an average of 20 patents per day. The Bosch Group's products and services are designed to fascinate, and to improve the quality of life by providing solutions which are both innovative and beneficial.
In this way, the company offers technology worldwide that is "Invented for life."

Lockheed Martin .....Booth 302

www.lockheedmartin.com

Lockheed Martin is a global security and aerospace company that employs approximately 113,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. The Corporation's net sales for 2013 were $45.4 billion. Lockheed Martin takes a comprehensive approach to solving global energy and climate challenges, delivering solutions in the areas of energy efficiency, smart energy management, alternative power generation and climate monitoring. The company brings high-level capabilities in complex systems integration, project management, information technology, cyber security and advanced manufacturing techniques to help address these challenges. Today, Lockheed Martin is partnering with customers and investing talent in clean, secure and smart energy – enabling global security, a strong economic future and climate protection for future generations.

SIEMENS

Siemens AG.....Booth 702

www.siemens.com/energy

Siemens is a global powerhouse positioned along the electrification value chain – from power generation, transmission and distribution to smart grid solutions and the efficient application of electrical energy – as well as in the areas of medical imaging and in-vitro diagnostics. As of September 30, 2014, we had approximately 343,000 employees worldwide. Orders totaled €78.4 billion and revenue from continuing operations was €71.9 billion in fiscal 2014.

The Pew Charitable Trusts.....Booth 307

www.pewtrusts.org/cleanenergy

The Pew Charitable Trusts is driven by the power of knowledge to solve today's most challenging problems. Pew applies a rigorous, analytical approach to improve public policy, inform the public, and invigorate civic life. Pew's Clean Energy Business Network seeks to inform and engage clean energy business leaders on policy issues that affect the industry. For more information or to sign up for this free resource, visit pewtrusts.org/businessnetwork. Network members Go Electric, FreeWire Technologies, LuminAID, and NBD Nanotechnologies will join Pew during the ARPA-E Summit.

SILVER PARTNERS

Applied Materials, Inc.....Booth 511

www.appliedmaterials.com

Applied Materials, Inc. is the global leader in precision materials engineering solutions for the semiconductor, flat panel display and solar photovoltaic (PV) industries. Our technologies help make innovations like smartphones, flat screen TVs and solar panels more affordable and accessible to consumers and businesses around the world.

Chevron Technology Ventures

www.chevron.com/ctv/

Chevron Technology Ventures champions innovation, commercialization and integration of emerging technologies within Chevron.

GE Global Research

www.ge.com/research

GE Global Research is the hub of technology development for all of GE's businesses. Our scientists and engineers redefine possibilities, drive growth for our businesses, and find answers to some of the world's toughest problems. We innovate 24 hours a day, with sites in Niskayuna, New York; San Ramon, California; Bangalore, India; Shanghai, China; Munich, Germany; and Rio de Janeiro, Brazil. Visit GE Global Research at the web address above or our blog, www.edisonsdesk.com where researchers today discuss the technologies of tomorrow.

SolarReserve

LANYARD PARTNER

www.solarreserve.com

SolarReserve is a leading global developer of large-scale solar power projects and advanced solar thermal technology, with over $1.8 billion of projects in construction and operation. Proprietary molten salt power tower technology with integrated energy storage enables the company's solar thermal power plants to operate on-demand day and night, comparable to conventional power facilities but with zero emissions and no fuel costs. SolarReserve has assembled an extensive 5,000 MW worldwide development portfolio of large-scale solar projects. The company's diverse portfolio of solar power projects is comprised of advanced solar thermal technology (CSP), photovoltaic (PV) technology, and hybrid (combined CSP and PV) solutions that can deliver solar energy that is cost competitive with conventional energy sources, including projects that can provide reliable solar energy 24-hours per day.

United Technologies Research Center ..... Booth 604

www.utrc.utc.com

United Technologies (UTC) is a diversified company that provides a broad range of high-technology products and services to the global building systems and aerospace industries. The company also operates a central research organization, United Technologies Research Center (UTRC), that partners with the businesses to deliver the world's most advanced technologies, innovative thinking and disciplined research.

FUTURE ENERGY PITCHING SESSION PARTNER

Shell ..... Booth 606

www.shell.com

Shell is an energy and petrochemical company that ranks among the world's largest independent oil and gas companies. Its upstream business explores for and extracts crude oil and natural gas, while its downstream business refines, supplies, trades and ships crude worldwide; manufactures and markets a range of products; and produces petrochemicals for industrial customers. The company is actively engaged in the development of alternative energy and carbon capture and storage technologies. At Shell, we use human ingenuity, innovation and technology to unlock the energy our customers need to power their lives in the years ahead.

SIEMENS

Siemens Flex-Plants™ - a trusted partner for renewables

Fast, efficient and reliable Siemens Flex-Plant technology works in harmony with intermittent renewables to meet grid demand.

siemens.com

The continued growth of renewable energy generation puts power supply at nature's whim. The potential for rapid fluctuations in generation must be quickly balanced to maintain a reliable supply of power to the grid. With all of the flexibility and features of a peaker and the high efficiency of a combined cycle plant, proven Flex-Plants from Siemens work in harmony with renewables, providing efficient and reliable electricity when the wind stops blowing or the sun stops shining.

We also offer unique Clean-Ramp™ technology that integrates the operation of the combined cycle to keep your emissions in compliance while ramping up and down.

As you tackle the challenge of ensuring a reliable power supply while remaining committed to using natural resources responsibly, Siemens has the solutions that help you do both. The journey to a new kind of energy system needs all types of answers. Answers today, and answers that last.

BRONZE PARTNERS

American Gas Association (AGA)

www.aga.org

The American Gas Association, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 72 million residential, commercial, and industrial natural gas customers in the U.S., of which 94 percent — over 68 million customers — receive their gas from AGA members. AGA is an advocate for natural gas utility companies and their customers and provides a broad range of programs and services for member natural gas pipelines, marketers, gatherers, international natural gas companies and industry associates. Today, natural gas meets more than one-fourth of the United States' energy needs.

Bright Capital

www.bright-capital.com

Bright Capital is an independent venture capital firm that invests globally in a wide range of promising companies. It invests across multiple technologies in energy and resource efficiency, clean technology, and industrial biotech.

Bright Capital won the prestigious 2012 title as Cleantech Investor of the Year, a much watched annual award from the Cleantech Venture Group recognizing the investment company that made the greatest contribution to clean technology.

Working as a multi-corporate fund, Bright Capital employs merchant venturing approach to build bridges among the United States, Russia and the CIS, Europe, Middle East, and Southeast Asia. In addition to financial investments and managerial expertise, through its network of industrial businesses, Bright Capital provides its portfolio companies direct access to markets in Russia and the CIS. Bright Capital strategically co-invests with top-tier venture funds and corporate partners.

Exponent.....Booth 708

www.exponent.com

Exponent is a leading engineering and scientific consulting firm providing solutions to complex technical problems. We offer independent third party design consulting services through a network of 25 offices worldwide. Our services include aiding in scale up of manufacturing, providing expertise in areas outside of the research groups core expertise (for example, supporting plastic design for solar panels), conducting independent testing for research group's marketing claims such as supporting battery life and safety claims through testing and providing a resource for meeting time intensive deadlines associated with startup funding rounds.

MACCOR.....Booth 205

www.maccor.com

Maccor manufactures testing equipment for the battery and energy storage market (i.e. batteries, capacitors, fuel cells, etc.). Maccor Inc. was the pioneer, and is the world's largest commercial manufacturer for this type of equipment. More companies rely on Maccor everyday for their battery and cell test equipment needs. Today Maccor has thousands of systems in operation in more than 50 countries.

MDB Capital .....Booth 410

www.mdb.com

MDB Capital Group, LLC, is Wall Street's only IP-driven public venture bank, with over 15 years of experience launching disruptive technologies into the public markets. We maximize the value of disruptive technology companies by positioning them to attract growth capital, strengthening their IP portfolios to create sustainable competitive advantage, and connecting them with a base of high-quality investors with deep technology expertise. To support these efforts, we created PatentVest®, a fully-integrated analytic and reporting platform that measures, scores and ranks every patent and application in the United States Patent and Trademark Office (USPTO) database. Seeing value others do not - creating value others cannot.

TUESDAY LUNCH IN THE TECHNOLOGY SHOWCASE

ABB, Inc.

COFFEE BREAK PARTNER

www.abb.com

ABB is a leader in power and automation technologies that enable utility, industry, transport and infrastructure customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in roughly 100 countries and employs about 145,000 people.

TECHNOLOGY DEVELOPMENT PARTNERS

Argonne National Laboratory ..... Booth 711

www.anl.gov

Projects Include:
-SAE Fast Charging and PEV Emulator
-Remote Area Modular Monitoring (RAMM)
-Atomic Layer Deposition

Argonne is a multidisciplinary science and engineering research center, where "dream teams" of world-class researchers work alongside experts from industry, academia and other government laboratories to address vital national challenges in clean energy, environment, technology and national security. Through collaborations with researchers here at Argonne and around the world, we strive to discover new ways to develop energy innovations through science, create novel materials molecule-by-molecule, and gain a deeper understanding of our planet, our climate and the cosmos. Surrounded by the highest concentration of top-tier research organizations in the world, Argonne leverages its Chicago-area location to lead discovery and to power innovation in a wide range of core scientific capabilities, from high-energy physics and materials science to structural biology and advanced computer science.

Battelle ..... Booth 706

www.battelle.org

The people of Battelle apply science and technology to solving what matters most. Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers in the energy and environment, national security, and health and life sciences industries. Battelle delivers market-ready alternative energy solutions based on the latest scientific discoveries. Our broad expertise in related science and engineering disciplines and our management of several U.S. Department of Energy (DOE) national laboratories—including the National Renewable Energy Laboratory—has put us at the forefront of alternative energy innovation.

CalCharge ..... Booth 807

www.calcharge.org

CalCharge is a groundbreaking public-private partnership that creates a "center of gravity" for the California energy storage cluster. It connects innovators and market drivers to the experts and resources they need to accelerate the development, commercialization, and adoption of energy storage technologies for the consumer electronic, transportation, and grid markets. Through its programs, CalCharge enables the energy storage cluster to collaborate, identify barriers to emerging technology success, and develop solutions. The goal of CalCharge is a thriving California energy storage cluster, which is a key driver of industry and market growth globally.

Carnegie Mellon University
Scott Institute
for Energy Innovation

Carnegie Mellon University Scott Institute for Energy Innovation .....Booth 311

www.cmu.edu/energy

The Wilton E. Scott Institute for Energy Innovation at Carnegie Mellon University (CMU) is focused on using and delivering the energy we already have far more efficiently; expanding the mix of energy sources in a way that is clean, reliable, affordable and sustainable; and creating innovations in energy technologies, regulations and policies. CMU is uniquely suited for these challenges with our many research centers and longstanding faculty expertise in technology, policy, integrated systems and behavioral science. What makes us different is our ability to seamlessly combine these areas for maximum impact.

TECHNOLOGY CENTRE MONGSTAD

CO2 Technology Centre.....Booth 203

www.tcmda.com

Technology Centre Mongstad (TCM) is the world's largest and most advanced facility for testing and improving CO_2 capture. TCM is a joint venture set up by the Norwegian state (75.12 %), Statoil (20 %), Shell (2.44 %) and Sasol (2.44 %). It aims to increase knowledge on carbon capture technologies in order to reduce technical and financial risk, and accelerate the development of qualified technologies capable of wide scale international deployment. The center comprises two CO_2 capture plants each with a capacity to capture approximately 80,000 tons of CO_2 from the nearby refinery or 20,000 tons from a gas fired power plant. In addition the center has available space and infrastructure to sustain the next generation technologies to be tested in the future. We are in dialogue with a number of companies for testing at TCM after Shell Cansolv completes its test programme this year.

BERKELEY LAB | **cyclotron**road

Cyclotron Road.....Booth 505

cyclotronroad.lbl.gov

Projects Include:
-High-efficiency Industrial Separations
-Thermionic Energy Conversion
-Electrochemical Conversion of CO_2 to Fuel
-Ocean Wave Energy
-Biofuels and Materials
-Advanced Functional Materials

For decades, startups have been a home for researchers to aggressively drive technological innovations toward commercial impact. However, over the past five years, venture capital investment in early-stage energy technology startups has nearly disappeared. The reason: industrial-scale technologies carry significant technical risks, high capital requirements, and long timelines that are misaligned with the traditional VC funding model. Cyclotron Road is a new early-stage energy technology incubation program at Lawrence Berkeley National Laboratory, built to address this gap between academic research and industrial outcomes. At Cyclotron Road, project leads have access to tools and expertise at the national lab, and receive two years of salary and seed funding to support critical R&D for their project. Throughout the technology development process, the program provides focused technical and business mentorship, engagement with a network of potential commercialization partners, and interaction with a community of fellow entrepreneurs. Put together, Cyclotron Road aims to create the best environment for developing industrial energy technologies that can succeed in the marketplace.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Electric Power Research Institute (EPRI) ..... Booth 304

www.epri.com

The Electric Power Research Institute, Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, affordability, health, safety and the environment. EPRI also provides technology, policy and economic analyses to drive long-range research and development planning, and supports research in emerging technologies. EPRI's members represent approximately 90 percent of the electricity generated and delivered in the United States, and international participation extends to more than 30 countries. EPRI's principal offices and laboratories are located in Palo Alto, CA, Charlotte, NC, Knoxville, TN, and Lenox, MA.

LACI

Los Angeles Cleantech Incubator ..... Booth 902

www.laincubator.org

LACI is a nonprofit, public-private partnership that pursues public objectives by leveraging private sector expertise. Launched by the City of Los Angeles, LACI accelerates the development of cleantech start-ups by offering flexible office space, CEO coaching and mentoring, and access to a growing network of experts and capital.

LucidEnergy™

Lucid Energy ..... Booth 405

OREGON BEST BOOTH PARTNER

www.lucidenergy.com

Lucid Energy is a renewable energy and smart water technology company that enables municipal water agencies and water-intensive industrial and agricultural users to improve the economics and intelligence of delivering water.

MASSACHUSETTS CLEAN ENERGY CENTER

Massachusetts Clean Energy Center ..... Booth 509

www.masscec.com

The Massachusetts Clean Energy Center (MassCEC) is dedicated to accelerating the success of clean energy technologies, companies and projects in Massachusetts—while creating high-quality jobs and long-term economic growth for the people of Massachusetts. MassCEC provides early-stage investments to startup companies, funds renewable energy rebates for residents and businesses and supports the development of a local clean energy workforce. Since its inception in 2009, MassCEC has helped clean energy companies grow, supported municipal clean energy projects and invested in residential and commercial renewable energy installations creating a robust marketplace for innovative clean technology companies and service providers.

M3 Wave LLC ..... Booth 405

OREGON BEST BOOTH PARTNER

www.m3wave.com

M3 Wave LLC, a leader in submerged renewable energy systems, is field testing a submerged technology that converts ocean waves into electricity using a simple, economical, and reliable technology. Potential applications range from military surveillance and homeland security to island and coastal community power systems. The system harnesses the pressure wave under ocean swell while resting on the ocean floor protected from surface hazards. All power systems are inside protected dry chambers. Funded by U.S. DOE as well as state and private funding, the technology is at Technology Readiness Level 6 (TRL6) and is ready for extended duration pilot testing following a successful 2014 deployment in the Pacific Ocean. Levelized Cost of Energy approaches 15 cents (US) per kWh at utility scale deployments. The unique simplicity of the design enables unconventional deployment methods including air-dropping to facilitate rapid disaster response or quick-interdiction expeditionary force projection.

MTEK Energy Solutions

MTEK Energy Solutions ..... Booth 405

OREGON BEST BOOTH PARTNER

MTEK Energy Solutions was formed to develop and commercialize a novel desalination system, based on capacitive deionization technology (CDT) licensed from Oregon State University. Traditional desalination technologies require substantial operational scale, mandating large facilities for economically viable operation and requiring large sites typically adjacent to centralized electric power plants. Our CDT modules are designed to be deployed as field replacements for reverse osmosis (RO) technology utilized in large-scale plants with advantageous energy utilization and water productivity, while also addressing small-volume operations serving new markets not economically addressable by existing technologies. Smaller plants may be suited for agricultural use, low population density markets, developing nations lacking electric power infrastructure, as well as other specialized industrial treated-water applications. We are actively seeking venture investors and strategic partners to provide funding and to accelerate the development and market introduction of our proposed CDT desalination system.

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

National Institute of Standards and Technology (NIST) ... Booth 603

www.nist.gov

NIST's laboratories collaborate with U.S. Industry and universities to conduct measurement, standards, and technology research that advances the nation's R&D infrastructure. The overarching goal of the NIST laboratory programs is to accelerate U.S. innovation, which is a major driver of economic growth and job creation.

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

National Renewable Energy Laboratory ..... Booth 610

www.nrel.gov

NREL is the only federal laboratory dedicated to the research, development, commercialization, and deployment of renewable energy and energy efficiency technologies. We focus on creative answers to today's energy challenges. From breakthroughs in fundamental science to new clean technologies to integrated energy systems that power our lives, NREL researchers are transforming the way the nation and the world use energy.

New York State Energy Research and Development Authority (NYSERDA) ..... Booth 608

www.nyserda.ny.gov

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975. To learn more about NYSERDA's programs, visit nyserda.ny.gov or follow us on Twitter, Facebook, YouTube, or Instagram.

Oregon BEST ..... Booth 405

www.oregonbest.org

Projects Include:

-Renewable Energy and Smart Water Technology

-APEX Autonomous Air-deployable Submerged Ocean Power System (Sensor Class)

-Capacitive Deionization Technology

Oregon BEST is an independent, nonprofit state signature research center dedicated to transforming cleantech research ideas into green collar jobs, greater sustainability, and economic prosperity. We make targeted, strategic investments in technologies and teams positioned to have maximum impact on the world's biggest problems. We work in a unique role, providing leadership and leveraging our expertise, resources, and relationships to achieve impact beyond our scale.

Pacific Northwest National Laboratory ..... Booth 507

www.pnnl.gov

Projects Include:

-Power Grid Analytics

-Binding Organic Liquids

-Redox Flow Batteries

Pacific Northwest National Laboratory's (PNNL) mission is to transform the world through courageous discovery and innovation. Located in Richland, Washington, PNNL is one among ten U.S. Department of Energy (DOE) national laboratories managed by DOE's Office of Science. Our research strengthens the U.S. foundation for innovation and helps find solutions to the nation's toughest challenges for DOE, other government agencies, and industry. PNNL conducts ground breaking research on next generation clean energy technology. Research areas include battery chemistry, biofuels and biochemicals, grid-scale energy storage, processing of lightweight metals and alloys, soft and permanent magnets, fuel cells, HVAC technologies, power grid analytics and operation, distributed controls for grid and buildings, etc. PNNL has a history of encouraging innovation and is a leader among DOE laboratories in industrial engagement, building strong multi-disciplinary teams with the scientific and technical expertise to address complex challenges in energy and the environment. Building on a successful record of technology transfer and commercialization, PNNL offers a number of mechanisms for doing collaborative research with industrial and academic partners. PNNL is operated by Battelle Memorial Institute for the U.S. DOE.

PARC, A Xerox Company

www.parc.com

Projects Include:

-Low Cost Printed Thermoelectrics for Capture of Low Temperature Waste Heat

-Net Positive Energy Wastewater Treatment Technology

-Metamaterials-Enhanced Thermophotovoltaic System For High Efficiency Heat-To-Electricity Conversion

PARC is in The Business of Breakthroughs®. Our broad Energy Program comprises multidisciplinary energy projects spanning low-carbon generation, electricity storage, energy management and efficiency, and low-carbon transportation. We advance these fields by leveraging PARC's diverse set of core competencies. On the software side, our competencies include networking, internet of things, data analytics, model-based reasoning, ethnography, and security. Our hardware competencies include large-area electronics, optoelectronics and optical design, fluid dynamics, digital manufacturing, and functional printed objects. Operating under a proven open innovation model, we provide applied R&D, technology development, and commercial transition solutions to government agencies and clients ranging from startups to Fortune 500 companies. We discover and reduce to practice new approaches to long-standing challenges, develop comprehensive systems that balance competing requirements, and deliver technology solutions that can scale. Our clients reap the benefits of cross-fertilization across industries, technologies, cultures, and disciplines.

Sandia National Lab ..... Booth 810

www.sandia.gov

Projects Include:

-Advanced Materials for Energy and Cost-Efficient Large Scale Separations of Oxygen from Air

-Nano-Stabilized Enzymatic Membrane for CO_2 Capture

-Ionic Liquid Redox Flow Battery Prototyping

Sandia National Laboratories carries out research and development in national security, defense, energy, and homeland security. Sandia's mission is enabled through research staff working at the forefront of innovation, collaborative research with companies and universities, and discretionary research projects with significant impact. Our goal is to become the laboratory the nation turns to for innovative, science-based systems engineering solutions to the most challenging problems. We seek collaborative partnerships on emerging technologies that support our mission. Sandia is a government-owned/contractor operated (GOCO) facility managed by Sandia Corporation, a Lockheed Martin company, for the U.S. Department of Energy's National Nuclear Security Administration.

SLAC National Accelerator Laboratory ..... Booth 704

www.slac.stanford.edu

SLAC is a U.S. Department of Energy multipurpose national laboratory, that operates the world's first hard X-ray free-electron laser, generating light of unprecedented brilliance for capturing atomic-scale snapshots. We use synchrotron radiation to help design better pharmaceuticals, more efficient sources of energy and improved methods of energy storage and conversion.

SyracuseCoE.....Booth 609

www.syracusecoe.org

Projects Include:

-Flame-assisted Fuel Cell for CHP

-Solstice Power

SyracuseCoE is New York State's Center of Excellence in Environmental and Energy Systems. Led by Syracuse University, SyracuseCoE excels at development and commercialization of innovations for building efficiency, data centers, combined heat and power, energy conversion, and biofuels production. Our assets include more than $70 million in laboratories and testbeds and a global network of more than 200 collaborating firms and institutions. SyracuseCoE leads a federally funded initiative in Advanced Manufacturing in Thermal and Environmental Controls (AM-TEC), which focuses on strengthening a regional cluster of firms that manufacture systems and technologies for cryogenics, HVAC, process heating, filtration, lighting, and controls. Our AM-TEC initiative includes assistance for research and development, technology to market, manufacturing process improvement, increasing exports, workforce training, and local sourcing.

Texas A&M AgriLife Research .....Booth 407

agriliferesearch.tamu.edu

Texas A&M AgriLife Research is the state's premier research agency in agriculture, natural resources, and the life sciences. We conduct hundreds of projects spanning many scientific disciplines to deliver life-sustaining and industry-changing impacts to citizens throughout Texas and around the world.

University of Louisville Conn Center for Renewable Energy Research .....Booth 308

www.conncenter.org

Projects Include:

-High Performance Catalyst Technology for Sulfur Removal and Sulfur Tolerance

-High Temperature Adsorbents for CO_2 Capture

-Copper Based Inks for the Metallization of Silicon Solar Cells and Printed Electronics

Conn Center for Renewable Energy Research at the University of Louisville conducts and facilitates R&D on potentially commercializable renewable energy and energy efficiency technologies, including advanced energy materials, solar energy conversion, energy storage, biofuels/biomass conversions, and energy efficiency. The center fosters development of transformational concepts and accelerates translation from lab to pre-commercial scale to enhance global energy security, maintain US technological leadership, and improve high-tech manufacturing activity in Kentucky. The Center employs top-notch scientists and engineers to direct this research and enable collaborations with researchers and partners. The Center maintains unique, state-of-the-art facilities for scalable manufacturing R&D of advanced nanoscale materials, roll-to-roll manufacturing R&D for solar technologies, and lithium ion battery fabrication. The Center also hosts: pre-pilot scale processing tools for converting waste and biomass streams to fuels/chemicals; test facilities for solar photovoltaics, solar fuels, lithium ion batteries, and fuel cells; and materials characterization and ultrafast transient absorption spectroscopy facilities.

Virginia Tech.....Booth 209

www.vt.edu

Dedicated to its motto, Ut Prosim (That I May Serve), Virginia Tech takes a hands-on, engaging approach to education, preparing scholars to be leaders in their fields and communities. As the commonwealth's most comprehensive university and its leading research institution, Virginia Tech offers more than 240 undergraduate and graduate degree programs to 31,000 students and manages a research portfolio of $496 million. The university fulfills its land-grant mission of transforming knowledge to practice through technological leadership and by fueling economic growth and job creation locally, regionally, and across Virginia.

The university generated $496 million for research programs in fiscal year 2013, ranking 40th in the nation. Researchers pursue new discoveries in agriculture, biotechnology, information and communication technology, human health, transportation, energy, security, sustainability, and a wide range of other engineering, scientific, social science, and creative fields, leading to 36 patents and 17 license and option agreements in fiscal year 2013. Virginia Tech has facilities located across the commonwealth and the world - several locations in the Virginia Tech National Capital Region including the recently opened VT Research Center-Arlington; Hampton Roads Center, Virginia Beach, and Hampton Roads Center, Newport News; Virginia Tech Roanoke Center; and Virginia Tech Richmond Center.

PATRON PARTNER

CPS Energy

newsroom.cpsenergy.com

CPS Energy is the nation's largest municipally owned natural gas and electric company, providing service to 756,000 electric and 334,000 natural gas customers in the Greater San Antonio area. The company offers the lowest bills among the top 10 largest U.S. cities, while ranking number one in wind-energy capacity among municipally owned energy systems and number one in Texas for solar generation. For more information, visit newsroom.cpsenergy.com.

SESSION/PANEL PARTNER

Booz Allen Hamilton

www.boozallen.com

Booz Allen Hamilton has been at the forefront of strategy and technology consulting for nearly a century. Providing a broad range of services in strategy and organization, technology, operations, and analytics, Booz Allen is committed to delivering results that endure. To learn more, visit www.boozallen.com.

MAGNET PARTNER

American Elements

www.americanelements.com

American Elements is the world's largest materials science company with a catalogue of 12,000+ products including high purity chemicals and metals, semiconductors, nanoparticles and isotopes for high technologies such as battery and hydrogen storage, solar energy and automotive/aerospace. American Elements has manufacturing and research facilities in the U.S., Mexico, Europe and China.

SUPPORTING PARTNERS IN THE SHOWCASE

American Society of Mechanical Engineers (ASME).....Booth 803

go.asme.org/powerenergy

For more than 100 years, ASME has successfully enhanced performance and safety for the energy and piping industries worldwide through its renowned codes and standards, conformity-assessment programs, training courses, journals, and conferences – including the Offshore Technology Conference (OTC), the International Conference on Ocean, Offshore and Arctic Engineering (OMAE), the International Pipeline Conference (IPC), Turbo Expo, and Power & Energy.

BIO .....Booth 809

www.bio.org

The Biotechnology Industry Organization (BIO) represents more than 1,100 biotechnology companies, academic institutions, state biotechnology centers, and related organizations across the United States and in more than 30 other nations. BIO members are involved in the research and development of innovative healthcare, agricultural, industrial and environmental biotechnology products. BIO also produces the BIO International Convention, the world's largest gathering of the biotechnology industry.

NextEnergy .....Booth 733

www.nextenergy.org

Founded in 2002 as 501(c)(3) nonprofit organization in Detroit, MI, NextEnergy is one of the nation's leading accelerators of advanced energy technologies, businesses, and industries. NextEnergy drives technology demonstration and commercialization; delivers industry and venture development services; and provides an authoritative voice in the public sector. NextEnergy is funded in part by the Department of Energy through the National Incubator Initiative for Clean Energy program to support its NextChallenge, technology demonstration, and I-Corps Energy and Transportation programs. For more information, visit nextenergy.org.

SUPPORTING PARTNERS

ACORE - American Council on Renewable Energy
www.acore.org

Advanced Energy Economy (AEE)
www.aee.net

Alliance to Save Energy
www.ase.org

American Gas Association ..... Networking Event Partner
www.aga.org

Association for Women in Science ..... Networking Event Partner
www.awis.org

Bloomberg New Energy Finance
www.bnef.com

California Energy Commission
www.energy.ca.gov

Clean Edge, Inc
www.cleanedge.com

Collegiate Energy Association (CEA)
www.collegeenergy.org

Energy Storage Association (ESA) ..... Networking Event Partner
energystorage.org/

Environmental Entrepreneurs (E2)
www.e2.org

FAMU - EnergyWaterFood Nexus
www.famuenergywaterfoodnexus.org

Fuel Cell and Hydrogen Energy Association (FCHEA)
www.fchea.org

Information Technology and Innovation Foundation (ITIF)
www.itif.org

National Venture Capital Association ..... Networking Event Partner
www.nvca.org

NATTBatt International
www.NAATBatt.org

New England Clean Energy Council (NECEC)
www.necec.org

Research Triangle Cleantech Cluster (RTCC)
www.researchtrianglecleantech.org

SAE International
www.sae.org

Semiconductor Industry Association..... Networking Event Partner
www.semiconductors.org

Spark Clean Energy
STUDENT CHALLENGE COMPETITION PARTNER
www.sparkcleanenergy.org

SXSW Eco
www.sxsweco.com

MEDIA PARTNERS

greentechmedia:
Greentech Media
www.greentechmedia.com
Greentech Media (GTM) produces industry-leading news, research, and conferences in the business-to-business greentech market. Our coverage areas include solar, grid modernization, energy efficiency, wind, and other non-incumbent energy markets. GTM Research, the research arm of the company, produces competitive intelligence reports and data subscriptions. Using our extensive network and in-depth analysis, GTM hosts conferences for in-person networking and deal-making.

MIT Technology Review
MIT Technology Review
www.technologyreview.com
MIT Technology Review is leading the global conversation about technologies that matter. An independent media company owned by the Massachusetts Institute of Technology (MIT), the company produces publications read by millions of business leaders, innovators, thought leaders, and early adopters around the globe. MIT publishes in six languages and on a variety of digital and print platforms.

REAL CLEAR ENERGY
RealClearEnergy
www.realclearenergy.org
RealClearEnergy (RCE) is the information destination for today's best energy policy and news. As energy continues to be a driving national issue, RealClearEnergy is a tool for business leaders, energy policy makers, and environmentally concerned readers looking for up-to-the minute news. RCE is a vertical coverage area of RealClearPolitics. Founded in 2000 by John McIntyre and Tom Bevan, Chicago-based RealClearPolitics.com (RCP) is one of America's premier independent political web sites. Updated every morning and throughout the day, RCP publishes the best commentary, news, polling data, and links to important resources from all points of the political compass, covering all the important issues of the day.

SHOWCASE SUPPORTERS

AeroVironment .....Table 320
www.avinc.com

AeroVironment, a leader in electric vehicle (EV) charging and the preferred home charging solution supplier for five global automakers will present a series of demos featuring our latest charging solution, TurboDock™during the showcase. TurboDock is a next-generation EV charging station for commercial and workplace settings that is controlled through a smartphone app. Out of the box, TurboDock charges at Level 1 (16 Amps/120 Volts), or at Level 2 (16 Amps/240 Volts), which will recharge EVs on a typical commute in less than four hours, making TurboDock ideal for commercial and workplace environments.

CTC Vehicle-to-Grid (V2G) Demo .....Booth 705
www.ctc.com

In November of 2014, the Los Angeles Air Force Base in El Segundo, California replaced its entire general-purpose fleet with plug-in electric vehicles. The base's electric vehicle fleet consisting of 42 vehicles, including sedans, pick-up trucks and mini vans—of which 36 will be V2G-capable—is the largest operational vehicle-to-grid (V2G) demonstration in the world. Concurrent Technologies Corporation—a key partner on the project—is showcasing one of the electric vehicles and charging stations in the new fleet.

Fluent Visual

Fluent is a creative production group providing high caliber video, photography, graphics and animation services. They create all of the ARPA-E videos shown on the Summit main stage.

Local Motors "Strati" 3-D Printed Car.....Booth 249
www.localmotors.com

ARPA-E has teamed up with Local Motors on the Lightweighting Technologies Enabling Comprehensive Automotive Redesign (LITECAR) Challenge, which seeks innovative conceptual designs to lightweight a vehicle while maintaining or exceeding current U.S. automotive safety standards. Local Motors, a tech company based in Phoenix, Ariz., may have given us our first glimpse of the future of automobile manufacturing. The Strati, a two-seater is made of plastic components is a 3D-printed a car with the ability to accelerate up to 25 miles per hour. The car — which Local plans to sell later this year — takes about 44 hours to print, and is then outfitted with an electric car battery, motor and suspension. The Strati is the first of three vehicles Local Motors plans to sell and will retail between $18,000 and $30,000.

Motion Battery.....Booth 306

www.surfacetensionengine.com

Modern Communication Technology has patented the Motion Battery. The Motion Battery generates electricity proportional to the cube of it's velocity. When the electricity generated equals the electricity required to sustain motion infinite range is achieved. At higher velocities surplus energy is stored in the Motion Battery for use at home or business.

Oshkosh Defense® MTVR with ProPulse® OBVP Kit..... Booth 1049

www.oshkoshdefense.com

When Power Generation Must Be Highly Mobile and Rapidly Deployable.

The demand for expeditionary power has been answered. The Oshkosh Defense® MTVR with ProPulse® OBVP Kit charts new territory in mobile power generation, providing uncompromised performance capabilities for forward deployed Marines. Equipped with the Oshkosh® ProPulse diesel-electric drive train with exportable power, the MTVR with ProPulse OBVP kit can be utilized for mobile radar systems, mobile command centers and IED defeat – eliminating the need for additional support vehicles or trailered generators. The MTVR with ProPulse OBVP kit greatly expands the mobile power profile with a host of pioneering features. The kit provides 120 kilowatts of power when stationary and 21 kilowatts of power on the move. And it fully integrates with most MTVR variants including cargo configurations, retaining the conventional MTVR payload area, vehicle performance and fording capability. Oshkosh Defense delivers leading-edge tactical wheeled vehicles and life cycle sustainment services to military and security forces around the globe. For over 97 years, Oshkosh has designed, tested and manufactured a robust portfolio of heavy, medium, light and highly protected military vehicles and technologies to support our customers' missions.

GOVERNMENT AGENCY PARTNERS

Visit the following U.S. Government Agencies staffing an exhibit in the Technology Showcase.

★ U.S. Department of Defense Agencies ★

Air Force Energy Office (SAF/IEN) .....Booth 731

www.safie.hq.af.mil/energy

The Deputy Assistant Secretary of the Air Force (Energy) provides guidance, direction, and oversight of all matters related to energy, to reduce Air Force energy demand, increase Air Force energy supply, change Air Force energy culture, and make energy a consideration in all we do. In the area of technology, the office provides expertise and coordinates efforts led by the Air Force Research Lab (AFRL), Air Force Civil Engineer Center (AFCEC) and other offices.

Marine Corps Expeditionary Energy Office (E2O) .....Booth 729

www.hqmc.marines.mil/e2o

In 2009, the Commandant of the Marine Corps (CMC) created the USMC Expeditionary Energy Office (E2O) to "analyze, develop, and direct the Marine Corps' energy strategy in order to optimize expeditionary capabilities across all warfighting functions." E2O, a Director-level office within Headquarters Marine Corps reporting to the Assistant Commandant, works closely with the combat and technology development communities. E2O serves as the Proponent for Expeditionary Energy in the force development process. Additionally, E2O is tasked with advising the Marine Requirements Oversight Council on all energy and resource-related requirements, acquisitions, and programmatic decisions. And, in accordance with the National Defense Authorization Act for Fiscal Year 2009, the Secretary of the Navy assigned the E2O responsibilities as the Marine Corps Senior Official for Operational Energy.

Navy Energy.....Booth 830

http://greenfleet.dodlive.mil

Navy Energy programs are focused on enhancing energy security and sustainability, with the ultimate goal of increasing combat capability and resiliency for the warfighter. We value energy as a strategic resource and vital enabler of our mission. We need assured access to reliable energy sources to meet our operational, training, and installation needs. Through technology and best practices, energy efficiency can allow our forces to travel farther on a gallon of fuel, remain on station longer, and/or increase the intensity of operations when needed. Stop by our booth to learn about our energy programs and the revolutionary changes on the horizon.

U.S. Navy Military Sealift Command Operational Logistics (OPLOG) Energy Conservation (ENCON)

www.navsea.navy.mil

The Operational Logistics Integration (OPLOG) and Military Sealift Command (MSC) Energy Conservation (ENCON) team partners OPLOG's research and development capabilities with MSC's expertise in ship management and operation to reduce energy and fuel consumption onboard the Command's fleet.

Office of Naval Research (ONR)

www.onr.navy.mil

As an executive branch agency within the Department of Defense, the Office of Naval Research (ONR) supports the President's budget. ONR provides technical advice to the Chief of Naval Operations and the Secretary of the Navy. The guiding principles for the ONR Power and Energy Focus Area are contained in the "Department of the Navy's Energy Program for Security and Independence" and "A Navy Energy Vision for the 21st Century." To meet the energy challenges for the Department of Navy, ONR has partnered with the Department of Energy, Department of Agriculture and all Department of Defense Services to ensure innovative, state-of-the-art, science and technology (S&T) that rapidly transitions from laboratories to military end users. New systems with higher energy densities are being enabled through new material breakthroughs and innovative architectures specifically developed for the naval environment and mobility requirements.

Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OASD/OEPP)

http://energy.defense.gov

Established in 2010, the Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OASD/OEPP) was created to strengthen the energy security of U.S. military operations. The mission of the office is to help the military services and combatant commands improve military capabilities, cut costs, and lower operational and strategic risk through better energy accounting, planning, management, and innovation. Operational Energy, or the energy required to train, move, and sustain forces, weapons, and equipment for military operations, accounted for 75 percent of all energy used by the Department of Defense in 2012.

Special Operations Command-Tactical Assault Light Operator Suit (USSOCOM-TALOS) ..... Booth 832

www.socom.mil

USSOCOM sees technology advancing to the point where a vision to better protect and enhance the capabilities of SOF operators, like the Tactical Assault Light Operator Suit (TALOS), is realistic and achievable. A Joint Acquisition Task Force (JATF) comprised of SOF Operators, Acquisition Professionals and relevant Subject Matter Experts was established in 2013 to achieve this solution within a five year timeline, with the First Article Tactical Prototype planned for delivery in August 2018. JATF TALOS is comprised of nine functional areas, one of which focuses on the suit's required power and energy. The TALOS power supply must generate enough power to support the suit for the entire duration of a typical SOF mission profile. It must be self-contained, in a man-packable form factor, reliable, redundant and tactically feasible for operational employment.

Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) ..... Booth 828

www.serdp-estcp.org

The Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) are DoD's environmental research programs, harnessing the latest science and technology to improve DoD's environmental performance, reduce costs, and enhance mission capabilities. SERDP and ESTCP promote partnerships and collaboration among academia, industry, the military services, and other federal agencies. Both manage investments in five program areas, with each focusing on specific components of DoD's environmental responsibilities—Energy and Water, Environmental Restoration, Munitions Response, Resource Conservation and Climate Change, and Weapons Systems and Platforms. They are independent programs managed from a joint office to coordinate the full spectrum of efforts, from basic and applied research to field demonstration and validation. SERDP is DoD's environmental science and technology program, planned and executed in partnership with the DOE and EPA, with participation by numerous other federal and non-federal organizations. The Program focuses on cross-service requirements and pursues solutions to DoD's environmental challenges. ESTCP is DoD's environmental technology demonstration and validation program. The Program's goal is to identify and demonstrate innovative and cost-effective technologies and methods that address DoD's high-priority environmental requirements. Projects conduct demonstrations at DoD facilities in operational settings to document and validate performance and cost savings.

★ U.S. Department of Energy Agencies ★

Advanced Research Projects Agency-Energy (ARPA-E) ....Booth 629

www.arpa-e.energy.gov

The Advanced Research Projects Agency-Energy (ARPA-E) invests in disruptive ideas to create America's future energy technologies. ARPA-E focuses exclusively on early-stage technologies that could fundamentally change the way we generate, use, and store energy. ARPA-E invests in innovative ideas from academia, private industry, national labs, start-up companies, and small businesses—providing project teams with an average award of $2-3 million over several years. Every project team receives hands-on guidance to meet ambitious technical milestones that push the boundaries of energy innovation. ARPA-E's unique Technology-to-Market program also empowers project teams with business insight and strategies to accelerate the adoption of their potentially game-changing technologies. To date, ARPA-E has invested in over 400 energy technology projects across 20+ focused program areas. The Agency also issues periodic open funding solicitations to address the full range of energy-related technologies, as well as funding solicitations aimed at supporting America's small business innovators.

Energy Information Administration (EIA) .....Booth 827

www.eia.gov

The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. EIA is the nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. government. The agency conducts a comprehensive data collection program that covers the full spectrum of energy sources, end uses, and energy flows.

Energy Loan Programs Office (LPO)

www.energy.gov/lpo

The Department of Energy's Loan Programs Office (LPO) invests in the power of American innovation. LPO investments accelerate the deployment of innovative clean energy projects and advanced vehicle manufacturing facilities across the U.S. To date, LPO has supported a diverse portfolio of more than $30 billion in loans, loan guarantees, and commitments covering more than 30 projects across the U.S. These include some of the world's largest solar projects, and electric vehicle, wind, bioenergy, geothermal, and nuclear facilities. LPO is currently accepting applications under the Title XVII Innovative Clean Energy Projects loan guarantee program in response to three solicitations: up to $8 billion for Advanced Fossil Energy Projects, up to $4 billion for Renewable Energy and Efficient Energy Projects, and up to $12.5 billion for Advanced Nuclear Energy Projects. LPO also administers the Advanced Technology Vehicles Manufacturing loan program, which currently has more than $16 billion in available loan authority.

Office of Electricity Delivery and Energy Reliability (OE) ..... Booth 825

www.oe.energy.gov

The Office of Electricity Delivery and Energy Reliability (OE) provides national leadership to ensure that the Nation's energy delivery system is secure, resilient and reliable. OE works to develop new technologies to improve the infrastructure that brings electricity into our homes, offices, and factories, and the federal and state electricity policies and programs that shape electricity system planning and market operations. OE also works to bolster the resiliency of the electric grid and assists with restoration when major energy supply interruptions occur.

Office of Energy Efficiency and Renewable Energy (EERE) ..... Booth 829

www.eere.energy.gov

The Office of Energy Efficiency and Renewable Energy (EERE) is at the center of creating the clean energy economy today. EERE leads the U.S. Department of Energy's efforts to develop and deliver market-driven solutions for energy-saving homes, buildings, and manufacturing; sustainable transportation; and renewable electricity generation.

Office of Fossil Energy (FE) ..... Booth 930

www.energy.gov

The U.S. Department of Energy's Office of Fossil Energy plays a key role in helping the United States meet its continually growing need for secure, reasonably priced and environmentally sound fossil energy supplies. With Fossil Energy the Office of Clean Coal and Carbon Management is focused on developing and demonstrating advanced power generation and carbon capture, utilization and storage technologies for existing facilities and new fossil-fueled power plants by increasing overall system efficiencies and reducing capital costs. In the near-term, advanced technologies that increase the power generation efficiency for new plants and technologies to capture carbon dioxide (CO_2) from new and existing industrial and power-producing plants are being developed. In the longer term, the goal is to increase energy plant efficiencies and reduce both the energy and capital costs of CO_2 capture and storage from new, advanced coal plants and existing plants. These activities will help allow coal to remain a strategic fuel for the nation while enhancing environmental protection.

Office of Nuclear Energy (NE) ..... Booth 928

www.energy.gov/ne/office-nuclear-energy

The Office of Nuclear Energy's (NE) primary mission is to advance nuclear power as a resource capable of making major contributions in meeting our Nation's energy supply, environmental, and energy security needs. We seek to resolve technical, cost, safety, security and regulatory issues through research, development and demonstration. By focusing on the development of advanced nuclear technologies, NE supports the Administration's goals of providing domestic sources of secure energy, reducing greenhouse gases, and enhancing national security. NE serves present and future U.S. energy needs by developing critical technologies for the future and helping to train tomorrow's workforce. The benefits of nuclear power as a safe, carbon-free, reliable and secure source of energy make it an essential element in our Nation's energy and environmental future.

U.S. DEPARTMENT OF ENERGY | Office of Science

Office of Science (OS) ..... Booth 924

www.science.doe.gov

The Department of Energy's (DOE's) Office of Science is an indispensable pillar of America's leadership in science and technology. We are the nation's largest supporter of basic research in the physical sciences, the steward of ten national laboratories, and the lead federal agency supporting fundamental research for energy. We support over 25,000 researchers – scientists, engineers and students – at national laboratories and in more than 300 universities and institutions of higher learning in all 50 States and the District of Columbia. The Office of Science provides the world's largest array of scientific user facilities—major research infrastructure including supercomputers, large-scale x-ray light sources, neutron scattering sources, and sophisticated facilities for nanoscience and genomic sequencing—serving more than 29,000 researchers from universities, government laboratories, and industry each year. The Office of Science User Facilities are key to U.S. leadership in research and have enabled U.S. industry to achieve breakthroughs in areas ranging from drug discovery to the design of vehicles, aircraft, and jet engines. Over forty Fortune 500 companies and dozens of small businesses use the facilities each year.

★ Other U.S. Federal Agencies ★

Volpe

Department of Transportation/Volpe

www.dot.gov

For over 40 years, Volpe has helped the transportation community navigate its most challenging problems. As the National Transportation Systems Center, our mission is to improve transportation by anticipating and addressing emerging issues and advancing technical, operational, and institutional innovations across all modes. Part of the U.S. Department of Transportation, Volpe is a unique federal agency that is 100 percent funded by sponsor projects. We partner with public and private organizations to assess the needs of the transportation community, evaluate research and development endeavors, assist in the deployment of state-of-the-art transportation technologies, and inform decision and policy-making through our comprehensive analyses.

NASA

National Aeronautics and Space Administration (NASA) Goddard Space Flight Center ..... Booth 725

www.nasa.gov/centers/goddard

NASA's Goddard Space Flight Center is home to the nation's largest organization of combined scientists, engineers and technologists that build spacecraft, instruments and new technology to study the Earth, the sun, our solar system, and the universe. Goddard and its several facilities are critical in carrying out NASA's missions of space exploration and scientific discovery.

National Science Foundation (NSF)

www.nsf.gov

Since its creation over 60 years ago, the National Science Foundation (NSF) has profoundly impacted U.S. innovation by funding transformative, fundamental research in academia and ground-breaking, translational research in high-tech small businesses. NSF investments have led to advances ranging from nanotechnologies and chemical processes to sensor technologies and complex systems theory. NSF's commitment to support a wide range of fields and disciplines -- including those advancing sustainable, economical, and resilient energy systems -- helps secure long-term U.S. competitiveness and economic growth. Similarly, NSF's strong support for science, technology, engineering, and mathematics (STEM) education provides the nation with a globally competitive workforce. The NSF Directorate for Engineering supports frontier research and education across all fields of engineering. The Directorate also supports academic research with industrial partners through its centers programs, and it is home to NSF's two federal small business research programs: the Small Business Innovation Research (SBIR) program and the Small Business Technology Transfer (STTR) program. These investments advance innovation by leveraging findings from academic research and by building collaborations with the goal of commercializing new technologies.

SHOWCASE PARTICIPANTS

Accio Energy, Inc. ..... Booth 1133

Jennifer Baird
jbaird@accioenergy.com
www.accioenergy.com

Electrohydrodynamic Wind Energy for Low Cost Offshore Power Generation

Wind turbines are mature, but wind energy is ripe for innovation. Based on electrohydrodynamic charge separation principles, Accio Energy's wind systems can eliminate 50% of the cost of offshore wind power generation and have a 20% higher capacity factor. Without massive spinning blades, Accio's offshore system is visually unobtrusive and more easily enables a floating option that allows deep-water deployment. Leveraging high-volume, efficient automotive-heritage manufacturing to create modular panels from readily available materials, Accio's systems are shipped using standard container-based shipping methods to be assembled and installed in utility scale arrays. The next step is an offshore 10kW demonstration.

Aerojet-Rocketdyne ..... ARPA-E AWARDEE Booth 1114

Kenneth M. Sprouse
kenneth.sprouse@rocket.com
www.rocket.com/clean-fossil-energy-0

Rocket Engine Derived High Efficiency Turbomachinery for Electric Power Generation / Turbo-Pox for Ultra-Low Cost Gasoline

Aerojet-Rocketdyne is developing advanced turbine systems to improve the conversion of natural gas to liquid fuels and power. Their approach would partially oxidize natural gas in the high-temperature, high-pressure combustor of a natural gas turbine, facilitating its conversion into a liquid fuel. This approach could simultaneously improve the efficiency of gas conversion into fuels and chemicals, while generating electricity in the process.

AirGreen LLC ..... Booth 1239

Andrew Mongar
andrew@mongar.net
www.airgreenllc.com

Multi-Stage Liquid Desiccant Air Conditioning to Reduce Overall Cost and Improve IAQ

The new AirGreen technology provides a cost-effective solution to humidity control and indoor air quality in commercial buildings throughout the year. Replacing existing systems can save 60% of electrical energy in almost all climates, while supplying cleaned and sterilized outside air. Indoor humidity levels can be lowered in summer improving comfort levels and removing all condensate. Indoor humidity in winter can be raised while also recovering ventilation heat and moisture. Capital costs are reduced because the airflows required are lower, as are the energy requirements. The technology combines all air treatment in one low maintenance, long life, sustainable device.

Alcoa, Inc. ..... ARPA·E AWARDEE Booth 225

www.alcoa.com

Energy Efficient, High Productivity Aluminum Electrolytic Cell with Integrated Power Modulation and Heat Recovery

Alcoa will develop a highly advanced electrochemical system for low-cost and energy-efficient aluminum production. This advanced system will incorporate a high-cycle-life electrode that consumes less electricity while incorporating molten glass technology, which captures and reuses lost heat.

Allylix, Inc. ..... ARPA·E AWARDEE Booth 936

www.allylix.com

Renewable Platform for Production of Sesquiterpene Aviation Fuels & Fuel Additives from Biomass Feedstocks

The Allylix project team will develop energy-dense terpenes as high performance liquid aviation fuels. The increased energy density of these terpene-based fuels could outperform existing petroleum fuels by increasing flight range up to 20%.

Alveo Energy ..... ARPA·E AWARDEE Booth 717

www.alveoenergy.com

Open Framework Electrode Batteries for Cost-Effective Stationary Storage

Alveo Energy will develop a grid-scale storage battery using Prussian Blue dye as the basis for active material within the battery. Prussian Blue is inexpensive, readily available, and most commonly known for its application in blueprint documents. Alveo will repurpose this inexpensive dye for a new battery that can endure more charges under more extreme circumstances without suffering internal damage, helping to facilitate the adoption and deployment of renewable energy technologies.

Ames Laboratory ..... ARPA·E AWARDEE Booth 215

R. William McCallum
mccallum@ameslab.gov
www.ameslab.gov

Novel High Energy Permanent Magnet Without Critical Elements

Ames Laboratory and its team members will develop a new class of permanent magnets based on the element cerium. Cerium is four times more abundant than the critical rare earth element neodynium, which is used today in state-of-the-art magnet material. This project will test combining other metal elements with cerium to create a new, powerful magnet. A significant goal of this project is to develop a new magnet that has the high temperature stability required for electric vehicle motors. If successfully developed, this new magnetic material will ultimately be demonstrated in prototype electric motors.

APEI

APEI ..... ARPA·E ALUMNI **Booth 1221**

Ty McNutt
tmcnutt@apei.net
www.apei.net

Low-Cost, Highly-Integrated Silicon Carbide (SiC) Multichip Power Modules (MCPMs) for Plug-In Hybrid Electric Vehicles (PHEVs)

APEI is dedicated to the design, development, and manufacturing high performance electronic solutions that enable tomorrow's technology today. Through the use of cutting edge materials and creative thinking, APEI delivers product lines and engineering solutions that perform like no other, always innovating the impossible. Under an ARPA-E award, a transformational, highly-efficient, ultra-compact, and low-cost silicon carbide (SiC) PHEV charger that will have a disruptive impact on electrical power conversion technology was developed and integrated into a Toyota Prius for demonstration. Maximizing operational frequency and power density capability was achieved through integration of gate drivers into SiC-based low-parasitic multi-chip power module (MCPM) technology. The optimized >200 C capable power module (to be released in 2015 as an APEI product) and low loss operability of SiC power switch technology enabled a 10x increase in power density, making an ideal technology for size and weight sensitive platforms, such as HEVs.

Applied Materials, Inc.

Applied Materials, Inc. ..... ARPA·E AWARDEE **Booth 511**

Ajey M Joshi
ajey_m_joshi@amat.com
www.appliedmaterials.com

Kerfless Crystalline-Silicon PV: Gas to Modules

The goal of this project is to significantly improve the utilization of silicon material by manufacturing solar modules through a "kerf-less" wafer approach. This approach will employ a fully integrated value chain, from "gas to module", to produce high-efficiency, low-cost solar modules from thin epitaxial crystalline silicon films transferred from reusable substrates. These goals can best be achieved through the simultaneous optimization of each step in the value chain. Applied Materials - a leading supplier of tools for the solar, semiconductor, display, and other industries - is developing the tools and process for thin kerf-less silicon wafer preparation. Suniva – a leading cell/module manufacturer in the USA and the first firm to use ion implantation in production – is developing and optimizing processes for solar cells and modules using epi kerf-less wafers. Arizona State University is developing a hetero-junction process using thin epi substrates. The future commercialization of modules using this approach requires an ecosystem of key research, production equipment, material and cell/module manufacturing partners in a fully integrated solar module value chain, taking the manufacturing from "gas to module."

Arcadia Biosciences

Arcadia Biosciences ..... ARPA·E AWARDEE **Booth 1116**

www.arcadiabio.com

Vegetative Production of Oil in a C4 Crop

Arcadia Biosciences will modify a number of genes involved in oil biosynthesis to induce grasses to produce vegetable oil. Oil is one of the most energy dense forms of stored energy in plants, and it is a liquid that can be extracted readily, separated, and converted into biodiesel fuel. Arcadia's technology will yield biomass comprised of 20% oil and can be transferred into highly productive energy crops such as sorghum and switchgrass.

Architectural Applications ..... ARPA·E ALUMNI Booth 1127

John Breshears

www.architecturalapplications.com

AirFlow Panels – Ultra-Efficient Energy Recovery Ventilation Integrated Into the Building Envelope

AirFlowTM Panels are a disruptive, next generation approach to conditioning buildings, incorporating ultra-efficient energy recovery ventilation integrated into the building envelope. The product achieves superior air conditioning performance by virtue of its large-scale, and the panelized exchangers within the building enclosure simultaneously improve the wall insulation. The hybrid system leverages both HVAC and enclosure systems symbiotically to deliver 25-50% building energy savings with improved indoor air quality, enhanced control, and increased leasable floor area. The ARPA-E-funded technology has been demonstrated at full-scale at Lawrence Berkeley National Laboratory and ETH-Zurich BubbleZERO facility in Singapore.

Argonne National Laboratory ..... ARPA·E AWARDEE Booth 1115

www.anl.gov

Nanocomposite Exchange-Spring Magnets for Motor and Generator Applications

Argonne National Laboratory will create a new class of permanent magnets for electric motors for wind turbines and electric vehicles. This design contains a type of very small magnetic particles coated with a second type of magnetic film. The size of the particles is approximately 1,000 times smaller than the diameter of a human hair. Arraying these small coated magnetic particles in alignment has the potential to create a powerful exchange-spring magnet with reduced use of critical rare earth material. The ultimate goal of this project is to demonstrate this new type of exchange-spring magnet in a prototype electric motor.

Argonne National Laboratory ..... ARPA·E AWARDEE Poster 7

Theodore Krause

krauset@anl.gov

www.cse.anl.gov/ARPA-E/intermediate_temp_fuel_cell.htm

Intermediate Temperature Hybrid Fuel Cell System for the Conversion of Natural to Electricity and Liquid Fuels

This project will develop a new hybrid intermediate temperature (500°C) fuel cell technology that co-produces electricity and ethylene from natural gas. The hybrid system will consist of a proton-conducting solid oxide fuel cell with methane coupling and alkane dehydrogenation catalyst technologies integrated into the anode compartment of the fuel cell. Having the fuel cell consume the hydrogen as it is being produced by the methane coupling and alkane dehydrogenation reactions, allows both reactions to proceed to a higher conversion level at a lower temperature than is possible in the absence of consuming hydrogen. New coupling catalyst technology will be developed based on recently discovered Argonne catalyst technology for C-H bond activation that exhibits high reaction rates for dehydrogenation reactions at temperatures as low as 500°C without promoting coke formation which leads to catalyst deactivation. The development of new proton-conducting electrolytes with higher proton conductivity than currently available will also be pursued. One of the potential applications for this technology is the recovery of stranded shale gas where the fuel cell can be used to generate electricity for the mining operation while producing a product, such as ethylene, that can be more cost effectively transported to market than natural gas.

ASU Arizona State University

Arizona State University..... ARPA·E AWARDEE **Booth 839**

Cody Friesen
cody@zmlabs.org
www.asu.edu

Advanced Cells for Transportation via Integrated Vehicle Energy (ACTIVE)

Arizona State University (ASU) will develop an innovative, formable battery that can be incorporated as a structural element in the vehicle. Unlike today's batteries which require significant packaging and protection, ASU's non-volatile chemistry could better withstand collision because the battery would be more widely distributed throughout the vehicle. The chemistry minimizes conventional protection and controls while enabling it to store energy and provide structure, thus making vehicles lighter and safer.

ASU Arizona State University

Arizona State University..... ARPA·E AWARDEE **Booth 1215**

www.asu.edu

Diamond Power Transistors Enabled by Phosphorus Doped Diamond

Arizona State University (ASU) will develop a method to produce low-cost, vertical diamond semiconductor devices for use in high-power electronics. Diamond is an excellent conductor of electricity when boron or phosphorus are added, or doped, into its crystal structures. In fact, diamond can withstand much higher temperatures with higher performance levels than silicon, which is widely used in today's semiconductors. However, growing uniformly doped diamond crystals is expensive, and it is difficult to grow them in multiple layers while maintaining the structure necessary for semiconductor devices. ASU's innovative diamond-growing process could create greater doping uniformity, enable improved electrical contacts, and help lower the cost of diamond semiconductors.

ASU Arizona State University

Arizona State University..... ARPA·E AWARDEE **Booth 639**

www.asu.edu

Energy Efficient Electrochemical Capture and Release of Carbon Dioxide

Arizona State University (ASU) will develop an innovative electro-chemical technology for the capture of carbon dioxide coming from power plants. ASU's technology aims to cut both the energy use and the cost, in half, compared to current methods.

ASU Arizona State University

Arizona State University..... ARPA·E AWARDEE **Booth 416**

faculty.engineering.asu.edu/holman

PV Mirror: A Solar Concentrator Mirror Incorporating PV Cells

Arizona State University will develop a curved mirror made of solar cells to collect both direct and diffuse sunlight for conversion to electricity and heat. While today's concentrating solar systems cannot use diffuse sunlight that has been scattered by the atmosphere, this system will simultaneously convert diffuse sunlight and some direct sunlight into electricity in solar cells while reflecting the unused portion of the direct sunlight for conversion to heat. This design can provide a low-cost way to utilize the diffuse portion of the solar spectrum.

Arizona State University..... Booth 339

www.vasileska4.wix.com/focus

High-Temperature InGaN Thermionic Topping Cells

We are developing a solar cell that can maintain efficient operation at temperatures above 400°C for application in next generation hybrid CPV/CSP solar systems that generate both electricity and dispatchable heat at the same time. The technology is based on high bandgap InGaN materials similar to those used in the LED industry.

ARZEDA Corp..... Booth 923

www.arzeda.com

Design of Metalloenzymes for Methane Activation

Arzeda will leverage computational algorithms to engineer proteins for the creation of new synthetic enzymes to activate methane, the first step in producing a liquid fuel from natural gas. These completely new enzymes could transform the way methane is activated and will be more efficient than current chemical and biological approaches. If successful, Arzeda's technology could efficiently activate methane for cost-effective fuel production, and it could also be applied in a variety of other synthesis processes for fuels and chemicals.

AVEtec Energy Corporation..... Booth 1131

Brian Monrad
bmonrad@vortexengine.ca
www.avetecenergy.com

Atmospheric Vortex Engine (AVE)

AVEtec Energy Corporation mimics nature to produce renewable energy cheaper than coal. Here's how: A tornado is a natural power house that's made of warm air and runs on warm air with no other moving parts. It is also a virtual chimney that helps to cool the planet, and the draft of that virtual chimney is an awesome source of power. Our AVE AERO uses freely available natural or industrial sources of low-temperature heat to create and control an artificial tornado that functions like a virtual chimney. The vortex is created by feeding warm air tangentially into an open-roofed arena. Power and robustness will scale up exponentially with size, creating a draft that will move vast quantities of air at extremely low cost, making this a disruptive technology for the air handling, cooling and power generation industries. At full scale, turbines installed at ground level in the intake draft will generate dispatchable clean electricity at half the cost of fossil fueled plants.

Avogy, Inc..... Booth 442

Isik Kizilyalli
i.kizilyalli@avogy.com
www.avogy.com

Vertical GaN Transistors on Bulk GaN Substrates

Avogy will develop a vertical gallium nitride (GaN) transistor that can conduct significantly more electricity and is 30 times smaller than a conventional silicon transistor. With such a small device, Avogy could achieve functional cost parity with current technologies within three years while offering significant performance improvements. If successful, Avogy's transistors will enable smaller, more reliable, energy-efficient, and cost-effective high-power converters, electrical motor drives, and photovoltaic and wind inverters.

Baldor Electric Company ..... ARPA·E AWARDEE ..... Booth 748

Gregory Sawicki
greg.sawicki@baldor.abb.com
www.baldor.com

Rare-Earth-Free Traction Motor for Electric Vehicle Applications

Baldor and partners will develop a new type of electric motor with the potential to efficiently power a next generation class of electric vehicles. Unlike today's electric vehicle motors which use expensive, imported rare earth magnets, in this project, the team will develop a motor that uses no rare earth materials, but is light, compact, and has the potential to deliver more power than today's vehicle motors at a substantially lower cost. Key innovations in this project include the use of an innovative motor design, incorporation of a unique cooling system, and the development of advanced materials manufacturing techniques that if successful has the potential to substantially reduce the costs of an electric motor's rotating components.

BASF Corporation ..... ARPA·E AWARDEE ..... Booth 1213

www.basf.com

High Performance NiMH Alloy For Next-Generation Batteries

BASF will develop metal hydride alloys using new, low cost metals for use in high-energy nickel-metal hydride (NiMH) batteries. Conventional water-based NiMH batteries use rare earth metals and have a limited capacity that results in decreased driving range. BASF's rare earth-free components could offer both lower cost and improved capacity while maintaining many of the traditional characteristics of NiMH batteries, including simple design, low volume, and long service life.

Beacon Power, LLC ..... ARPA·E AWARDEE ..... Booth 317

Richard Hockney
hockney@beaconpower.com
www.beaconpower.com

Development of a 100 kWh/100 kW Flywheel Energy Storage Module

Beacon Power will lead a team in developing a next generation flywheel energy-storage technology. In a flywheel system, electricity is stored as kinetic energy in a spinning wheel. The proposed flywheel could store four times more energy than current flywheels at 1/8th the cost. It employs a radically new "flying ring" design that is capable of accepting and delivering energy over 40,000 times during its 20-year lifetime. The proposed technology is ideal for simultaneously addressing both the renewable ramping challenge and other grid-storage applications.

Bettergy Corp. ..... ARPA·E AWARDEE ..... Booth 718

www.bettergy.com

Low-Cost Solid-State Battery for EV Applications

Bettergy will develop an inexpensive battery that uses a novel combination of solid, non-flammable materials to yield an energy density suitable for modern electric vehicles. Today's electric vehicle batteries require costly materials and expensive safety architectures. In contrast to today's electric vehicle battery chemistry, Bettergy's alternative will use low-cost energy storage materials combined with non-flammable components to produce batteries with comparable energy density, but enhanced strength and robustness.

BlackPak Inc. ..... ARPA·E AWARDEE **Booth 816**

www.blackpaktech.com

Container-Less Natural Gas Storage

BlackPak is developing an adsorbed natural gas storage technology based on ultra-microporous carbon materials. Key targeted features include conformability to shape, low total system cost inclusive of associated fill and flow pumps, high cycle lifetime, and robust performance under operation with commercial pipeline natural gas.

BlazeTech Corp. ..... ARPA·E AWARDEE **Booth 912**

www.blazetech.com

Hyperspectral Imaging for the Identification of Light Metals

BlazeTech will develop an advanced sorting technology that uses the reflection from a specialized lamp to distinguish multiple grades of light metal scrap. Current light metal sorting technologies are inefficient and costly because they cannot distinguish between different types of alloys. If successful, BlazeTech's sorting technique will enable the recycling of typically discarded light metal scrap. This advanced reflection recycling process could reduce the energy consumption, carbon dioxide emissions, and costs associated with manufacturing light metal components.

Bosch ..... ARPA·E AWARDEE **Booth 518**

www.bosch.us

Advanced Battery Management System

Bosch will develop battery monitoring and control software to improve the energy utilization, reliability, and charge rate of electric vehicle batteries. Bosch's advanced battery management system will leverage breakthroughs in real-time modeling of the battery's internal environment.

Brookhaven National Laboratory ..... ARPA·E AWARDEE **Booth 837**

Qiang Li

qiangli@bnl.gov

www.bnl.gov

Superconducting Wires for Direct-Drive Wind Generators

In this project, Brookhaven National Laboratory and partner American Superconductor will develop a new, low-cost superconducting wire that can be used in future advanced wind turbine generators. All electricity generators contain coils of wire (often made of copper) that conduct electricity. A "superconducting" wire can transport hundreds of times more electric current than a similarly-sized copper wire, and has the potential to make a wind turbine generator lighter, more powerful, and more efficient. However, the use of superconducting wire traditionally has been too expensive to use in wind generators. In this project, the team will develop a high-performance superconducting wire that can handle significantly more electrical current, and will demonstrate an advanced manufacturing process that if successful, has the potential to yield a several-fold reduction in wire costs. These breakthroughs in superconducting wire manufacturing process technologies have the potential to make these advanced wind generators practical for widespread deployment.

Brown University ..... ARPA·E AWARDEE **Booth 243**

Alice Fawzi
alice.fawzi@gmail.com
www.brown.edu

Marine Hydrokinetic Energy Harvesting Using Cyber-Physical Systems

Brown University will develop an oscillating underwater wing to capture energy from flowing water in rivers and tidal basins. The wing would be coupled with adaptive control software to maximize power production. Brown's design could reduce the cost of producing electricity from flowing water.

California Institute of Technology ..... ARPA·E AWARDEE **Booth 342**

Michael Enescu
enescu@alumni.caltech.edu
www.caltech.edu

Scalable Real-Time Decentralized Volt/VAR Control

The California Institute of Technology (Caltech) will develop scalable, real-time, decentralized methods for power control to achieve system-wide efficiency, stability, reliability, and power quality in the presence of uncertain renewable generation. The distributed control architecture will allow each of the end nodes to effectively manage their own power, while at the same time optimizing overall power flow within the grid. This will enable an interconnected system with millions of active energy applications, such as distributed wind and solar power units.

California Institute of Technology ..... ARPA·E AWARDEE **Booth 716**

www.caltech.edu

Optics for Full Spectrum, Ultrahigh Efficiency Solar Energy Conversion

The California Institute of Technology (CalTech) will develop an optical device that focuses and splits sunlight into individual color bands to improve the efficiency of solar electricity generation. Once light is separated into colors, CalTech's tailored solar cells match each separated color band to dramatically improve the overall efficiency of solar energy conversion.

Calysta, Inc. ..... ARPA·E AWARDEE **Booth 736**

www.calysta.com

Novel Bioreactor Designs Based on High Mass Transfer Chemical Reactors for Methanotroph Fermentation

Calysta and Celanese will develop new bioreactors to enable efficient biological conversion of methane into liquid fuels. Unlike current technologies, Calysta's new bioreactor designs facilitate the delivery of methane to the biocatalyst for rapid fermentation of methane to transportation fuel. If successful, Calysta's technology would enable low-cost conversion of natural gas at remote sources, while reducing energy inputs associated with liquid fuel production.

Carnegie Mellon University ..... ARPA·E AWARDEE Booth 426

www.cmu.edu

Nanocomposite Magnet Technology for High Frequency MW-Scale Power Converters

Carnegie Mellon University's Materials Science and Engineering Department in partnership with Los Alamos National Laboratory developed a 100 kW high power density DC-AC converter based on nanoscale magnetic materials. The prototype targets direct connection to a medium voltage grid, eliminating the need for a step up transformer. High frequency switching reduces size and weight and lowers balance of system costs.

Case Western Reserve University ..... ARPA·E AWARDEE Booth 937

www.case.edu

Transformation Enabled Nitride Magnets Absent Rare Earths (TEN Mare)

Case Western University and its team members will use micro-alloying (small amounts of metal additions) added to iron-nitride alloys to maximize its magnetic properties, potentially exceeding the magnetic properties of industrially important rare earth magnets. This new alloy modification will provide stability to a specific iron-nitride structure with phenomenal magnetic properties, potentially achieving the "holy grail" of magnets. This magnet could have the highest energy density made entirely from earth abundant raw materials. If successful in this high-risk, high-reward effort, the ultimate goal of the project is to demonstrate this new magnet system, which contains no rare earths, in a prototype electric motor.

Case Western Reserve University ..... ARPA·E AWARDEE Booth 1026

www.case.edu

Novel Titanium Electrowinning Process Using Specialized Segmented Diaphragms

Case Western Reserve University is developing a single-step process to produce titanium from titanium salts using a multi-membrane electrochemical reactor. The thin, non-polar membrane technology prevents undesirable chemical reactions, enabling simpler conversion of titanium salts to titanium sponge. Conventional titanium production methods are costly and energy intensive, limiting the widespread use of titanium, a versatile and durable structural metal. Case Western's single-step titanium production process will require one-third of the energy at a fraction of the cost, compared to conventional production methods.

Case Western Reserve University ..... ARPA·E AWARDEE Booth 241

www.case.edu

High Energy Storage Capacity Low-Cost Iron Flow Battery

Case Western Reserve University will develop a water-based, all-iron flow battery for grid-scale energy storage at low cost. Flow batteries store chemical energy in external tanks instead of within the battery container. Using iron provides a low-cost, safe solution for energy storage because iron is both abundant and non-toxic. If successful, this technology would surpass the DOE 2015 cost targets for stationary energy storage and facilitate the adoption and deployment of renewable energy technology.

Ceramatec, Inc. ARPA·E AWARDEE **Booth 332**

www.ceramatec.com

Intermediate Temperature Proton Conducting Fuel Cells for Transportation Applications

Ceramatec will develop a solid-state fuel cell that operates at temperature ranges similar to internal combustion engines. Ceramatec's design would allow for low-cost materials and catalysts that demonstrate high performance without the need for expensive components. The project would engineer a fuel cell stack that performs at lower cost than current automotive designs.

Ceramatec, Inc. ARPA·E AWARDEE **Booth 330**

Feng Zhao
fzhao@ceramatec.com
www.ceramatec.com

Advanced, Hybrid Planar Lithium/Sulfur Batteries

Ceramatec will develop a non-porous, high-conductivity ceramic membrane for lithium-sulfur batteries to minimize self-discharge, provide mechanical integrity, and extend battery life. Current porous separators contain liquids that negatively impact cycle life and have a low abuse tolerance. Ceramatec will demonstrate its innovative, low-cost, non-porous membrane with a prototype lithium-sulfur battery that also contains advanced electrolytes developed for this system.

Ceramatec, Inc. ARPA·E AWARDEE **Booth 328**

Dolly Chitta
chittadolly@gmail.com
www.ceramatec.com

Natural Gas to Chemicals via Reactive Separation

Ceramatec, Inc. will develop a small-scale membrane reactor to convert natural gas into transportable liquids in one step. Many remote oil wells burn natural gas as a by-product because it is not economical to store or transport. Such natural gas contains energy that equals 20% of annual U.S. electricity production (5 quadrillion BTUs worldwide). Capturing this energy would reduce both waste and greenhouse gas emissions and could be deployed in remote areas to convert otherwise wasted gas into usable chemicals that can be transported to market.

CERC at University of South Florida ARPA·E AWARDEE **Booth 915**

Prof. Yogi Goswami
goswami@usf.edu
www.usf.edu

Development of a Low-Cost Thermal Energy Storage System Using Phase-Change Materials with Enhanced Radiation Heat Transfer

The University of South Florida team will develop low cost industrially scalable high temperature phase change materials (PCMs) for thermal energy storage (TES) system. An innovative electroless encapsulation technique will be used to enhance the heat transfer to overcome the low thermal conductivity of common PCMs. The proposed research will result in the development of an innovative high temperature and smaller footprint TES system at a low cost representing almost a 75% reduction in the cost of TES.

Chromatin Inc. ..... ARPA·E AWARDEE **Booth 436**

www.chromatininc.com

Plant-Based Sesquiterpene Biofuels

Chromatin will lead a team to engineer sorghum, a plant that requires less water than most crops, to accumulate the fuel molecule farnesene. Genes from microbes and other plants will be incorporated into sorghum to allow the plant to produce up to 13% of its biomass as farnesene.

CIEE-UC Berkeley & Power Standards Lab ..... ARPA·E AWARDEE **Booth 842**

Alex McEachern
Alex@PowerStandards.com
www.berkeley.edu

Micro-Synchrophasors for Distribution Systems

The California Institute for Energy and Environment (CIEE) will develop a device to monitor and measure electric power data from the grid's distribution system. Data collected from a network of these devices would provide new capabilities to monitor and control grid power flow, a critical element for integrating intermittent and renewable resources such as rooftop solar and wind energy. If widely deployed, these devices could also enhance grid reliability.

Citrine Informatics ..... **Booth 1129**

Gregory Mulholland
greg@citrine.io
www.citrine.io

Data Aggregation and Machine Learning to Accelerate Energy Materials Development

Citrine uses large-scale data aggregation and machine learning to accelerate the path of advanced materials from early lab tests to scale-up and manufacturing, in areas ranging from batteries to aerospace alloys to photovoltaics. Citrine is tackling one of the greatest scientific challenges of today: How to replace the traditional decades-long materials R&D pipeline with "materials on demand" that have desired performance, cost, and supply chain characteristics. Instead of operating traditional laboratories and manufacturing facilities, Citrine uses data and computation to radically accelerate the pace of progress in the materials industry.

Cloteam, LLC ..... ARPA·E AWARDEE **Poster 6**

Novel, Low-Cost, and Safe Electric Vehicle Battery

Cloteam LLC will develop an innovative system to join and package batteries using a wide range of battery chemistries. Unlike today's battery pack design, Cloteam's design enables flexible placement of battery packs to absorb and manage the impact energy from a collision. Cloteam's batteries could provide greater energy density compared to today's lithium-ion batteries, while reducing the costs associated with materials and processing.

Cogenra Solar, Inc. — ARPA·E AWARDEE — Booth 1018

www.cogenra.com

Double-Focus Hybrid Solar Energy System with Full Spectrum Utilization

Cogenra Solar will develop a hybrid solar converter with a specialized light-filtering mirror that splits sunlight by wavelength, allowing a low-cost converter to integrate both efficient solar cells and a separate, high-temperature heat-storage component for on-demand conversion to electricity. The system would also capture waste heat from the solar cells, providing additional gains from the sun's energy. This hybrid converter could be used to provide inexpensive solar power from both centralized and distributed locations.

Colorado School of Mines — ARPA·E AWARDEE — Poster 10

Neal Sullivan
nsulliva@mines.edu
www.mines.edu

Low-Cost Intermediate-Temperature Fuel-Flexible Protonic-Ceramic Fuel Cell and Stack

The Colorado School of Mines (CSM) will develop a mixed proton and oxygen ion conducting electrolyte that allows a fuel cell to operate at temperatures less than 500°C, which is a departure from today's ceramic fuel cells. Additionally, the team will leverage a recently developed ceramic processing technique that decreases fuel cell manufacturing cost and complexity by reducing the number of manufacturing steps from 15 to 3 to provide low-cost power for distributed generation applications.

Colorado State University — ARPA·E AWARDEE — Booth 338

www.colostate.edu

Synthetic Gene Circuits to Enhance Production of Transgenic Bioenergy Crops

Researchers from Colorado State University are developing a system to rapidly introduce new genetic traits into crops that currently cannot be engineered. If successful, this technology would widen the variety of plants that could be improved for biofuel production.

Columbia University — ARPA·E AWARDEE — Booth 14

Scott Banta
sbanta@columbia.edu
www.columbia.edu

Co-Generation of Fuels During Copper Bioleaching

Sulfide minerals comprise more than 10^15 kg of the Earth's crust and are used by microbes as a primary energy source and by the mining industry as a source for non-ferrous metals (biomining). These reduced minerals are an attractive source of energy for liquid fuels production. We have recently genetically modified these microbes for fuel production. The overall goal of this project is to explore the feasibility of using genetically engineered organisms in the biomining process for the co-generation of fuels.

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

Columbia University ..... ARPA·E AWARDEE Booth 438

www.bioee.ee.columbia.edu

Vertical GaN Power Transistors Using Controlled Spalling for Substrate Heterogeneity

Columbia University will create vertical gallium nitride (GaN) devices using a technique called spalling, a method to transfer entire GaN devices to alternate substrates or bases. Columbia will spall entire fabricated transistors from GaN wafers to lower-cost silicon substrates. Columbia will also interconnect the supporting silicon substrates, enabling small-scale integration of its GaN devices.

Cornell University

Cornell University ..... Booth 450

Genggeng Qi

www.cornell.edu

High-efficiency CO_2 Sorbents Lowering Carbon Capture Energy Penalty Over 30 Percent

To address the challenges of current carbon capture technologies including high energy penalty, capital and operation cost, we have developed a technology based on CO_2 adsorption that allows fast, highly selective carbon capture from different industrial sources even direct air capture at low energy penalty and recovery of high purity CO_2 up to food grade at low temperatures (<120 degree). By commercializing our technology through the pilot production of our high-efficiency sorbents, our target market includes chemical, energy industries and small scale carbon capture and utilization such as gas production and biofuel industry.

Cornell University

Cornell University ..... ARPA·E AWARDEE Booth 538

Kenneth Birman

ken@cs.cornell.edu

www.cs.cornell.edu/Projects/Gridcontrol

GridControl: A Software Platform to Support the Smart Grid

Cornell University will create software that will reduce the time and difficulties required to prototype and demonstrate new smart-grid control methods. The project will enable cloud computing capabilities that are more responsive, secure, and accurate for grid control.

CREE

Cree, Inc. ..... ARPA·E AWARDEE Booth 318

www.cree.com

Agile Direct Grid Connect Medium Voltage 4.7-13.8 kV Power Converter for PV Applications Utilizing Wide Band Gap Devices

Cree, Inc. and subcontractors VACON and Advanced Energy will develop a high power conversion device capable of taking utility-scale solar power and outputting it directly to the electric utility grid at a much higher voltage. The developed technology will replace the large power transformers that are currently necessary with a very compact, lightweight single device. This will result in cost reductions in large solar utility projects, and will enable a wider adoption of PV generating plants.

Cree, Inc. ..... ARPA·E AWARDEE Booth 318

David Grider
david_grider@cree.com
www.cree.com

15 kV SiC IGBT Power Modules for Grid-Scale Power Conversion

The purpose of this project is to demonstrate advanced transistor based electrical substations that can help make the electrical grid more flexible and controllable. These novel substations will be enabled by record high voltage (15-20kV) transistors using Silicon Carbide (SiC). The advanced transistors enable the replacement of today's heavy (8000lb) transformers used for electricity distribution, with much smaller, suit-case size (100lbs) electronic transformers.

CUNY Energy Institute ..... ARPA·E AWARDEE Booth 351

Damon Turney
dturney@ccny.cuny.edu
www.cuny.edu/site/energy.html

Low-Cost Grid-Scale Electrical Storage Using a Flow-Assisted Rechargeable Zinc-Manganese Dioxide Battery

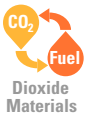
In this project, the CUNY Energy Institute, in partnership with Rechargeable Battery Corporation (RBC) and the Ultralife Corporation, will develop a novel battery that radically transforms the chemistry and low-cost materials found in disposable consumer-grade alkaline batteries into a long-lasting, fully-rechargeable energy storage system. While CUNY has already demonstrated some of the basic scientific principles, work in this high-risk project will achieve a rechargeable attery system that lasts for over ten years, costs under $100/kWh, demonstrating potential for use on the electricity grid.

Dais Analytic Corporation..... ARPA·E AWARDEE Booth 1048

Brian Johnson
brian.johnson@daisanalytic.com
www.daisanalytic.com

Membrane Dehumidification Enabling Alternative Cooling Strategies in Humid Environments

Dais has designed a way to revolutionize the HVAC industry using its patented polymer membrane, which allows water vapor but not air to pass through it. Two sheets of membrane are welded to a plastic "slat" and a vacuum pump is used to evacuate the region between the two membranes. When the plenum pressure is pulled below the vapor pressure of the air passing along the outside of the membrane, water vapor is transferred through the membrane, effectively dehumidifying the incoming air stream. Whereas the traditional air conditioning cycle dehumidifies air as a byproduct of the cooling process, our system can effectively control the humidity independently of the temperature.



Dioxide Materials ..... ARPA·E AWARDEE Booth 526

www.dioxidematerials.com

Energy Efficient Electrochemical Conversion of Carbon Dioxide into Useful Products

Dioxide Materials will develop a technology to produce transportation fuels and industrial chemicals electrochemically from carbon dioxide emitted by power plants. Dioxide Material's approach would improve conversion efficiency and reduce energy input that would cut costs, greenhouse gas emissions, and reduce U.S. dependence on foreign oil.

DNV GL ..... ARPA·E AWARDEE Booth 814

www.dnv.com

Sensor-Enhanced and Model-Validated Batteries for Energy Storage

Det Norske Veritas will develop a gas monitoring system to provide early warning signals when a battery is operating in stressful conditions and at risk of premature failure. As batteries degrade, they emit measurable quantities of gas that can be mapped over the battery's lifetime. This detection method will optimize performance and help repurpose batteries for other applications.

Donald Danforth Plant Science Center..... ARPA·E AWARDEE Booth 643

Dr. Toni Kutchan
tmkutchan@danforthcenter.org
www.danforthcenter.org

Field Trials of Enhanced Camelina

The team led by the Donald Danforth Plant Science Center is developing a highly-engineered variety of the oilseed crop Camelina that is designed to produce enough fuel per acre to compete successfully with other fuel sources. Several previously-characterized modifications are being incorporated into a single Camelina variety. These modifications include improvements in fuel energy density and content. Field trials are being conducted at several Midwest and Northern Plain locations. At the end of this commercially-focused project, a superior variety of Camelina, dedicated specifically to fuel production, is expected to be ready for licensing/commercialization.

EaglePicher™
Technologies, LLC
An OM Group Company

EaglePicher Technologies, LLC ..... ARPA·E AWARDEE Booth 819

www.eaglepicher.com

Planar Sodium-Beta Batteries for Renewable Integration and Grid Applications

EaglePicher Technologies originally teamed with Pacific Northwest National Laboratory to develop a next-generation sodium-beta battery. Due to the project success, the current follow-on project will advance scalability, improve cost performance and provide a domestic source for a competitive grid scale energy storage technology.

Eaton ..... ARPA-E AWARDEE Booth 1017

www.eaton.com

Predictive Battery Management for Commercial Hybrid Vehicles

Eaton Corporation is developing a power control system to optimize the operation of commercial-scale hybrid electric vehicles. Eaton's innovative approach reduces the size of the battery needed for operating large hybrid electric vehicles with no loss in battery life or vehicle performance, enabling a more cost-effective solution for commercial vehicles.

Eaton ..... ARPA-E AWARDEE Booth 1015

www.eaton.com

Highly Efficient, Near-Isothermal Liquid-Piston Compressor for Low Cost At-Home Natural Gas Refueling

Eaton Corporation will develop a natural gas refueling system that will use a liquid, which acts as a piston, to compress natural gas. Eaton will engineer a heat-transfer material that controls the temperature during compression and improves efficiency. This liquid compression system will eliminate the need for costly high-pressure piston seals that are used in conventional gas compression.

EcoCatalytic Technologies ..... ARPA-E AWARDEE Booth 1034

John A. Sofranko
jasofranko@ecocatalytic.com
www.ecocatalytic.com

Advanced Catalytic Olefin Production via Chemical Looping ODH Technology

This novel oxidative dehydrogenation (ODH) chemical looping process will significantly reduce GHG gas release from, and cost of the production of ethylene and propylene. The ODH process is a net exporter of energy and uses air rather than oxygen for the highly selective conversion. Research at the bench scale has demonstrated single pass ethylene yields in excess of 70%. Scoping economic evaluations show a 4-5 ¢/lb cost advantage over conventional steam cracking. Chemical looping ODH employs high through-put circulating fluid bed reactors, greatly reducing the number of reactor trains in the plant. Olefin production is the largest emitter of CO_2 and NOx in the organic chemical industry. With worldwide ethylene production at ~4,500 MT/yr, the industry emits 4,500-9,000 MT/yr. of CO_2 and roughly 1.4 MT/yr of NOx. Projects located in severe EPA non-attainment zones are challenged by the increased costs of NOx control. Reducing the total GHG emission profile is critical for the permitting of industry expansions. The ODH of ethane and propane to olefins via chemical looping offers a production route that can significantly reduce CO_2 emission and virtually eliminate NOx emission from world-scale plants.

Electron Energy Corporation ..... ARPA-E AWARDEE Booth 316

www.electronenergy.com

Solid State Processing of Fully Dense Anisotropic Nanocomposite Magnets

Electron Energy Corporation and collaborators are developing a technology to manufacture permanent magnets that are both stronger and lower cost than those available today, based on a friction consolidation extrusion process. If successful, this technology would have a transformative impact on motors, sensors, actuators industries and eliminate the critical dependence on foreign raw material supply chain.

Energy Research Company ..... ARPA-E AWARDEE Booth 217

Robert De Saro
rdesaro@er-co.com
www.er-co.com

Development of an Integrated Minimill for the Aluminum Industry: From Scrap to Product in One Step

Energy Research Company (ERCo, Plainfield, NJ), wTe Corporation (Bedford, MA), and Materials Strategies LLC (MS LLC, West Boylston, MA) are developing an Aluminum Integrated Minimill (AIM) that will transform and revitalize the aluminum processing landscape in the U.S. AIM will use 100% mixed aluminum scrap as the input to produce a specification cast product in a single facility using an integrated process that only requires a single melt. The advantages of AIM over current methods of aluminum recycling are:

- It uses low-value mixed-scrap as the feedstock, retaining a U.S. resource that now is going to foreign markets such as China and India
- It reduces the energy use from scrap-to-product by 84%, saving the aluminum recycling industry 9.8 billion kWh yearly
- It reduces carbon dioxide emissions industry-wide by 2.7 million tonnes/year
- It saves the U.S. aluminum recycling industry $1.1 billion yearly through a combination of energy savings, increased metal yield, and use of lower-cost materials

Energy to Power Solutions (E2P) ..... ARPA-E AWARDEE Booth 419

www.e2pco.com

Novel, Low-Cost, High-Field Conductor for Superconducting Magnetic Energy Storage

E2P is developing a grid-scale device that stores energy in a high-power, superconducting coil using an innovative high current density superconducting cable. This innovative cable enables an increase in magnetic field strength by optimizing cable design features when connected to a power source. This approach would enable higher power storage densities that decrease cost and overall size of the system.

EnZinc Inc. ..... ARPA·E AWARDEE Booth 719

Michael F. Burz
mburz@enzinc.com
www.enzinc.com

Rechargeable Dendrite-Free 3D Zinc Sponge Anode

EnZinc, in collaboration with the U.S. Naval Research Laboratory, will develop a low-cost energy storage using 3D zinc-based technology. Currently, zinc batteries are low power and offer a limited cycle life. EnZinc/NRL's porous, sponge-like zinc component prevents battery failure and enables high-power charge and discharge. Successful testing has demonstrated EnZinc/NRL's zinc-based technology could reduce electric vehicle battery cost by more than half.

Fairfield Crystal Technology ..... ARPA·E AWARDEE Booth 430

www.fairfieldcrystal.com

High-Quality, Low-Cost GaN Single Crystal Substrates for High-Power Devices

Fairfield Crystal Technology will develop a new technique to speed up the growth of gallium nitride (GaN) single-crystal boules. A boule is a large crystal cut into wafers and polished to provide a surface, or substrate, suitable for semiconductor device manufacturing. Fairfield Crystal Technology's unique technology can grow superior quality GaN crystal boules rapidly.

FINsix ..... Booth 1228

Bryan McGowan
bmcgowan@finsix.com
www.finsix.com

VHF Power Conversion

FINsix is commercializing a revolutionary power conversion technology that is ten times smaller and one thousand times faster than existing solutions. Originally developed at MIT, this technology has potential applications in consumer electronics, lighting, transportation and many other fields. The first product to demonstrate this technology is a 65 watt laptop adapter called the Dart. It is intended to replace bulky power bricks that come with today's computers and is approximately five times smaller.

Ford Motor Company ..... ARPA·E AWARDEE Booth 713

www.ford.com/technology

High-Precision Tester for Automotive and Stationary Batteries

Ford Motor Company, Arbin Instruments and Sandia National Lab will develop a high-precision battery testing device to improve battery-life forecasting and validation. Extremely precise measurements sampled by the device will reduce the time and expense required in the research, development, and qualification testing of new automotive and stationary batteries.

Ford Motor Company ..... ARPA·E AWARDEE Booth 715

www.ford.com

Covalent and Metal-Organic Framework High-Capacity

Ford Motor Company is developing high capacity natural gas storage at low pressure utilizing novel adsorbent nanoporous materials which has the potential to significantly lower the cost of on-board storage tanks and off-board fueling compression, as well as facilitate conformable tanks.

FuelCell Energy ..... ARPA·E AWARDEE Booth 1242

Carl Willman
willman@fce.com
www.fuelcellenergy.com

Dual Mode Intermediate Temperature Fuel Cell: Liquid Fuels and Electricity

FuelCell Energy will develop an intermediate-temperature fuel cell that will directly convert methane to methanol and other liquid fuels using advanced metal catalysts. These catalysts will be optimized to improve the yield and selectivity of the methane-to-methanol reaction. In addition, a new reactive spray deposition technique will be employed to manufacture the cell in a continuous process. The combination of these advanced catalysts and advanced manufacturing techniques will reduce overall system-level costs.

Gas Technology Institute ..... ARPA·E AWARDEE Booth 615

www.gastechnology.org

Hybrid Solar System

Gas Technology Institute will develop a hybrid solar converter that bounces sunlight off a mirror into a solar cell that converts most visible wavelengths of light to electricity while reflecting other wavelengths to heat a stream of flowing particles. This double-mirror design is optimized to capture as much of the energy in sunlight as possible. The team's ultra-high-efficiency converter could be used to provide solar electricity and simultaneously collect solar heat near a centralized point of use, such as in industrial parks or shopping centers.

Gas Technology Institute ..... ARPA·E AWARDEE Booth 615

www.gastechnology.org

Dual Electrolyte Extraction Electro-Refinery for Light Metal Production

Gas Technology Institute (GTI) will develop a new electrochemical process that uses abundant, domestic ores to produce aluminum powder at near room temperature. Current domestic aluminum smelters use expensive foreign-sourced ore to produce aluminum, and operate at high temperatures with a significant amount of thermal energy loss. GTI's unique electrochemical process will require less energy and produce fewer carbon dioxide emissions than conventional smelters.

Gas Technology Institute ..... ARPA·E ALUMNI Booth 615

www.gastechnology.org

Nano-Valved Adsorbents for CH4 Storage

The Gas Technology Institute will develop a unique low-pressure natural gas storage tank for light-duty vehicles using a thin tailored shell to dramatically increase storage capacity while driving down cost. GTI's innovative shell contains valves that can be opened and closed on demand to allow for vehicle refueling, driving, or storage.

Gas Technology Institute ..... ARPA·E AWARDEE Booth 615

www.gastechnology.org

Methane to Methanol Fuel: A Low Temperature Process

The Gas Technology Institute (GTI) will develop a new process to convert natural gas into methanol and hydrogen. Current methods to produce liquid fuels from natural gas require large and expensive facilities that use significant amounts of energy. GTI's process uses metal oxide catalysts that are continuously regenerated in a reactor, similar to a battery. This process operates at room temperature, is more energy efficient, and less capital-intensive than existing methods.

General Electric ..... ARPA·E AWARDEE Booth 537

www.ge.com

High Energy Density Flow Battery for EV Storage

General Electric (GE) will develop an innovative high-energy chemistry for a water-based flow battery. Current flow batteries are generally low-energy density and only used for stationary energy storage. If successful, GE's new chemistry could enable the use of flow batteries in electric vehicles and improve driving range, cost, and reliability.

General Electric ..... ARPA·E AWARDEE Booth 537

Dr. Aaron Knobloch
Knobloch@research.ge.com
www.geglobalresearch.com

Control Enabling Solutions with Ultrathin Strain and Temperature Sensor System for Reduced Battery Life Cycle Cost

GE Global Research will develop thin-film sensors that enable real-time, two-dimensional mapping of temperature and surface pressure for each cell within a battery pack. These new sensors will provide higher resolution compared to today's thermal sensors, improving internal battery measurement capabilities and lowering the cost of electric vehicles.

General Electric ..... ARPA·E AWARDEE **Booth 537**

Chiranjeev Kalra
kalra@ge.com
www.geglobalresearch.com

Electrothermal Energy Storage with a Multiphase Transcritical CO_2 Cycle

GE will design and test components of a unique gas turbine that is driven by high-temperature, high-pressure carbon dioxide. The carbon dioxide expands to low pressure and extremely cold temperatures to generate electricity from stored electrical and heat energy. The dramatic change in temperature and pressure is necessitated by an innovative design that prevents thermal losses across the turbine. This grid-scale energy storage system could be coupled to a hybrid solar converter to deliver solar electricity on demand.

General Electric ..... ARPA·E AWARDEE **Booth 537**

Rob Sellick, Ph.D.
Rob.Sellick@ge.com
www.geglobalresearch.com

Resilient Multi-Terminal HVDC Networks with High-Voltage High-Frequency Electronics

Some advanced transmission technologies require expensive power conversion stations to interface with the grid. GE Global Research will collaborate with North Carolina State University (NCSU) and Rensselaer Polytechnic Institute (RPI) to develop a prototype transmission technology that incorporates an advanced semiconductor material, silicon carbide. This prototype will operate at a high voltage level appropriate for the grid. It will decrease the cost and complexity of advanced transmission systems as well as improve efficiency.

General Electric ..... ARPA·E AWARDEE **Booth 537**

Timothy J Sommerer
timothy.sommerer@ge.com
www.geglobalresearch.com

High-Voltage, High-Power Gas Tube Technology for HVDC Transmission

GE Global Research will develop a new electrical power switching technology for high voltage transmission lines. Currently, electricity is routed using silicon-based switches that require multiple devices to function at high voltages. GE will develop a robust, gas-based switch that could reduce the cost of transmission infrastructure, improve grid reliability, and facilitate renewable technology deployment.

Georgia Institute of Technology ..... ARPA·E AWARDEE **Booth 427**

www.ece.gatech.edu/research/labs/aces/pages/home.html

Prosumer-Based Distributed Autonomous Cyber-Physical Architecture for Ultra-Reliable Green Electricity Networks

Georgia Tech will develop and demonstrate an internet-like, autonomous control architecture for the electric power grid. The architecture has distributed intelligence, autonomously coordinating control within a network that includes energy production units, storage units, and consumers (homes, buildings, microgrids, utility systems). It will reduce constraints on grid control and enable massive penetration of distributed energy resources.

Georgia Institute of Technology ..... ARPA·E AWARDEE Poster 16

Meilin Liu
meilin.liu@mse.gatech.edu
www.fcbt.mse.gatech.edu/liu.htm

A Novel Intermediate-Temperature Fuel Cell Tailored for Efficient Utilization of Methane

Georgia Tech Research Corporation will develop a fuel cell that operates at temperatures less than 500°C by integrating nanostructured materials into all cell components. The Georgia Tech team will fabricate electrodes to directly process methane and develop nanocomposite electrolytes to reduce cell temperature without sacrificing system performance. These advances will enable an efficient, intermediate-temperature fuel cell for distributed generation applications.

Georgia Institute of Technology ..... ARPA·E AWARDEE Booth 418

sov.gatech.edu

Power Generation Using Anchored, Buoyancy-Induced Columnar Vortices: The Solar Vortex (SoV)

The Georgia Institute of Technology (Georgia Tech) will develop a method to capture energy from wind vortices that harvest the thin layer of hot air along the ground created by the sun. "Dust devils" are a random and intermittent example of this phenomenon in nature. If successful, Georgia Tech's approach is expected to cost 25% less than conventional wind and 60% less than traditional solar power.

Georgia Institute of Technology ..... ARPA·E AWARDEE Booth 1141

www.gatech.edu

High-Efficiency Solar Fuels Reactor Concept

The Georgia Institute of Technology (Georgia Tech) is developing the infrastructural components and system design for a high temperature concentrated solar power plant based on liquid metal thermal storage. The technology will allow for dispatchable electricity production from solar energy at a cost competitive with fossil fuels. The group is also developing a high-efficiency solar reactor to produce fuel. Using liquid metal, the reactor transports heat away from the sunlight-collection point to a chemical reaction zone, minimizing the loss of heat.

Georgia Institute of Technology ..... ARPA·E AWARDEE Booth 938

www.gatech.edu

Ultra High-Performance Supercapacitor by Using Tailor-Made Molecular Spacer Grafted Graphene

The Georgia Institute of Technology (Georgia Tech) will develop a supercapacitor using graphene, a two-dimensional sheet of carbon atoms, to store energy at ten times greater density than current technologies. Supercapacitors store energy in a manner similar to a battery, yet can charge and discharge much more rapidly. The Georgia Tech team will improve the internal structure of graphene sheets to store more energy at lower cost.

Georgia Tech Research Corporation ..... ARPA·E AWARDEE **Booth 1214**

Srinivas Garimella
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www.stsl.gatech.edu

Microscale Absorption Heat Pump ECUs for Naval Applications

A miniaturized thermally activated absorption heat pump driven by waste heat from a diesel engine generator set is being developed for naval expeditionary Environmental Control Units (ECUs). The proposed technology capitalizes on several-fold heat and mass transfer enhancements possible in micro-scale passages to provide a compact architecture for components and the overall system. The compact design, integrating several components into a monolithic assembly, reduces fluid inventories significantly over conventional systems. The technology is inherently modular and can be scaled readily from cooling capacities of 100 Watts to tens of kW. Quiet, reliable, vibration resistant, long-life operation due to the absence of a compressor and the use of few moving parts are further critical distinguishing advantages. The project team has already built and demonstrated similar miniaturized absorption heat pumps of smaller and larger capacities in related projects. The compact, packaged ECU will deliver 0.75 RT of cooling at an ambient temperature of 125 °F. This technology can also be readily used for gas-fired residential space cooling and heating and water heating, integrated cooling, heating and power systems, solar driven heat pumps, and automotive and long haul refrigerated transport trucks.

Glint Photonics, Inc. ..... ARPA·E AWARDEE **Booth 1216**

Peter Kozodoy
peter@glintphotonics.com
www.glintphotonics.com

Self-Tracking Concentrator Photovoltaics

Glint will develop a solar concentrator that can capture the full amount of available sunlight regardless of the sun's position. Unlike today's technology, this concentrator does not require complex moving parts to track the sun's movements. Glint's inexpensive design uses an automatic optical system of fluid layers that adjust their positions in response to solar heat.

GreenLight Biosciences ..... ARPA·E AWARDEE **Booth 1139**

William Blake
wblake@glbiosciences.com
www.glbiosciences.com

Highly Productive Cell-Free Bioconversion of Methane

GreenLight Biosciences will develop a cell-free bioreactor that can convert large quantities of methane to fuel in one step. This technology integrates the rapid conversion rate of chemical catalysis into a single-step bioconversion process that does not use living cells. If successful, it could enable mobile fermenters to access remote sources of natural gas for low-cost conversion of natural gas to liquid fuel.

Grid Logic Inc. ..... ARPA·E AWARDEE Booth 1040

George Caravias
info@grid-logic.com
www.grid-logic.com

Development of a New Generation High-Temperature Superconducting Composite Conductor Delivered at $20/(kA m) with Low AC Loss

Grid Logic will develop a low-cost and innovative superconducting wire for electric utility applications. Using a new manufacturing technique, Grid Logic will embed very fine superconducting particles in a combination of metals to induce superconductivity. Such a wire would reduce the cost of transmission lines, motors for wind turbines, and other electric devices.

Halotechnics, Inc. ..... ARPA·E ALUMNI Booth 341

www.halotechnics.com

Advanced Molten Glass for Heat Transfer and Thermal Energy Storage

Halotechnics will develop a high temperature thermal storage system utilizing a new low cost, earth abundant, and low melting point molten glass as the heat transfer and thermal storage material. This new material will enable unprecedented efficiency with thermal energy storage and has the potential to reduce costs by a factor of ten when developed and deployed at commercial scale. Halotechnics will optimize the material in order to develop a complete system to pump, heat, store, and discharge the molten glass. If successful, this technology will enable low cost and efficient thermal energy storage for concentrating solar and nuclear power applications.

Harvard University ..... ARPA·E AWARDEE Booth 637

www.wyss.harvard.edu

Novel Slippery Coatings for Extreme Energy-Savings Associated with Frost Reduction in the Refrigeration Industry

Harvard University will develop robust, cost-effective coatings for commercial and residential refrigeration equipment that may reduce the need for defrost cycles. This ice-phobic coating may reduce the energy used in active and passive defrost cycles by up to 40%. Similar energy savings may also be possible if the coatings are used in air conditioners and heat pumps.

Harvard University ..... ARPA·E AWARDEE Booth 1118

Michael J. Aziz Ph.D.
maziz@harvard.edu
www.seas.harvard.edu/news-events/press-releases/greener-storage-for-green-energy

Small Organic Molecule Based Flow Battery for Grid Storage

Harvard University will develop an innovative grid-scale flow battery to store electricity from renewable sources. Flow batteries store chemical energy in external tanks instead of within the battery container. Harvard's battery will use an active material that is relatively inexpensive, non-toxic and can hold up to ten times more energy by volume compared to other flow batteries.

HexaTech, Inc. ..... ARPA·E AWARDEE Booth 323

www.hexatechinc.com

Aluminum Nitride-Based Devices for High-Voltage Power Electronics

HexaTech, Inc. will develop new switches to more efficiently control the flow of electricity across high-voltage electrical lines. The technology will use a new material that exceeds the performance of currently used materials, enabling smaller, more reliable devices. Implementation of these devices would decrease the cost of electricity transmission while increasing overall grid security and reliability.

HRL Laboratories, LLC ..... ARPA·E AWARDEE Booth 335

www.hrl.com

Low-Cost Gallium Nitride Vertical Transistor

HRL Laboratories will develop a new, high-performance gallium nitride (GaN) vertical transistor that will displace inefficient silicon transistor technologies used in high-power switching applications like electric motor drives. HRL will improve device fabrication and circuit design to enable high-power operation of GaN. This new GaN vertical transistor could have 10 times lower power loss at the same cost as today's widely used silicon transistors.

iBeam Materials, Inc..... ARPA·E AWARDEE Booth 340

Vladimir Matias
vlado@ibeammaterials.com
www.ibeammaterials.com

Epitaxial GaN on Flexible Metal Tapes for Low-Cost Transistor Devices

iBeam Materials will develop a new way to manufacture low-cost gallium nitride (GaN) devices for use in large-scale power electronics. iBeam Materials will use crystal-aligned coatings on large-area, flexible, metal foils for deposition of epitaxial GaN films. This low-cost coating technology was recently developed to manufacture high-quality, low-cost superconductor wire. If successful, iBeam Materials will adapt the coating technology for use in high-performance GaN electric devices, significantly reducing manufacturing costs.

Ideal Power Inc. ..... ARPA·E AWARDEE Booth 616

Bill Alexander
bill.alexander@idealpower.com
www.idealpower.com

Dual Bi-Directional IGBTs Modules Enables Breakthrough PV Inverter Using Current Modulation Topology

Ideal Power Converters is developing light-weight electronics to connect photovoltaic solar panels to the grid. Their technology explores innovative circuits using revolutionary transistor designs to develop solar panel electronics for commercial-scale buildings that are compact enough to be installed on walls or roof-tops. The project goal is to reduce the weight of these electronics by 98%, reducing the cost of materials, manufacturing, shipping and installation, and supporting the aggressive cost-reduction goals of the Department of Energy's SunShot Initiative.

ILLINOIS INSTITUTE OF TECHNOLOGY

Illinois Institute of Technology ..... ARPA·E AWARDEE Booth 12

Adam S. Hock, Ph. D.
ahock@iit.edu
www.cse.anl.gov/ARPA-E/intermediate_temp_fuel_cell.htm

Intermediate Temperature Hybrid Fuel Cell System for the Conversion of Natural Gas to Electricity and Liquid Fuels

Argonne National Laboratory and the Illinois Institute of Technology will develop a hybrid gas cell technology that will both generate electricity and produce liquid fuel. This dual mode capability is enabled by a device that removes protons from the reaction site, which allows the cell to operate at lower temperatures. In addition to conventional fuel cell capabilities, the resulting cell could use natural gas to produce ethylene for conversion into liquid fuel or high-value chemicals.

ILLINOIS INSTITUTE OF TECHNOLOGY

Illinois Institute of Technology/ Argonne National Lab..... ARPA·E AWARDEE Booth 820

www.iit.edu

Prototype of Rechargeable Nanoelectrofuel Flow Battery for EV Systems with High Energy Density, Low Viscosity and Integrated Thermal Management Function

The Illinois Institute of Technology (IIT) will develop a flow battery for electric vehicles that uses a high-energy density liquid as its electrode. Flow batteries, which store chemical energy in external tanks instead of within the battery container, are generally low in energy density and therefore not normally used for transportation. IIT's battery will use a liquid electrolyte containing a large portion of nanoparticles to increase energy density while ensuring stability and low-resistance flow within the battery.

ITC

Infinia Technology Corporation (ITC) ..... ARPA·E AWARDEE Booth 916

Amy Underwood
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www.itcpowersolutions.com

Free-Piston Zero Emission Refrigeration (FREEZER)

The FREE-piston Zero Emissions Refrigeration (FREEZER™) system is an adaptation of ITC's Stirling cycle technology that heavily leverages existing cooler projects and the availability of mass produced linear alternators for the commercial freezer equipment market. The Stirling FREEZER™ system offers a number of advantages of the emerging CO_2 refrigeration systems for this application. A major advantage of CO_2-based refrigeration systems is that CO_2 as a working fluid has an ozone depletion potential (ODP) of zero, a global warming potential (GWP) of 1, and the impact of refrigerant leakage. The Stirling FREEZER™ system simply uses the CO_2 as a 2-phase heat transport loop by using the FREEZER™ cold head to liquefy CO_2 vapor return, an approach commonly referred to in the industry as a single condensing CO_2 refrigeration unit. It also enables direct utilization of existing food freezer CO_2 refrigeration hardware. ITC has fabricated and extensively tested a prototype of the FREEZER™ system confirming many of the expected positive attributes of the Stirling cycle based refrigeration system concept. The FREEZER™ unit is currently being installed at ITC's industrial partner's (Heatcraft Inc.) test facility where it will undergo extensive testing while integrated with existing CO_2 based commercial refrigeration systems.

Infinia Technology Corporation (ITC) ..... ARPA·E AWARDEE Booth 918

Peter Brehm
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www.itcpowersolutions.com

Rugged Innovative Scalable Environmental Control Unit (RISE)

The 5 Ton Rugged Innovative Scalable ECU (RISE) is a significant upgrade of ITC's ARPA-E sponsored 1 Ton Stirling Air Conditioner (StAC) project. It is expected to meet or exceed all primary 5 Ton ECU system targets. The ongoing 3-year RISE program has essentially completed the development of the Proof of Concept prototype unit, and is transitioning into the Operational Prototype 2nd generation hardware phase. Testing of the Proof-of-Concept unit is continuing in support of the development of innovative regenerative heat exchangers and thermosyphon based heat transport systems critical to attaining the RISE performance goals. The most innovative element of RISE is the passive 2 phase heat transport systems employing thermosyphons. These heat transport systems reduce the temperature drops between internal Stirling cycle heat exchangers and air-side heat exchangers. The highly-effective thermosyphons enables RISE to achieve system coefficients of performance using Helium cycle working fluid with very low greenhouse gas global warming potential thermosyphon working fluids. Throughout the hardware effort the design has been refined to meet the mass, physical size, and cost targets. In addition, ITC has evaluated potential commercial opportunities for a "RISE like" unit with particular emphases on markets serving high temperature / humidity environments.

INFINIUM..... ARPA·E AWARDEE Booth 314

www.infiniummetals.com

Clean Efficient Aluminum Oxide Electrolysis with SOM Inert Anodes

Infinium will develop an electrochemical aluminum extraction process using Pure Oxygen Anodes™. This anode technology eliminates toxic and corrosive contamination associated with conventional extraction methods, which enables use of insulation to dramatically reduce energy losses, compared to conventional aluminum industry best practices. If successful, Infinium will deploy low-cost and highly energy-efficient aluminum-production cells in brown-field retrofits or green-field plants.

Integral Consulting Inc. ..... ARPA·E AWARDEE Booth 721

Craig Jones, Ph.D.
cjones@integral-corp.com
www.integral-corp.com

Cost Effective Real Time Wave Assessment Tool

Integral Consulting Inc. is developing a real-time ocean wave buoy system that will accurately provide high temporal resolution measurements of the surface wave motions of the ocean. Data from the system can be used to inform control strategies for wave energy converters and enable the capture of significantly more energy than systems that do not employ control strategies.

ITN Energy Systems, Inc. ..... ARPA·E AWARDEE Booth 1218

Ashutosh Misra
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www.itnes.com

Demonstration of 2.5kW/10kWh Vanadium Redox Flow Battery (VRFB) Through Rationally Designed High Energy Density Electrolytes and Membrane-Electrode Assembly (MEA)

ITN will dramatically improve current state-of-the-art Vanadium flow batteries for grid-scale energy storage. This project integrates a unique, low-cost membrane with a new flow battery chemistry to develop an efficient and affordable energy storage system for renewable energy generation sources like solar and wind for small commercial and residential consumers.

Jet Propulsion Laboratory and Liox Power, Inc. ..... ARPA·E AWARDEE Booth 331

Dan Addison
dan@liox.com
www.jpl.nasa.gov www.liox.com

Safe, High Energy and Robust Aqueous Batteries for EVs

Jet Propulsion Laboratory (JPL) will develop a new water-based metal hydride-air battery. When compared to the lithium-ion batteries currently available for use in electric vehicles, JPL's technology could offer significant cost and performance benefits due to the battery's lower mass and volume. JPL's new batteries have simplified packaging and design, are low-cost, and can be easily integrated into electric vehicles.

Liox is a research and development company focused on commercialization of next generation "beyond Li-ion" battery technologies. Liox collaborates with Jet Propulsion Laboratory on the metal-hydride air battery project for the ARPA-E RANGE program among other federally funded projects.

Kohana Technologies Inc. ..... ARPA·E AWARDEE Booth 1140

Paul Lees
paul@kohanatech.com
www.kohanatech.com

Adaptive Turbine Blades: Blown Wing Technology for Low-Cost Wind Power

Kohana Technologies is developing a next generation active aerodynamics wind turbine control system. Reducing the peak structural loads for a wind turbine reduces the cost of energy, allowing rotor stretch, material savings, component savings, and reduced O&M. However in over a decade of research, no viable active control systems have emerged to meet this goal. Kohana's Blown Wing Technology now offers a truly deployable solution that can substantially reduce the cost of energy for wind power.

Kyma Technologies, Inc. ..... ARPA·E AWARDEE Booth 434

Jacob Leach
leach@kymatech.com
www.kymatech.com

Transformational GaN Substrate Technology

Kyma Technologies will develop a cost-effective technique to grow high-quality gallium nitride (GaN) by developing a high growth rate process for creating crystalline GaN boules, which are used as a starting material for semiconductor device manufacturing. Currently, growing boules from GaN seeds is slow, expensive, and inconsistent, which negatively affects manufacturing yield and electronic device performance. Kyma will select the highest quality GaN seeds and use their proprietary hydride vapor phase epitaxy (VPE) growth process to rapidly grow the seeds into boules while maintaining high crystal structural quality and purity. If successful, Kyma will produce low-cost, high-performing boules needed for power semiconductor manufacturing.

LanzaTech, Inc..... ARPA·E AWARDEE Booth 424

Derek Griffin
derek.griffin@lanzatech.com
www.lanzatech.com

Innovative Bioreactor Designs for Process Intensification in Biological Natural Gas Conversion

LanzaTech will design a gas fermentation system that will significantly improve the rate at which methane gas is delivered to a biocatalyst. Current gas fermentation processes are not cost effective compared to other gas-to-liquid technologies because they are too slow for large-scale production. If successful, LanzaTech's system will process large amounts of methane at a high rate, reducing the energy inputs and costs associated with methane conversion.

Lawrence Berkeley National Laboratory..... ARPA·E AWARDEE Booth 448

www.lbl.gov

PEPMase - Enzyme Engineering for Direct Methane Conversion

Lawrence Berkeley National Laboratory (LBNL) will re-engineer an enzyme to directly "methylate," or bind methane with a common fuel precursor in order to produce a liquid fuel. Methylation, which does not require the input of oxygen or energy, is a new technique that has never been applied for efficient methane conversion. If successful, LBNL's process will enable low-cost, energy-efficient fuel production from natural gas.

Lawrence Berkeley National Laboratory..... ARPA·E AWARDEE Booth 917

www.lbl.gov

RAMS-Ex-BEE - Rapid Automated Modeling and Simulation of Existing Buildings for Energy Efficiency

Lawrence Berkeley National Laboratory (LBNL) will develop a portable system of sensing and computer hardware to rapidly generate indoor thermal and physical building maps. This mapping technology allows for cost-effective evaluation of heat loss and building inefficiencies. The system enables rapid data collection and export to existing computer models to guide strategies that reduce building energy usage.

Lawrence Berkeley National Laboratory..... ARPA·E ALUMNI Booth 549

www.lbl.gov

FOLIUM - Installation of Hydrocarbon Accumulating Pathways in Tobacco Leaves

The Lawrence Berkeley National Laboratory and its team will develop tobacco plants with leaves that contain fuel molecules. The team will engineer tobacco with traits conferring hydrocarbon biosynthesis, enhanced carbon uptake, and optimized light utilization. The tobacco will be grown using advanced cultivation techniques to maximize biomass production.

Lawrence Livermore National Laboratory and Yardney Technical Products..... ARPA·E AWARDEE Booth 931

www.llnl.gov

Battery Management System with Distributed Wireless Sensors

Lawrence Livermore National Laboratory (LLNL) is developing a wireless sensor network for large lithium-ion battery packs that can operate reliably in the full range of electrified grid and vehicle environments. This wireless sensor network can dramatically reduce system cost, improve operational performance, and detect pack failures in real time, enabling a path to cheaper, better, and safer large-scale systems.

LiquidPiston, Inc. ..... Booth 1231

Alexander Shkolnik
as@liquidpiston.com
www.liquidpiston.com

Small Efficient Rotary Engine

LiquidPiston, Inc (LPI) is developing compact, quiet, high-efficiency, low-vibration, multi-fuel capable combustion engines that are scalable from 1HP to over 1000 HP. LiquidPiston's X Engine is a non-Wankel rotary embodiment of the company's innovative High Efficiency Hybrid Cycle (HEHC). The technology is based on the physics of the internal combustion engine, and transforming the thermodynamic cycle to optimize it for efficiency, with up to 75% thermodynamic efficiency. The company is currently developing a 70cc 5 HP spark-ignited engine, intended for use in power equipment, generator, range extenders for electric vehicles, and UAVs.

LiquiGlide Inc. ..... Booth 1223

Leslie Rose
leslie.rose@liquiglide.com
www.liquiglide.com

LiquiGlide's Slippery Surface Solutions

LiquiGlide is the first company to create permanently wet slippery surfaces - no other durable solution makes viscous liquids slide easily. From oil and gas, to better packaging for consumer goods, to high tech medical equipment, LiquiGlide custom develops slippery surfaces for any viscous liquid. What the wheel was to transportation, LiquiGlide is to liquids – it changes how liquids move.

Massachusetts Institute of Technology

Massachusetts Institute of Technology ..... ARPA·E AWARDEE Booth 530

www.mit.edu

Bio-GTL: Direct and Indirect Paths of Methane Activation and Conversion to Biofuels

Massachusetts Institute of Technology (MIT) will develop a comprehensive process to directly convert methane into a usable transportation fuel in a single step. MIT's unique technologies integrate methane activation and fuel synthesis—two distinct processes required to convert methane that are typically performed separately—into one step.

Massachusetts Institute of Technology

Massachusetts Institute of Technology ..... ARPA·E AWARDEE Booth 1138

www.mit.edu

Spectrum Splitting for High-Efficiency Photovoltaic and Solar Thermal Energy Generation

The Massachusetts Institute of Technology will develop a high-efficiency solar cell grown on a low-cost silicon wafer incorporating a custom reflective filter. The proposed system will enable more efficient use of solar energy to produce dispatchable renewable electricity on a utility scale.

Massachusetts Institute of Technology

Massachusetts Institute of Technology ..... ARPA·E AWARDEE Booth 1033

www.mit.edu

Full-Spectrum Stacked Solar-Thermal and PV Receiver

The Massachusetts Institute of Technology will develop a hybrid solar converter that integrates a thermal absorber and a solar cell into a layered stack. The design allows focused sunlight to heat fluid piped through layers of optically transparent thermal insulation. The part of the spectrum most easily converted to electricity filters through to the solar cells. This unique stack design would enable low-cost solar energy conversion systems that can flexibly dispatch electricity when most needed.

Massachusetts Institute of Technology

Massachusetts Institute of Technology ..... ARPA·E ALUMNI Booth 1031

www.mit.edu

Metallic Composites Phase-Change Materials for High-Temperature Thermal Energy Storage

MIT and Boston College will develop phase change materials (PCMs) based thermal energy storage (TES) materials to achieve high energy efficiency for the TES system using novel thermodynamic phenomena. The PCMs will have high phase change temperatures, high thermal conductivity values, long lifetime and low cost. The team will develop the PCMs through characterization and modeling the properties of these materials. The successful project will enable continuous power supply from concentrated solar-thermal power (CSP) systems and nuclear plants with base and peak power capacity.

Massachusetts Institute of Technology ..... ARPA·E AWARDEE Booth 649

drl.mit.edu/research.cgi?p=storage

Advanced Thermo-Adsorptive Battery Climate Control System

MIT is developing advanced adsorption-based hot and cold batteries for effective climate control of electric vehicles (EVs). These batteries will have high cooling and heating storage and fast charging times. The hot and cold battery completely eliminates the need for a vapor compression cycle. It can handle peak heating and cooling loads and attain continuous operation beyond the initial charged capacity. If successful, the technology can also be broadly applicable to residential and commercial buildings, where there are substantial needs to deliver energy in the form of heating and cooling while displacing electricity consumption during peak demand times.

Materials & Systems Research, Inc. ..... ARPA·E AWARDEE Booth 349

Joonho Koh
jkoh@msrihome.com
www.msrihome.com

Advanced Sodium Batteries with Enhanced Safety and Low-Cost Processing

MSRI will design advanced sodium battery membranes that are stronger and cost less than existing membrane technologies. This manufacturing process will make high-strength membranes for grid-scale batteries that increase cycle life and improve safety in a single step.

Materials & Systems Research, Inc. ..... ARPA·E AWARDEE Poster 11

Greg Tao
gtao@msrihome.com
www.msrihome.com

Intermediate-Temperature Electrogenerative Cells for Flexible Cogeneration of Power and Liquid Fuel

Materials & Systems Research, Inc. (MSRI) will develop an intermediate-temperature fuel cell capable of electrochemically converting natural gas into electricity or liquid fuel in a single step. The electrodes will be designed to use catalysts more effectively and the entire cell will be fabricated using a cost-effective process that can be readily scaled up for mass production. MSRI's technology will provide low-cost power while operating in a temperature range of 400-500˚C, enabling better durability than today's high-temperature fuel cells.

Medical University of South Carolina..... ARPA·E AWARDEE Booth 849

Harold May
mayh@musc.edu
www.electrobiome.org

Fuel and Chemical Production with the Electrobiome™ Platform

Microbial electrosynthesis is being used to convert carbon dioxide into chemicals and fuels. Products includes hydrogen and organic acids, and the Electrobiome™ Platform is being further developed for the production of diesel and liquid hydrocarbon fuels. It may also be modified for the production of higher value organic acids and alcohols.

Michigan State University ..... ARPA-E AWARDEE Booth 428

Timothy Grotjohn
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www.researchgroups.msu.edu/diamond

Diamond Diode and Transistor Devices

Michigan State University (MSU) is building high-voltage diamond semiconductor devices for use in high-power electronics. Diamond is an excellent conductor of electricity when boron or phosphorus are added, or doped into its crystal structures. Diamond can withstand much higher temperatures with higher performance levels than silicon, which is widely used in today's semiconductors. Current techniques for growing layers of doped diamond are too expensive and need further development. This project is building diamond semiconductor devices that are capable of handling enough electricity to power advanced electronics. If successful, MSU's innovative technique to grow diamond layers with different doping levels and elements will facilitate devices capable of conducting enough electricity for high-power electronics.

Michigan State University ..... ARPA-E AWARDEE Booth 742

www.egr.msu.edu

Transformer-Less Unified Power Flow Controller for Wind and Solar Power Transmission

Michigan State will develop a unified power flow controller (UPFC) that will have enormous technological and economic impacts on controlling the routing of energy through existing power lines. The UPFC will incorporate an innovative circuitry configuration that eliminates the transformer, an extremely large and heavy component, from the system. As a result, it will be lightweight, efficient, reliable, low cost, and well suited for fast and distributed power flow control of wind and solar power.

MicroLink Devices ..... ARPA-E AWARDEE Booth 229

Chris Youtsey
cyoutsey@mldevices.com
www.mldevices.com

Vertical-Junction Field-Effect Transistors Fabricated on Low-Dislocation-Density GaN by Epitaxial Lift-Off

MicroLink Devices will engineer affordable, high-performance transistors needed for power conversion. Currently, high-performance power transistors are prohibitively expensive because they are grown on expensive gallium nitride (GaN) semiconductor wafers. In conventional manufacturing processes, this expensive wafer is permanently attached to the transistor, so the wafer can only be used once. MicroLink Devices will develop an innovative method to remove the transistor structure from the wafer without damaging any components, enabling wafer reuse while significantly reducing costs.

MicroLink Devices ..... ARPA·E AWARDEE **Booth 231**

www.mldevices.com

Epitaxial Lift-Off III-V Solar Cell for High Temperature Operation

MicroLink Devices will develop a high-efficiency solar cell that can operate at temperatures above 400°C, unlike today's solar cells which lose efficiency rapidly above 100°C. The team will customize the materials as well as the design of today's low-temperature concentrator solar cells to provide reliability over the 25-year lifetime needed in the field. In addition, MicroLink will use manufacturing techniques that allow for the reuse of expensive solar cell manufacturing templates to minimize costs. The high-temperature solar cells will be optimized to extract the most energy possible from sunlight when integrated with hybrid solar converters.

MicroLink Devices ..... ARPA·E AWARDEE **Booth 233**

www.mldevices.com

High-Efficiency, Lattice-Matched Solar Cells Using Epitaxial Lift-Off

MicroLink Devices will develop high-efficiency solar cells to capture concentrated sunlight with a unique blend of crystal layers in an innovative design. These cells will improve concentrated photovoltaic products to increase the amount of energy generated from solar power plants. MicroLink will use sophisticated manufacturing techniques to allow for reuse of expensive growth templates to minimize costs normally associated with high-performance solar cells.

MOgene Green Chemicals LLC ..... ARPA·E AWARDEE **Booth 1039**

Dr. Abhay Singh

asingh@mogene.com

www.mogene.com

Biotransformation of Methane into N-Butanol by a Methanotrophic Cyanobacterium

MOgene Green Chemicals will engineer a photosynthetic organism for methane conversion that can use energy from both methane and sunlight. The use of renewable and readily available solar energy reduces equipment costs and greenhouse gas emissions. If successful, MOgene will develop a low-carbon-dioxide-emissions technology that produces a liquid fuel from natural gas and sunlight through efficient, low-cost biological conversion.

Monolith Semiconductor Inc. ..... ARPA·E AWARDEE **Booth 414**

Kevin Matocha

kmatocha@monolithsemi.com

www.monolithsemi.com

Advanced Manufacturing and Performance Enhancements for Reduced Cost Silicon Carbide MOSFETS

Monolith Semiconductor, Inc., is developing affordable SiC power semiconductor devices for advanced power electronics, including traction, wind, solar, data centers and smart-grid applications.

MTPV Power Corporation ..... Booth 1222

David Mather
www.mtpv.com

MTPV (Micron-gap Thermal Photovoltaic) Makes Semiconductor Chips That Convert Heat Directly into Electricity

MTPV (Micron-gap Thermal Photovoltaic) makes semiconductor chips that convert heat directly into electricity. Much like a solar panel will convert sunlight into electricity, MTPV solutions are able to convert any source of heat into electricity with several significant advantages when compared to other chip based solutions. MTPV chips are able to generate 10x to 50x more power, with 45% less heat/temperature than competitive technologies and are capable of generating 1-50 watts/cm^2 at efficiencies between 10%-60%. MTPV solutions are solid-state, scalable, and create 100% green energy when converting waste heat to electricity.

Nanofoundry, LLC ..... ARPA-E ALUMNI Booth 948

Everett Carpenter, Ph.D.
everett.carpenter2@gmail.com
www.nanofoundry.us

Next Generation Magnetic Materials

Founded in 2012, Nanofoundry is a technology spin-off from Virginia Commonwealth University (VCU) in Richmond, Virginia. Everett Carpenter, Ph.D., one of the company's founders, has led the innovation of process technology that enables large-scale manufacturing of high grade nanoparticle material. He has also led the development of novel nanoparticle materials, specializing in applications of magnetic materials. We are primarily focused on the development of a very low cost, high-effectiveness magnetic material for use in power generation, motor, automotive, and power conversion applications. Our main line of research is funded by the NSF under a Phase II SBIR grant. In addition, we are performing funded research for several industrial clients. Nanofoundry has world-renowned, hands-on technical leadership, an experienced research and operations team, and a seasoned business management team. Nanofoundry's principals were participants in the NSF I-Corps program and Nanofoundry has received two grants from Virginia's Center for Innovative Technology. Our exclusive IP portfolio includes both production process and materials technology. We are headquartered in Glen Allen, Virginia, with lab facilities in nearby Ashland, Virginia. We have ready access to the state-of-the-art Nanomaterials Core Characterization Facility at VCU.

NanoRIS ..... Booth 1226

Ruxandra Vidu
r_vidu@yahoo.com

Wastewater Toxic Removal Module Using Magnetic Nanomaterials

The removal of some toxic metals and organics from wastewaters has received considerable attention in recent years due to their toxicity and carcinogenicity. Presently, chemicals used in industrial wastewater treatments are not able to eliminate completely toxic materials. We have developed a filtering technology based on a new class of high adsorbent magnetic nanoparticles. This wastewater filtration technology is capable of removing heavy metals (most of them are carcinogenic: chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium, antimony, mercury, thallium and lead), biological, cations, anions or other toxic elements from liquids.

National Renewable Energy Laboratory ..... ARPA·E AWARDEE Poster 19

www.nrel.gov

High Energy, Long Life Organic Battery with Quick Charge Capability

The National Renewable Energy Laboratory (NREL) will develop a new low-cost flow battery using organic energy storage materials. Flow batteries store chemical energy in external tanks instead of within the battery container and are generally low in energy density, so they are not generally used for transportation. NREL's electric vehicle batteries will use newly developed, renewable organic compounds to increase energy density and reduce cost.

National Renewable Energy Laboratory ..... ARPA·E AWARDEE Booth 429

Dave Ginley
david.ginley@nrel.gov
www.nrel.gov

Solar Thermoelectricity via Latent Heat Storage (STEALS)

Low cost solar energy generation with dispatchability is a key U.S. goal. Recently thermoelectric (TE) converters have undergone a true revolution in performance. This has opened the way toward TE as a primary solar thermal conversion technology. This project researches how TE can be integrated in a facile way with heat storage to provide a scalable dispatchable solar system.

North Carolina State University ..... ARPA·E AWARDEE Booth 336

www.cals.ncsu.edu/plantbiology

Jet Fuel From Camelina Sativa: A Systems Approach

North Carolina State University will engineer the oilseed crop Camelina with traits that increase the yield per acre of biodiesel. The project incorporates both an alternative way to capture carbon from air and features that allow the plant to accumulate larger quantities of vegetable oil and other fuel molecules in oilseeds. When combined together, the fuel molecules plus vegetable oil isolated from the plant can be converted into a fuel mixture that is comparable to dieselor jet fuel. This variety of Camelina is expected to produce more fuel per acre of land than other conventional biofuel crops.

Northrop Grumman Aerospace Systems & Jet Propulsion Laboratory ..... ARPA·E AWARDEE Booth 422

www.northropgrumman.com

FSPOT-X: Full Spectrum Power for Optical/Thermal Exergy

Northrop Grumman Aerospace Systems will develop a dish-shaped hybrid solar converter that combines a high-efficiency solar cell with a thermo-acoustic engine which converts heat into electricity. The thermo-acoustic unit, originally designed for space missions, converts waste heat from the solar cell into sound waves that generate electricity using few moving parts. The engine and solar cell are surrounded by salts that store heat as needed by melting when the sun shines and releases the heat to make electricity by solidifying when the sun is not shining. This combination could lead to inexpensive, on-demand electricity from solar energy.

Northwestern University ..... ARPA·E AWARDEE Booth 642

Thomas Lawton
t-lawton@northwewtern.edu
www.northwestern.edu

Engineering Multicopper Oxidases for Methane C-H Activation

Northwestern University will engineer an entirely new biocatalyst for highly efficient methane activation, the first step required to convert methane into a liquid fuel. Northwestern University will adjust and repurpose chemical properties within a certain class of natural enzymes that utilize metal to activate methane without the input of energy. Northwestern University's process could provide a low-cost solution to the first step of methane conversion, which has been a long-standing technological challenge.

Oak Ridge National Laboratory ..... ARPA·E AWARDEE Booth 1128

www.ornl.gov

Safe Impact Resistant Electrolyte (SAFIRE)

Oak Ridge National Laboratory (ORNL) will create a battery technology that replaces conventional safety components with a material that changes from liquid to solid upon application of external force. Today's batteries include safety features that manage the spontaneous release of energy, but result in increased weight. ORNL's new impact-resistant materials would reduce the amount of shielding needed resulting in a decrease in the overall weight of the battery while ensuring safety.

Oak Ridge National Laboratory ..... ARPA·E AWARDEE Booth 1233

Hsin Wang
wangh2@ornl.gov
www.ornl.gov

Temperature Regulation for Large-Format Li-Ion cells

Oak Ridge National Laboratory has developed an innovative battery cooling technology with Farasis Energy to make cell temperature uniform throughout the volume and more effectively regulate cell temperatures during use. This improvement in transporting heat away from active materials in the battery is expected to increase the battery's life and reduce the system cost associated with thermal management.

Oak Ridge National Laboratory ..... ARPA·E AWARDEE Booth 1029

www.ornl.gov

Magnetic Amplifier for Power Flow Control

Complete control of power flow in the grid is prohibitively expensive, which has led to sub-optimal, partial control. Oak Ridge National Laboratory will develop a magnetic based valve-like device for full power flow control. The controller will be inherently reliable and cost-effective, making it amenable for widespread distributed power flow control. The benefits are far-reaching, including full utilization of power system assets, increased reliability and efficiency, and more effective use of renewable resources.

Oak Ridge National Laboratory ..... ARPA-E AWARDEE Poster 13

Alexander Papandrew
apapandrew@utk.edu
www.ornl.gov

Nanocomposite Electrodes for a Solid Acid Fuel Cell Stack Operating on Reformate

Oak Ridge National Laboratory (ORNL) will redesign a fuel cell electrode that operates at 250 °C using highly porous carbon nano structures that dramatically increase the amount of surface area, lowering the amount of expensive platinum catalysts used in the cell. The team will also modify existing fuel processors to operate efficiently at reduced temperatures, and those processors will work in conjunction with the fuel cell to lower costs at the system level. ORNL's innovations will enable efficient distributed electricity generation from domestic fuel sources using less expensive catalysts.

Oak Ridge National Laboratory and General Motors ..... ARPA-E AWARDEE Booth 1126

www.ornl.gov

Lithium Ion Battery with Integrated Abuse Tolerant Electrode Features

Oak Ridge National Laboratory (ORNL) with General Motors (GM) propose a new architecture within each cell that will reduce the likelihood of thermal damage in the event of mechanical abuse.

Onboard Dynamics, Inc. ..... ARPA-E AWARDEE Booth 614

Rita Hansen
rita.hansen@onboarddynamics.com
www.onboarddynamics.com

Vehicle-integrated Natural Gas Compressor

Onboard Dynamics, Inc. is developing and commercializing natural gas compressor technology within the vehicle itself so that self-fueling can take place virtually anywhere with access to a natural gas pipeline. Our product roadmap includes a progression of bolt-on and proprietary in-cylinder technology that can be licensed. Much of our current development efforts are funded through an award from the ARPA-E MOVE program. A demonstration system will be operating in a fleet environment in the summer of 2015. As our product technology evolves, natural gas compression is provided by dual purpose cylinders designed for both compression and power. During the refueling process, these unique cylinders are dedicated to compressing natural gas with power supplied by the other engine cylinders running in normal combustion mode. The natural gas is pressurized in interim steps and subsequently stored in the high pressure storage tank located on the vehicle. When the vehicle is on the road, these dual purpose cylinders revert back to normal operation with all cylinders providing engine power. A prototype engine with these capabilities has been tested both in the laboratory and on the highway.

Oregon State University ..... ARPA-E AWARDEE Booth 548

Dr. Goran Jovanovic
goran.jovanovic@oregonstate.edu
www.oregonstate.edu

Bio-Lamina-Plates Bioreactor for Enhanced Mass and Heat Transfer

Oregon State University (OSU) will develop an entirely new bioreactor design to enable low-cost conversion of methane to liquid fuel. OSU's ultra-thin, stacked plate system will improve the overall rate at which methane is transferred to biocatalysts. If successful, this new design could provide a low-cost alternative to current state-of-the-art methane bioreactors.

Oregon State University ..... ARPA-E AWARDEE Poster 2

Chris Hagen
chris.hagen@oregonstate.edu
www.osucascades.edu/energy-systems-lab

Home Generator Benchmarking Program

Oregon State University (OSU) will collect previously unavailable thermal efficiency, exergy efficiency, lifetime, and levelized cost of energy data for commercially-relevant natural gas-fueled home generators. The resulting information will be disseminated and serve as a baseline for future United States based power generation research and development.

Otherlab, Inc. ..... ARPA-E AWARDEE Booth 815

www.otherlab.com

Hybrid Solar Converter with Integrated Thermal Storage

Otherlab will develop an integrated system that splits the solar spectrum, converting the most suitable wavelengths of sunlight into electricity via high-efficiency solar cells and using the rest of the spectrum to directly heat a pool of molten salt. The system will collect sunlight using an array of small, pneumatically driven mirrors that track the sun's movement, allowing the molten salt pool to cost-effectively store solar heat for generation of dispatchable electricity. This technology could enable a low-cost solar system that would fit easily inside a football field, in contrast to today's solar fields that can cover several square miles.

OtherLab, Inc. ..... ARPA-E AWARDEE Booth 813

Daniel Recht
info@voluteinc.com
www.otherlab.com

Safe, Dense, Conformal, Gas Intestine Storage

OtherLab is developing a high-pressure natural gas tank for light-duty vehicles using small diameter tubes tightly folded into a tank shape. Like human intestines, these small tubes will fit tightly into virtually any shape for efficient storage. Gas intestine storage tanks could be as light as today's carbon fiber tanks at substantially lower cost.

Otherlab, Inc. ..... ARPA·E AWARDEE Booth 817

Leila Madrone
leila@sunfolding.com
www.otherlab.com

Adaptive Fluidic Solar Collectors

Otherlab will develop an inexpensive method to reflect sunlight onto a solar tower using small mirrors. Many of today's mirrors are 20-30 feet tall, making them difficult to stabilize and rotate. Otherlab's hydraulic drivers, made with low-cost plastic parts, precisely position smaller energy-collecting mirrors to dramatically lower solar field costs.

Pacific Northwest National Laboratory ..... ARPA·E AWARDEE Booth 315

Jun Cui
Jun.Cui@pnnl.gov
www.pnnl.gov

Manganese-Based Permanent Magnet with 40 MGOe at 200°C

Pacific Northwest National Laboratory and team will develop a rare earth free permanent magnet based on an innovative composite using manganese materials. These manganese based composite magnets hold the potential to match the high temperature magnetic properties relative to those being used today. Members of this research team will leverage high-performance modeling and innovative synthesis methods to overcome the low purity problem typically found in the manganese composites. If developed successfully in this high-risk, high-reward effort, these composite magnets will reduce U.S. dependence on REE imports and establish U.S. leadership in wide adoption of green energy technologies.

Pacific Northwest National Laboratory ..... ARPA·E ALUMNI Booth 1243

Pete McGrail
pete.mcgrail@pnnl.gov
www.pnnl.gov

Genset Heat Recovery Adsorption Chiller for Military Forward Operations Bases

Pacific Northwest National Laboratory (PNNL) teams are working on two adsorption chiller concepts. Under the BEETIT program, PNNL is designing, assembling and testing an adsorption chiller that takes advantage of recently discovered superfluorophilic sorbents with select fluorocarbon refrigerants to achieve high efficiency in commercial heating, ventilation, air conditioning and refrigeration systems. The second project is working to leverage the superhydrophilic properties of a metal-organic framework sorbent to design, manufacture, and test a ¾ ton adsorption chiller that is substantially smaller, lighter, and far exceeds the operating performance requirements specified by the Navy for forward operations base deployments while meeting cost targets as well. An advanced adsorption module and system design is being utilized to minimize overall size and weight of the chillers and provide rapid heat transfer and efficient internal heat recuperation. A small 400W chiller demonstrating these technology innovations will be on display.

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Pacific Northwest National Laboratory ..... ARPA·E AWARDEE Booth 1245

Pete McGrail
pete.mcgrail@pnnl.gov
www.pnnl.gov

Catalyzed Organo-Metathetical (COMET) Process for Magnesium Production from Seawater

Pacific Northwest National Laboratory (PNNL) will extract magnesium salt from seawater and convert it to magnesium using a metal-organic process. As seawater contains low concentrations of magnesium, extraction is traditionally a difficult, energy-intensive, and expensive process. PNNL's novel metal-organic process could enable more efficient magnesium extraction from seawater.

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Pacific Northwest National Laboratory ..... ARPA·E AWARDEE Booth 540

Henry Huang
Zhenyu.huang@pnnl.gov
www.pnnl.gov

Non-Wire Methods for Transmission Congestion Management through Predictive Simulation and Optimization

Pacific Northwest National Laboratory will develop high-performance computing algorithms and software to use power transmission lines in the electric grid more efficiently. By analyzing unused capacity of existing transmission lines, this software would increase the efficiency of existing electrical infrastructure, eliminating or delaying the need to construct costly power lines.

parc
A Xerox Company

PARC, A Xerox Company ..... ARPA·E AWARDEE Booth 618

Craig Eldershaw
Craig.Eldershaw@parc.com
www.parc.com/services/focus-area/cleantech-energy

Medium-temperature Oxygen-conducting Fuel Cell Based on a Novel Membrane Structure

Palo Alto Research Center (PARC) will develop an intermediate-temperature fuel cell that is capable of utilizing a wide variety of carbon-based input fuels. This design will include a novel electrolyte membrane system that transports oxygen in a form that allows it to react directly with almost any fuel. The membrane eliminates the need for a separate fuel processing system, which reduces overall costs. Further, PARC's cell will operate at relatively low temperatures of 200-300˚C, avoiding the long-term durability problems associated with existing higher-temperature fuel cells.

PARC, A Xerox Company ..... ARPA·E AWARDEE Booth 622

Ajay Raghavan
raghavan@parc.com
www.parc.com

Smart Embedded Network of Sensors with Optical Readout (SENSOR)

Palo Alto Research Center (PARC) will develop new fiber optic sensors that are inserted into battery packs to monitor and measure batteries during charge and discharge cycles. These compact fiber optical sensors will measure the battery's health while in use to avoid degradation and failure.

PARC, A Xerox Company ..... ARPA·E AWARDEE Booth 620

www.parc.com

Probing Alloys for Rapid Sorting Electrochemically (PARSE)

PARC will develop a new electrochemical diagnostic probe that identifies the composition of light metal scrap for efficient sorting. Current sorting technologies for light metals are costly and inefficient because they cannot distinguish between different metals. If successful, PARC's electro-chemical diagnostic probe will enable the recycling of typically discarded light metal scrap.

Penn State University..... ARPA·E AWARDEE Booth 1132

www.best.psu.edu

PowerPanels: Multifunctional Composites with Li-Ion Battery Cores

Pennsylvania State University (PSU) will use a new fabrication process to build load-bearing lithium-ion batteries that could be used as structural components of electric vehicles. Today's batteries are independent of the vehicle's structure and require heavy protective components. PSU's design would integrate the battery into structural components such as floor panels, reducing vehicle weight and increasing driving range.

Penn State University..... ARPA·E AWARDEE Booth 841

www.psu.edu

Engineering a Methane-to-Acetate Pathway for Producing Liquid Biofuels

Penn State University will engineer a biocatalyst that makes use of methane as a co-reactant to generate chemical precursors of liquid fuels. Unlike other conversion approaches, this approach will explore reversing a naturally occurring sequence of reactions that produces methane from acetate. If successful, Penn State's technology will enable cost-effective, energy-efficient, and carbon-efficient conversion of natural gas to liquid fuels.

Penn State University ..... ARPA·E AWARDEE Booth 1219

www.psu.edu

A Multi-Purpose, Intelligent, and Reconfigurable Battery Pack Health Management System

Pennsylvania State University is developing an innovative design for electric vehicle battery packs that can reroute power in real-time between cells. Compared to today's electric vehicle battery packs, this reconfigurable battery architecture will enhance battery safety and performance.

Phinix, LLC ..... ARPA·E AWARDEE Booth 1236

Subodh Das
skdas@phinix.net
www.phinix.net

Production of Primary Quality Magnesium and Al-Mg Alloys from Secondary Aluminum Scraps

Phinix will develop a new electrochemical cell technology that can recover high-quality magnesium from aluminum-magnesium scrap. This technology could lower costs, energy inputs, and emissions from magnesium production, expanding its use in transportation industries. By recovering and reusing aluminum-magnesium scrap, Phinix's technology could reduce the need for manufacturing new, expensive primary metals while developing a sustainable and low-cost advanced manufacturing process.

Plant Sensory Systems ..... ARPA·E AWARDEE Booth 1043

www.plantsensorysystems.com

Development of High-Output, Low-Input Energy Beets

Researchers at Plant Sensory Systems will produce an enhanced energy beet, optimized for biofuel production. These beets will be engineered to use fertilizer and water more efficiently and produce higher levels of fermentable sugars than most existing crops. If successful, the new crop would have a lower cost of production and increased yield of biofuels without competing against food-grade sugar.

PolyPlus Battery Company ..... ARPA·E AWARDEE Booth 532

www.polyplus.com

A Revolutionary Approach to High-Energy Density, Low-Cost Lithium-Sulfur Batteries

PolyPlus Battery Company and Johnson Controls will develop an innovative water-based, lithium-sulfur battery. Today, lithium-sulfur battery technology offers the lightest high-energy batteries that are completely self-contained. New features in these water-based batteries make PolyPlus's unique, lightweight battery ideal for a variety of military and consumer applications. If successful, this technology would be able to transition to a widespread commercial and military market.

Princeton Optronics, Inc. ..... ARPA·E AWARDEE Poster 5

Qing Wang
qwang@princetonoptronics.com
www.princetonoptronics.com

Development of a New Type of Laser Ignition System for Next Generation High Efficiency, Low Exhaust Emission Combustion Engines

The laser ignition will be done using high temperature Vertical Cavity Surface Emitting Laser (VCSEL) pumps solid state laser gain material, which would work at temperatures of 200°C and higher. We would develop an igniter delivering an energy of 10mJ/pulse with good beam quality which would be able to ignite the combustible mixture in the engine. Laser ignition is expected to improve the efficiency of the engines very significantly. In addition, the tailpipe emissions will decrease as a result of more complete combustion resulting in better air quality. Laser ignition will also allow other fuels such as natural gas and biogas to be adapted as fuels for automobiles, stationary power generation and other types of engines more readily.

Princeton University ..... ARPA·E AWARDEE Booth 1241

Dan Steingart
steingart@princeton.edu
www.princeton.edu

Fast, Aqueous Multiple Electron Ubiquitous Systems for Robust, Affordable Next Generation EV-Storage (FAMEUS RANGE)

Princeton University will develop unique alkaline battery chemistry for use in electric vehicles. Princeton's new technology uses abundant and inexpensive materials structured to enable a longer cycle life. If successful, Princeton's new alkaline chemistry could result in low-cost electric vehicle batteries that require minimal shielding and packaging.

Purdue University ..... ARPA·E AWARDEE Booth 1130

www.purdue.edu

Crash Safety of Batteries for Passenger Vehicle

Purdue University developed a lithium-ion electric vehicle battery pack that can better withstand impact during a collision. Unlike today's electric vehicle battery packs, Purdue's battery system absorbs shock from a collision and prevents battery failure while preserving the integrity of the pack.

QM Power, Inc. ..... ARPA·E AWARDEE Booth 1019

www.qmpower.com

Advanced Electric Vehicle Motors with Low or No Rare Earth Content

QM Power and its partners will develop a new type of electric motor with the potential to efficiently power future generations of advanced electric vehicles. Many of today's electric vehicle motors use expensive, imported rare earth magnets to efficiently provide torque to the wheels. In this project, QM Power and its team will develop a motor that does not use rare earth materials, but is light, compact, and potentially delivers more power than many vehicle motors with greater efficiency at less cost. Key innovations in this project include the use of a new motor design, addition of emerging materials, and the incorporation of advanced manufacturing techniques that substantially reduce costs of the motor.

Redox Power Systems..... ARPA·E AWARDEE **Booth 515**

Dr. Bryan Blackburn
bryan@redoxpowersystems.com
www.redoxpowersystems.com

Low Temperature Solid Oxide Fuel Cells for Transformational Energy Conversion

Redox Power Systems will develop a fuel cell with a mid-temperature operating target of 400°C while maintaining high power density and enabling faster cycling. Using a combination of oxide materials that have traditionally been unstable alone, a new two layer electrolyte configuration will allow these materials to be used in a manner that increases system power density while maintaining stability. Redox's new material configuration also allows the operating temperature to be reduced when incorporated into commercially fabricated fuel cells. The fuel cells will have a startup time of less than 10 minutes, making them more responsive to demand.

REL, Inc..... ARPA·E AWARDEE **Booth 1037**

Adam R Loukus, Ph.D.
adam@relinc.net
www.relinc.net

Fully and Intricately Conformable, Single-Piece, Mass-Manufacturable High-Pressure Gas Storage Tanks

REL will develop a low-cost, conformable natural gas tank for light-duty vehicles that has an internal foam core. Unlike normal hollow pressure vessels that are cylindrical, this internal foam design will allow tanks to be formed into any shape. The foam core will enable higher storage capacity than current carbon fiber tanks at one third the cost.

Rensselaer Polytechnic Institute..... ARPA·E AWARDEE **Booth 319**

www.rpi.edu

High-Voltage, Bi-Directional MOS-Gated SiC Power Switches for Smart Grid Utility Applications

Rensselaer Polytechnic Institute (RPI) will develop a new type of silicon-carbide switch for higher voltage transmission. RPI's innovative power switch employs a compact design that enables higher voltage switching with less material. This technology would reduce the cost of transmission infrastructure, improve grid reliability, and facilitate renewable technology deployment.

Rentricity Inc. ..... **Booth 1232**

Frank Zammataro
frankz@rentricity.com
www.rentricity.com

In-Pipe Hydropower

Rentricity has created an innovative and cost effective in-pipe hydropower system that provides clean electricity from gravity-fed water pipelines. These systems include a micro-turbine, generator, sensors, processors, electronic controls, and communications equipment that operate seamlessly and autonomously within water utility and industrial infrastructure. The technology manages pressure while creating clean energy for use on the grid or behind the meter in water utility and industrial facilities. In addition, the systems are integrated with existing control systems to provide system controls and real time power, flow, and pressure information to operations personnel. Additional applications include powering distributed treatment technology and energy storage systems.

Ricardo..... arpa·e AWARDEE **Booth 648**

SHOWCASE SUPPORTER

Marc Wiseman
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www.ricardo.com

Reducing Automotive Capex Barriers Through Design, Manufacturing and Materials

Ricardo is a global strategic, technical and environmental consultancy. The company employs over 2,100 professional engineers, consultants and scientists who are committed to delivering projects focused on leading innovation for engine, transmission, vehicle, hybrid and electrical systems, environmental forecasting and impact analysis. Our client list includes the world's major transportation original equipment manufacturers, supply chain organizations, energy companies, financial institutions and government agencies. Ricardo offers a unique combination of technical and strategic management capabilities to assist both established and early stage companies in product planning and developing fully integrated production solutions. Our capabilities cover all aspects of the product development cycle including market assessments, benchmarking, technology and cost road mapping, product design and manufacturing, and supply chain management. Ricardo is committed to delivering on time quality solutions to meet the most demanding expectations. Ricardo's U.S. operation is headquartered in Van Buren Township, MI, with offices in Illinois and in the heart of Silicon Valley.

RTI International ..... ARPA·E AWARDEE **Booth 1038**

Markus Leseman
mlesemann@rti.org
www.rti.org/page.cfm/Energy_Research

Compact, Inexpensive, Micro-Reformers for Distributed GTL

RTI International has partnered with MIT and Columbia University to demonstrate the feasibility of utilizing an internal combustion engine as a syngas generator in conjunction with methanol production. One challenge to small-scale gas conversion is matching the economics derived from the economies of scale in traditional chemicals processing. Utilizing mass produced internal combustion engines exemplifies substituting economies of scale with economies of mass production, in so doing advancing the notion of viable distributed fuel production. Methanol synthesis provides a reliable market entry that can be expanded to other products including FT liquids, DME, NH3, etc. The team will develop an integrated system combining the engine-based syngas generation with methanol production at a scale capable of producing 15 bbl/d of methanol. If successful, this technology will enable economic, distributed small-scale conversion of natural gas across many platforms.

RTI International ..... ARPA·E AWARDEE **Booth 1036**

Markus Lesemann
mlesemann@rti.org
www.rti.org

High Operating Temperature Transfer and Storage (HOTTS) System for Light Metal Production

Research Triangle Institute (RTI) is developing a thermal storage system for metal manufacturing facilities that can replace fossil fuels as a source of energy. RTI's technology uses a high-temperature heat-transfer system to store and transport thermal energy from a concentrated solar power system to a smelting reactor. If successful, RTI's system will enable the use of low-cost, renewable energy in domestic metals manufacturing.

SAFCell, Inc. ..... ARPA·E AWARDEE **Booth 324**

Calum R.I. Chisholm
calum.chisholm@safcell.com
www.safcell.com

Solid Acid Fuel Cell Stack for Distributed Generation Applications

SAFCell develops scalable solid acid fuel cell stacks for applications requiring tens of watts to tens of kilowatts. Operating at around 250°C, SAFCell's stacks tolerate fuel impurities that pose obstacles to lower temperature fuel cell technologies. This allows SAFCell stacks to run easily on commercially available fuels, while simultaneously reducing the overall fuel cell system complexity and cost.

Sandia National Laboratories ..... ARPA·E AWARDEE Booth 641

www.sandia.gov

Improved Power System Operations Using Advanced Stochastic Optimization

Market management systems (MMSs) are used to securely and optimally determine which energy resources should be used to service energy demand. Increased penetration of renewable energy resources increases the uncertainty of operating and market conditions, complicating decision making. Sandia National Laboratory will collaborate with Iowa State University, the University of California at Davis, Alstom Grid, and ISO New England to create probability-based decision-making software for MMSs that can account for the increased uncertainty while retaining overall grid reliability and market stability.

Sharp Laboratories of America ..... ARPA·E AWARDEE Booth 927

Wei Pan
wpan@sharplabs.com
www.sharplabs.com

A CPV/CSP Hybrid Solar Energy Conversion System With Full Use of Solar Spectrum

Sharp Labs of America will develop a hybrid solar converter that incorporates a partially transmitting mirror to reflect visible wavelengths of light to extremely high-efficiency solar cells while passing ultraviolet and most infrared light to heat a thermal fluid. The extremely high concentration of visible wavelengths of light would allow expensive solar cells to be used in an inexpensive converter. The converter could enable utilities to provide dispatchable, on-demand, solar electricity at low cost.

Sharp Laboratories of America ..... ARPA·E AWARDEE Booth 925

www.sharplabs.com

Low-Cost Sodium-Ion Battery to Enable Grid Scale Energy Storage: Prussian Blue-Derived Cathode and Complete Battery Integration

Sharp Laboratories of America (SLA) is developing a sodium-ion battery using low cost Prussian blue material. Long cycle life and low cost fabrication process have been demonstrated. Currently, SLA is working on scale up process with partners to ensure smooth transition from laboratory to manufacturing.

Sheetak, Inc. ..... ARPA·E AWARDEE Booth 1013

www.sheetak.com

Non-Equilibrium Asymmetic Thermoelectric (NEAT) Devices

This project will develop a high efficiency solid-state refrigeration compressor using a new thermoelectric material system known as Non-Equilibrium Asymmetric Thermoelectric (NEAT). It will use less energy than conventional compressors without using fluids with Global Warming Potential.

Sheetak, Inc. ..... ARPA·E AWARDEE **Booth 1013**

www.sheetak.com

Thermoelectric Reactors for Efficient Automotive Thermal Storage (TREATS)

Sheetak Inc. will develop a new HVAC (heating, ventilation, and air conditioning) system for electric vehicles to store the energy required for heating and cooling for electric vehicles (EVs). This system combines Sheetak's novel solid state thermoelectric energy converters to recharge the hot and cold battery while the vehicle is parked and while the electrical battery is being charged. These converters can also run on the electric battery and provide the required cooling and heating to the passengers, eliminating the need for a traditional compressor and inefficient heaters used in today's EVs.

SiEnergy Systems ..... ARPA·E AWARDEE **Poster 8**

Masaru Tsuchiya

masaru.tsuchiya@sienergysystems.com

www.sienergysystems.com

Direct Hydrocarbon Fuel Cell - Battery Hybrid Electrochemical System

SiEnergy Systems will develop a hybrid electrochemical system that uses a multi-functional electrode to allow the cell to perform as both a fuel cell and a battery, which is a capability that does not exist today. In fuel cell mode, the system will create electricity directly from hydrocarbon fuels. In battery mode, the system will provide storage capability that offers faster response to changes in power demand compared to a standard fuel cell. SiEnergy's technology will operate at relatively low temperatures of 300-500˚C, which makes the system more durable than existing high-temperature fuel cells.

Sila Nanotechnologies, Inc. ..... ARPA·E AWARDEE **Booth 431**

www.silanano.com

Doubling the Energy Density Anodes of Lithium-Ion Batteries for Transportation

Sila will develop an electric vehicle battery that doubles the capacity of today's Li-ion batteries. This technology uses low cost nano-composite materials that could cut energy storage cost in half or more. This cost reduction could accelerate electric vehicle adoption and decrease range anxiety associated with current electric vehicles.

Silicon Power Corporation ..... ARPA·E AWARDEE **Booth 219**

David Syracuse

David_Syracuse@siliconpower.com

www.siliconpower.com

Optically-Switched 15kV SiC Single-Bias High-Frequency Thyristor

Silicon Power Corporation will develop a semiconducting device that switches high power and high voltage electricity using optical signals. This device will use light to trigger control circuits or mechanisms more rapidly, greatly simplifying the control of high-voltage equipment. Unlike current switching mechanisms that predominately use silicon, this device employs silicon carbide. Using these switches could improve high-power motors and renewable energy technologies such as wind and solar generators.

SixPoint Materials, Inc. ..... ARPA·E AWARDEE Booth 417

www.spmaterials.com

GaN Homoepitaxial Wafers by Vapor Phase Epitaxy on Low-Cost, High-Quality Ammonothermal GaN Substrates

SixPoint Materials will create low-cost, high-quality vertical gallium nitride (GaN) substrates using a multi-phase production approach that employs both hydride vapor phase epitaxy (HVPE) technology and ammonothermal growth techniques to lower costs and maintain crystal quality. Substrates are thin wafers of semiconducting material needed for power devices. In its two-phase project, SixPoint Materials will first focus on developing a high-quality GaN substrate and then on expanding the substrate's size. If successful, SixPoint Materials will enable high-power GaN circuits that can convert power for electric motors and electric vehicles with half the energy loss compared to today's GaN devices.

Smart Wires ..... ARPA·E AWARDEE Booth 1237

Michael Granstein
michael.grabstein@smartwiregrid.com
www.smartwires.com

Distributed Power Flow Control Using Smart Wires for Energy Routing

Over 660,000 miles of transmission line exist within the continental United States with roughly 33% of these lines experiencing significant congestion. This congestion exists while, on average, only 45-60% of the total transmission line capacity is utilized. A team led by startup company Smart Wire Grid will develop a solution for controlling power flow in the transmission grid to better take advantage of the unused capacity. The power controller will be a "smart wire" that incorporates advanced control software, sensors, and communications technologies.

Solid Power, Inc. ..... ARPA·E AWARDEE Booth 1041

www.solidpowerbattery.com

An Ultra High Energy, Safe and Low Cost All Solid-State Rechargeable Battery for Electric Vehicles

Solid Power will develop a new low-cost, all-solid-state battery for electric vehicles with improved energy density and safety than with conventional lithium-ion batteries. Solid Power's liquid-free cells use non-flammable and non-volatile materials that result in greater stability in the event of a collision or elevated temperature. Additionally, the use of low-cost, abundant materials in Solid Power's battery construction will result in lower material costs.

Soraa, Inc. ..... ARPA·E AWARDEE Booth 415

www.soraa.com

Large-Area, Low-Cost Bulk GaN Substrates for Power Electronics

Soraa is developing a cost-effective technique to manufacture superior, high-quality, high-performance gallium nitride (GaN) crystal substrates for power electronics and LEDs. Substrates are thin wafers of semiconducting material needed for power devices like transistors and integrated circuits. The new approach could enable GaN substrates with 100x fewer defects, 8x lower cost, and 2-4x larger diameter than conventional GaN substrates.

Soraa, Inc. ..... ARPA·E AWARDEE Booth 415

www.soraa.com

Ammonothermal Bulk GaN Crystal Growth for Energy Efficient Lighting and Power Electronics

Soraa is developing a new, scalable method for cost-effective manufacturing of bulk gallium nitride (GaN) substrates. We have demonstrated 2-inch crack-free GaN crystals and wafers with 100x lower defect densities than conventional bulk GaN substrates. The improved LED and power electronics applications enabled by these substrates represent markets of more than $30 billion per year and could reduce electricity consumption by 30 percent..

Southern Research Institute ..... Booth 1123

Ryan Melsert
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www.southernresearch.org

Novel High-Temperature Calcium-Based Thermochemical Energy Storage System

Southern Research Institute has developed a novel high-temperature calcium-based thermochemical energy storage system that is able to isothermally store thermal energy throughout the 600-900°C temperature window, at a very high volumetric energy density (0.8-1.0 MWhr/m3), and at a very low cost (~$13-15/kWhr thermal). This storage system can be integrated with concentrating solar power (CSP) or industrial facilities to dynamically store high-temperature thermal energy.

Southwest Research Institute ..... ARPA·E AWARDEE Booth 949

Jeff Xu
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www.swri.com

Novel SOC and SOH Estimation Through Sensor Technology

Southwest Research Institute has developed a new way to analyze lithium-ion battery capacity and health through tracking physical expansion and contraction of batteries during charge/discharge and modified drive cycles. The technology also provides a viable means to improve energy storage safety concerns.

Space Orbital Services ..... ARPA·E AWARDEE Poster 4

Ronald Clark
RN.CLARK1@GMAIL.COM

Low Temperature Methane Conversion Through Impacting Common Alloy Catalysts

Space Orbital Services, in conjunction with SRI International, is conducting laboratory-based, small-scale research to develop a methane conversion technology that employs unconventional chemistry at relatively low temperature, based on impacting a common alloy catalyst. The project uses laboratory experiments to establish, measure and refine operational parameters including conversion rates and efficiency, reaction products, and reactor design.

SRI International

SRI International ..... ARPA·E AWARDEE Booth 523

Marcy Berding
martha.berding@sri.com
www.sri.com

Direct Low-Cost Production of Titanium Alloys

SRI International is developing an advanced thermal chemical reactor that converts titanium and other metal chlorides to titanium alloys in a single step. The reaction between hydrogen and metal chlorides to produce titanium alloys would eliminate a series of expensive and energy-intensive melting steps used in current conversion processes. If successful, SRI's process will reduce the cost, energy consumption, and carbon dioxide emissions associated with titanium alloy production.

Stanford University ..... ARPA·E AWARDEE Booth 227

www.stanford.edu

Robust Multifunctional Battery Chassis Systems for Automotive Applications

Stanford University will develop a battery that becomes a structural component of the vehicle chassis that protects the batteries in the event of a collision. Today's batteries are independent of the vehicle's structure and require heavy protective components. By serving as a structural component, Stanford's battery system could reduce vehicle weight, resulting in increased driving range.

Stanford University ..... ARPA·E AWARDEE Booth 449

Carrie Armel
kcarmel@stanford.edu
peec.stanford.edu/energybehavior/about.php

Large-Scale Energy Reductions through Sensors, Feedback, and Information Technology

The goal of this initiative is to develop a comprehensive human-centered solution that leverages the widespread diffusion of energy sensors to significantly reduce and shift energy use. Our initiative has four parts: (1) analytics and a technology platform that enables behavioral programs to be implemented at scale; (2) behavioral interventions to reduce and shift energy use; (3) data evaluation and modeling to assess program effectiveness; and (4) an extensible energy communication network to enable future innovation. The behavioral interventions include media (e.g., Facebook applications), policy (behavioral economic incentive programs), and community (e.g., Girl Scout curriculum).

Stanford University radCool ..... ARPA·E AWARDEE Booth 1119

Aaswath Raman
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www.stanford.edu/group/fan

Photonic Radiative Cooling

Stanford University will develop a coating for the rooftops of buildings and cars that reflects sunlight and allows heat to escape, enabling passive cooling, even when the sun is shining. This device requires no electricity and would reduce the need for air conditioning, leading to energy and cost savings.

SUNPOWER

SunPower Corporation ..... ARPA·E AWARDEE **Booth 940**

Kristin Bunner
Kristin.Bunner@sunpower.com
www.sunpower.com

Scalable Submodule Power Conversion for Utility-Scale Photovoltaics

SunPower Corporation has researched and developed a prototype of a new electronic technique for improving the output of solar panels. The technique is specifically aimed at large solar power plants, where many solar panels are connected together. The new technology is "differential power processing," or DPP. The DPP technique involves correcting for the power differences that inherently occur when two solar modules, encountering different amounts of sun, are connected together. The DPP approach is particularly helpful in self-shading applications.

SUSTAINABLE ENERGY SOLUTIONS

Sustainable Energy Solutions (SES) ..... ARPA·E AWARDEE **Booth 919**

Kyler Stitt
K.Stitt@SESinnovation.com
www.sesinnovation.com

Cryogenic Carbon Capture

Cryogenic Carbon Capture is a game-changing, post-combustion technology that can capture carbon at less than $40/ton and less than 15% parasitic load. In addition to these benefits it can provide grid-scale energy storage allowing for near zero parasitic load during peak demand hours and better adoption of intermittent renewables. The technology is currently being tested at several industrial plants.

TECHNOLOGY HOLDING

Technology Holding LLC ..... **Booth 1230**

Mukund Karanjikar
Mukund@tekholding.com
www.tekholding.com

Novel Process for Natural Gas Conversion

Technology Holding LLC in partnership with Rice University has a NSF funded program constitutes to convert methanol to hexanoic acid, an excellent feedstock for a number of polymers and drop-in fuels, with the project serving the objectives of REMOTE program of ARPA-E. There is an abundance of natural gas in the United States. The proposed innovation will enable economic and distributed conversion of methanol to industrial chemicals. Current direct market uses of hexanoic acid include artificial flavors, rubber chemicals, varnish driers, resins and pharmaceuticals. It can be converted to hexene, caprolactam (nylon feedstock).

Texas A&M Engineering Experiment Station (TEES) ..... ARPA-E AWARDEE Booth 528

Dean Schneider
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smartgridcenter.tamu.edu/ratc/web

Robust Adaptive Topology Control (RATC)

The RATC research team is using topology control as a mechanism to improve system operations and manage disruptions within the electric grid. The grid is subject to interruption from cascading faults caused by extreme operating conditions, malicious external attacks, and intermittent electricity generation from renewable energy sources. The RATC system is capable of detecting, classifying, and responding to grid disturbances by reconfiguring the grid in order to maintain economically efficient operations while guaranteeing reliability. The RATC system would help prevent future power outages, which account for roughly $80 billion in losses for businesses and consumers each year. Minimizing the time it takes for the grid to respond to expensive interruptions will also make it easier to integrate intermittent renewable energy sources into the grid.

Texas A&M Engineering Experiment Station (TEES) ..... ARPA-E AWARDEE Booth 1117

http://tees.tamu.edu/

Generating Electricity from Waste Heat Using Metal Hydrides

Texas A&M Engineering Experiment Station of San Antonio, TX, with support from Ergenics of Ringwood, NJ, is developing a system to generate electricity from low-temperature waste heat. The system cycles between heating and cooling a metal hydride to produce a flow of high-pressure hydrogen. This hydrogen flow is then used to generate electricity via a turbine and generator.

Texas A&M University ..... ARPA-E ALUMNI Booth 812

Dr. Hongcai Joe Zhou
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www.chem.tamu.edu/rgroup/zhou

System Development for Vehicular Natural Gas Storage Using Advanced Porous Materials

Texas A&M University will develop highly adsorbent materials for low-pressure natural gas storage tanks. These low cost materials enable low-pressure natural gas to efficiently adhere to their engineered porous structures, storing gas at very high energy densities.

Texas A&M University ..... ARPA·E AWARDEE Booth 749

Joshua S. Yuan
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agriliferesearch.tamu.edu

Synthetic Crop for Direct Biofuel Production Through Re-Routing the Photosynthesis Intermediates and Engineering Terpenoid Pathways

Texas A&M University will address a major inefficiency of photosynthesis, the process used by green plants to capture light energy. Specifically, the team will redirect otherwise wasted energy in plants into energy-dense fuel molecules. The fuel will be readily separated from the plant biomass through distillation.

ThermoLift, Inc. ..... Booth 1125

Paul Schwartz
pschwartz@tm-lift.com
www.tm-lift.com

ThermoLift - The Ultimate Heat Pump

ThermoLift, Inc. is developing a novel natural gas driven, compressor-less, heat pump and air conditioner technology that will provide a 30-50% reduction in fuel consumption. The device provides superior performance for hot and cold-weather climates, including heating, air conditioning and hot water (HAC-HW) in one device. ThermoLift has been awarded three separate grants ($1.3M), two from the New York State Energy and Research Development Authority and one from the U.S. Department of Energy. ThermoLift has a multi-disciplinary technical team and is based out of the Advanced Energy Research and Technology Center (AERTC) located on Stony Brook University campus.

Titanium Metals Corp. ..... ARPA·E AWARDEE Booth 1137

www.timet.com

A Vision of an Electrochemical Cell to Produce Clean Titanium

Titanium Metals Corporation (TIMET) will use a multi-step system that converts titanium ores to titanium using a series of thermo- and electro-chemical processes. Today, the widespread adoption of titanium, a versatile and durable structural metal, has been limited in advanced energy and consumer applications due to costly and energy-intensive production methods. If successful, TIMET's new technique will significantly reduce energy consumption and CO_2 emissions for titanium production and at a fraction of the total cost, making it widely available for energy, industrial and advanced aerospace applications.

Topology Control Algorithms (TCA) ..... ARPA·E AWARDEE **Booth 536**

Pablo A. Ruiz
paruiz@ieee.org
www.topologycontrol.com

Transmission Topology Control for Infrastructure Resilience to the Integration of Renewable Generation

Power flow on the transmission network follows the path of least resistance and not necessarily in proportion to a transmission facility's capacity. Without the capability to optimize power flow, some transmission lines are frequently congested, while most of the remaining system has spare capacity. Transmission congestion costs electricity consumers billions every year and causes curtailment of renewables, such as wind and solar. TCA has developed fast topology optimization algorithms that enable near real time identification and control of transmission network reconfigurations to improve power flow. This technology allows for flexible system operation and planning to relieve congestion, minimize generation dispatch cost, and increase system reliability in an overload or contingency situation. An impact study with the PJM Interconnection estimated that the incorporation of topology optimization in their network results in over $100M in annual savings in the real time markets - by identifying and routing power away from congested facilities to uncongested parts of the system. TCA's topology optimization technology benefits power system and market operators and planners across a range of activities: Network Expansion & Retirement Planning, Maintenance Outage Scheduling, Unit Commitment and Economic Dispatch, and Contingency & Overload Response.

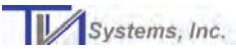
transphorm

Transphorm, Inc...... ARPA·E AWARDEE **Booth 440**

www.transphormusa.com

Four-Quadrant GaN Switch Enabled Three-Phase Grid-Tied Microinverters

Transphorm will develop a robust, cost effective, high efficiency power transforming device that will be integrated into solar panels. This technology is based on innovative high performance architecture, called a four quadrant switch, enabling a single semiconductor device to switch voltage and current in both directions. It will be made with an advanced semiconductor device material, Gallium Nitride (GaN). The four quadrant design will result in reduced losses and higher efficiency. This "plug-n-use" technology will enable reliable power transfer from solar panels to the grid and revolutionize photovoltaic deployment in commercial establishments and solar farms.



TVN Systems, Inc. ..... ARPA·E AWARDEE Booth 1112

Guangyu Lin
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www.tvnsystems.com

Hydrogen-Bromine Electrical Energy Storage System

The hydrogen-bromine flow battery is an excellent candidate for large-scale energy storage due to its fast kinetics, fully reversible electrodes and low chemical costs. However, today's conventional hydrogen-bromine flow batteries use very expensive membrane materials (such as Nafion®) and platinum catalyst that can be poisoned and corroded when exposed to HBr and Br2. TVN Systems is developing an advanced H2-Br2 flow battery with reduced cost and increased durability for energy storage. Teaming up with research groups at Vanderbilt University, The University of Kansas, Northeastern University and Lawrence Berkeley National Laboratory, we have successfully developed (a) new composite membranes with higher perm-selectivity at a fraction of the cost of conventional membranes; (b) new catalysts possessing excellent activity and durability in HBr/Br2 environment; (c) novel electrode/cell designs with superior cell performance. The advanced hydrogen-bromine flow battery features low-cost, high-power, high-efficiency, long lifespan and simple system design. It will enable deployment of renewable energy technologies throughout the grid.

UHV Technologies, Inc. ..... ARPA·E AWARDEE Booth 1042

Nalin Kumar
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www.nanoranch.com

Low-Cost High Throughput In-Line X-Ray Fluorescence Scrap Metal Sorter

UHV Technologies has developed an innovative X-ray fluorescent sorting technology that can distinguish multiple grades of scrap metals including different types of aluminum alloys. UHV's sorting technology will enable recycling of typically discarded light metal scrap by analyzing the electromagnetic spectrum emitted from scrap metal to enable identification.

United Technologies Research Center ..... ARPA·E AWARDEE Booth 441

David Tew
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www.utrc.utc.com

Development of an Intermediate Temperature Metal-Supported Proton-Conducting Solid Oxide Fuel Cell Stack

UTRC, Caltech, the University of Maryland and the University of Connecticut are developing the "core" component of a highly-efficient (>50% electric-only) residential combined heat and power system--an intermediate temperature (500°C) metal-supported proton conducting solid oxide fuel cell stack with an integral natural gas fuel processor.

United Technologies Research Center

United Technologies Research Center ..... ARPA·E AWARDEE **Booth 437**

Catherine Thibaud-Erkey
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www.utrc.utc.com

Thermal Storage Using Hybrid Vapor Compression Adsorption System

United Technologies Research Center (UTRC) will develop a hybrid vapor compression adsorption systems with thermal storage. The hybrid system will efficiently store thermal energy, and will be lighter and more compact compared to current heating and cooling systems. The team will use a unique approach of adsorbing a refrigerant on a metal salt, which has a high mass and volumetric capacity tailored to the refrigerant. The proposed project outcome will be a hot and cold battery that provides comfort to the passengers with minimum electricity utilization from the electric batteries during the drive cycle. This would extend the driving range of the electric vehicles or plug-in hybrid electric vehicles.

United Technologies Research Center

United Technologies Research Center ..... ARPA·E AWARDEE **Booth 439**

Dr. Ellen Sun
suney@utrc.utc.com
www.utrc.utc.com

Low Cost Hybrid Materials and Manufacturing for Conformable CNG Tanks

United Technologies Research Center will engineer a low-cost natural gas tank for light-duty vehicles using modular designs and low-cost construction materials, allowing tanks to be manufactured into shapes that easily fit into the tight spaces of light duty vehicles. This modular design will replace today's bulky storage tanks in light duty vehicles at a lower cost and without sacrificing driving range.

United Technologies Research Center

United Technologies Research Center ..... ARPA·E AWARDEE **Booth 443**

www.utrc.utc.com

Additive Manufacturing of Optimized Ultra-High Efficiency Electric Machines

United Technologies Research Center will use additive manufacturing to develop an ultra-high efficiency electric motor for automobiles. Additive manufacturing uses a laser to deposit copper and insulation layer by layer, instead of winding wires. The resulting motors will reduce electricity use and will require less rare earth material. This project will also examine the application of additive manufacturing more widely for energy systems.

UCDAVIS DEPARTMENT OF CHEMISTRY

University of California, Davis ..... ARPA·E AWARDEE **Booth 840**

www.ucdavis.edu

Biological Conversion of Ethylene to N-butanol

The University of California, Davis (UCD) will engineer new biological pathways for bacteria to convert ethylene to a liquid fuel. Currently, ethylene is readily available and used by the chemicals and plastics industries to produce a wide range of useful products, but it cannot be converted to fuels economically. If successful, UCD's new biocatalyst would enable cost-effective conversion of ethylene into an existing infrastructure-compatible fuel.

University of California, Berkeley ..... ARPA·E AWARDEE **Booth 843**

Thomas McDonald
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www.berkeley.edu

Developing Metal-Organic Frameworks as Adsorbents for Industrial Carbon Capture Applications

New high-throughput synthesis technology is developed and employed to generate robust metal-organic frameworks (MOFs) for the efficient capture of CO_2 from flue gas. MOFs represent a new class of porous materials holding great promise as solid sorbents capable of selectively binding CO_2 with a minimal energy penalty for regeneration. The best resulting materials are taken forward towards a scalable CO_2 capture process.

UCLA

University of California, Los Angeles..... ARPA·E AWARDEE **Booth 848**

www.ucla.edu

Safe Aqueous-Based High-Performance Electrochemical Energy Storage

The University of California, Los Angeles (UCLA) will develop a new acid-based, high-power, long-life battery that addresses the cycle life issues plaguing lead-acid batteries today. UCLA's battery could be combined with longer-range electric vehicle batteries to create a hybrid system that provides the power necessary for immediate response and acceleration. Additionally, this acid-based battery could also enable widespread adoption of start/stop technology that shuts vehicles off when stopped to improve efficiency.

UCLA

University of California, Los Angeles..... ARPA·E AWARDEE **Poster 15**

www.ucla.edu

Fuel Cells with Dynamic Response Capability Based on Energy Storage Electrodes with Catalytic Function

The University of Los Angeles (UCLA) will develop a low-cost, intermediate-temperature fuel cell that will also function like a battery to increase load-following capability. The fuel cell will use new metal-oxide electrode materials with superior energy storage capacity and cycling stability, making it ideal for distributed generation systems. UCLA's new materials also have high catalytic activity, which will lower the cost of the overall system.

UCLA

University of California, Los Angeles..... ARPA·E AWARDEE **Booth 1224**

Richard Wirz
wirz@ucla.edu
www.wirz.seas.ucla.edu

Thermal Energy Storage With Supercritical Fluids

This project demonstrates the lowest-cost solutions for thermal energy storage by considering new fluids that provide an overall cost-effective system for medium- to large-scale energy storage. Key to our technology is the use of low-cost, abundant fluids that exhibit thermal advantages in sensible, latent, and thermochemical energy storage. This approach provides thermal energy storage solutions that exceed the DOE SunShot target of $15/kWh-t, with simple thermal battery configurations that provide consistent and reliable performance for the 20-30 year system life.

UCLA

University of California, Los Angeles ..... ARPA·E AWARDEE **Booth 836**

Avinash Srivastava
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www.seas.ucla.edu/~liaoj

Energy Plant: High Efficiency Photosynthetic Organisms

The University of California, Los Angeles is re-engineering the plants so that they can be more energy efficient. The team will streamline the process by determining which green plants convert carbon dioxide into sugar or biofuels. This technology could then be applied broadly, for example, to crop plants to improve yields of grain and biomass.

UCLA

University of California, Los Angeles Chemical and Biomolecular Engineering Department ..... ARPA·E AWARDEE **Booth 838**

Igor Bogorad
igor.bogorad@gmail.com
www.seas.ucla.edu/~liaoj/

High Efficiency Methanol Condensation Cycle (MC2)

Methanol is an important intermediate in the utilization of natural gas for synthesizing other feedstock chemicals. Typically, chemical approaches for building C–C bonds from methanol require high temperature and pressure. Biological conversion of methanol to longer carbon chain compounds is feasible; however, the natural biological pathways for methanol utilization involve carbon dioxide loss or ATP expenditure. Here we demonstrated a biocatalytic pathway, termed the methanol condensation cycle (MCC), by combining the nonoxidative glycolysis with the ribulose monophosphate pathway to convert methanol to higher-chain alcohols or other acetyl-CoA derivatives using enzymatic reactions in a carbon conserved and ATP-independent system. We confirmed that the pathway forms a catalytic cycle through 13C-carbon labeling. With a cell-free system, we demonstrated the conversion of methanol to ethanol or n-butanol. The high carbon efficiency and low operating temperature are attractive for transforming natural gas-derived methanol to longer-chain liquid fuels and other chemical derivatives.

UC San Diego

University of California, San Diego ..... ARPA·E AWARDEE **Booth 743**

Yu Qiao
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mmrl.ucsd.edu

Developing Low-Cost, Robust, and Multifunctional Battery System for Electric Vehicles – A Non-Chemical Approach

The University of California, San Diego (UCSD) will develop a Li-ion battery that is thermal-runaway free. Thermal runaway retardation or shutdown mechanisms would begin to function as the battery cell is damaged. This technique is compatible with most battery chemistry.

UC San Diego

University of California, San Diego ..... ARPA·E AWARDEE **Poster 1**

Sungho Jin
jin@ucsd.edu
www.ucsd.edu

Novel Electrolytes Via Compressed Gas Solvent for Higher Voltage

The University of California at San Diego (UCSD) is developing advanced electrochemical energy storage systems to meet the demands of high energy and power density over a wide temperature range. Unlike many common traditional electrochemical energy storage systems, UCSD will use unique cell components that are safe, more efficient and readily available for energy storage devices. Initial results show promising trends toward high voltage operation, enabling increased energy densities in batteries and electrochemical capacitors. The UCSD team will perform analysis of electrochemical behavior of these novel materials and structures for enhanced understanding of the electrochemical mechanisms involved, and demonstrate the energy storage and cycling capabilities of the improved structures in electrochemical cells.

UCSB

University of California, Santa Barbara..... ARPA·E AWARDEE **Booth 737**

www.ucsd.edu

Current Aperture Vertical Electron Transistor Device Architectures for Efficient Power Switching

The University of California, Santa Barbara (UCSB) will develop several new vertical gallium nitride (GaN) semiconductor technologies that will enhance the performance and reduce the cost of high-power electronics. The team's current aperture vertical electron transistor devices could reduce power losses and reach beyond the performance of lateral GaN devices when switching and converting power. If successful, UCSB's devices will enable high-power conversion at low cost in motor drives, electric vehicles, and power grid applications.

UCSB

University of California, Santa Barbara..... ARPA·E AWARDEE **Booth 739**

www.ucsb.edu

Highly Powerful Capacitors Boosted with Both Anolyte and Catholyte

The University of California at Santa Barbara will develop an energy storage device for hybrid electric vehicles that combines the properties of capacitors and batteries into one technology. This energy storage device could charge within minutes, extend driving range, and have a longer life expectancy compared to today's electric vehicle batteries.

University of Colorado **Boulder**

University of Colorado, Boulder..... ARPA·E AWARDEE **Booth 943**

Dragan Maksimovic
maksimov@colorado.edu
www.colorado.edu

Wafer-Level Sub-Module Integrated DC/DC Converter

The University of Colorado team will develop and demonstrate advanced power conversion technologies at a small scale, suitable for integration into solar panels. The technology is based on very fast switching configurations employing low-loss power transforming devices. The power conversion devices will yield significantly improved energy capture in solar power systems and can be embedded in panels of all types – crystalline, laminate, or flexible.

University of Colorado **Boulder**

University of Colorado, Boulder..... ARPA·E AWARDEE **Booth 1014**

www.colorado.edu

Carbothermal Reduction Process for Producing Magnesium Metal using a Hybrid Solar/Electric Reactor

The University of Colorado will develop a new gasification process that uses concentrated solar power to produce magnesium and synthesis gas (syngas), a precursor for synthetic gasoline. The University of Colorado is using a novel quenching process to enable a gas-to-solid magnesium phase change. Current magnesium production is energy intensive and produces substantial carbon dioxide emissions. The University of Colorado's multi-faceted, renewable-energy-powered approach t magnesium production could reduce carbon dioxide emissions and lower costs, while also creating a synthetic fuel.

University of Colorado **Boulder**

University of Colorado, Boulder..... ARPA·E AWARDEE **Booth 1012**

Staci Van Norman

staci.vannorman@colorado.edu

www.colorado.edu

Low Cost Microtubular ALD-based Reactor System for Catalytic Reforming

The University of Colorado Boulder will use nanotechnology to improve the structure of gas-to-liquids catalysts, increasing surface area and improving heat transfer compared to current catalysts. The new structure of these catalysts would be used to create a small-scale reactor, for converting natural gas to liquid fuels, which could be located at remote sources of gas.

UNIVERSITY OF DELAWARE

University of Delaware ..... ARPA·E AWARDEE **Booth 935**

www.udel.edu

Synthetic Methylotrophy to Liquid Fuel

The University of Delaware seeks to engineer a synthetic methylotrophic organism to utilize new metabolic pathways to convert methanol into butanol while recapturing and reusing generated carbon dioxide. Unlike current bioconversion processes, The University of Delaware's technology offers greater efficiency without carbon dioxide emissions during the conversion of methanol to butanol, an infrastructure-compatible liquid transportation fuel.

UNIVERSITY OF DELAWARE

University of Delaware ..... ARPA·E AWARDEE **Booth 1027**

www.udel.edu

High-Voltage and Low-Crossover Redox Flow Batteries for Economical and Efficient Renewable Electricity Storage

The University of Delaware will develop a low-cost, water-based, flow battery that uses membrane technology to increase voltage and energy storage capacity. Flow batteries store chemical energy in external tanks instead of within the battery container. If successful, this flow battery would surpass the DOE 2015 cost targets for stationary energy storage and facilitate the adoption and deployment of renewable energy technology.

University of Florida ..... ARPA·E AWARDEE Booth 514

www.ufl.edu

A New Generation Solar and Waste Heat Power Absorption Chiller

This project will develop a next generation solar and waste heat powered absorption chiller and refrigeration system that is an order of magnitude smaller than the existing systems with a significantly reduced cost. We have also developed a membrane-based dehumidifier than can use the ambient moisture energy for domestic water heating when needed. The liquid absorbent-based dehumidifier can be used in residential buildings and light commercial buildings.

University of Florida ..... ARPA·E AWARDEE Booth 542

www.ufl.edu

Commercial Production of Terpene Biofuels in Pine

The University of Florida project will increase the production of turpentine, a natural liquid biofuel isolated from pine trees. The pine tree developed for this project is designed both to increase the turpentine storage capacity of the wood and to increase turpentine production from 3% to 20%. The fuel produced from these trees would become a sustainable domestic biofuel source able to produce 100 million gallons of fuel per year from less than 25,000 acres of forestland.

University of Houston ..... ARPA·E AWARDEE Booth 818

www.ee.uh.edu/faculty/yao

Advanced Aqueous Batteries

The University of Houston (UH) will develop a battery using a novel water-based chemistry that makes use of sustainable, low-cost, high-energy, organic materials. UH's new batteries will meet today's performance standards, while minimizing the potential impact of battery failure, thus offering manufacturers greater flexibility with regard to vehicle design.

University of Houston ..... ARPA·E AWARDEE Booth 433

www.uh.edu

High-Performance, Low-Cost Superconducting Wires and Coils for High Power Wind Generators

The University of Houston will develop a new, low-cost superconducting wire that can be used in future advanced wind turbine generators. All generators contain coils of wire (usually made of copper) that conduct electricity. A "superconducting" wire can transport hundreds of times more electric current than a similarly-sized copper wire, and can be used to make a wind turbine generator lighter, more powerful, and more efficient. However, the use of superconducting wire has traditionally been too expensive to use in wind generators. In this project, the team will develop a high-performance superconducting wire and will demonstrate an advanced manufacturing process that, if successful, has the potential to yield a several-fold reduction in wire costs, making superconducting wind generators more practical for widespread deployment.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

University of Illinois at Urbana-Champaign.... ARPA·E AWARDEE Booth 329

www.illinois.edu

Cyber-Physical Modeling and Analysis for a Smart and Resilient Grid

The University of Illinois at Urbana-Champaign will develop grid modeling, monitoring, and analysis tools that increase the resiliency and reliability of the grid during cyber attacks. Electrical infrastructure modeling will be combined with cyber analysis to examine the impact of failures and malicious threats to grid infrastructure. These tools and analysis could lead to higher reliability, improved efficiency, and facilitate renewable technology deployment.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

University of Illinois at Urbana-Champaign.... ARPA·E AWARDEE Booth 914

www.igb.illinois.edu/petross

Engineering Hydrocarbon Biosynthesis and Storage Together with Increased Photosynthetic Efficiency into the Saccharinae

Demand for biofuels is rapidly increasing, but future growth of biofuels needs to come from domestically produced feedstock other than corn and soybeans. The Plants Engineered to Replace Oil with Sugarcane and Sweet Sorghum (PETROSS) project is engineering sugarcane and sweet sorghum into ultra-productive biofuel crops with significantly higher yields and profit margins than any existing biofuel crop, via the following components: 1) producing and storing oil in the stem in place of sugar, 2) increasing leaf and crop photosynthesis by up to 50%, 3) increasing the cold tolerance by hybridizing Miscanthus with sugarcane and sorghum.

UNIVERSITY OF MARYLAND
Energy Research Center

University of Maryland..... ARPA·E AWARDEE Booth 519

www.umd.edu

Hybridized Mg2+/H+ Aqueous Battery for Vehicle Electrification

The University of Maryland (UMD) will use water-based magnesium and hydrogen chemistries to improve the energy density and reduce the cost of an electric vehicle battery. Current aqueous batteries have greater volume and weight compared to lithium-ion batteries, making them unsuitable for use in electric vehicles. If successful, UMD's aqueous battery would achieve the performance standards of lithium-ion batteries.

UNIVERSITY OF MARYLAND
Energy Research Center

University of Maryland..... ARPA·E AWARDEE Booth 516

www.umd.edu

Thermoelastic Cooling

This project will demonstrate the commercial viability of solid state thermoelastic shape memory alloy for space cooling using a 0.01-ton prototype intended to replace conventional vapor compression cooling technology. It will not use fluids with high Global Warming Potential and will have a smaller operational footprint than conventional vapor compression technology.

UNIVERSITY OF MARYLAND
Energy Research Center

University of Maryland ..... ARPA·E AWARDEE Poster 3

Dr. Michael Ohadi
ohadi@umd.edu
www.umd.edu

A Case Study on the Impact of Additive Manufacturing for Heat/Mass Transfer Equipment Used for Power Production

The University of Maryland (UMD) will leverage recent advances in additive manufacturing to develop next-generation air-cooled heat exchangers (HX), with the long-term goal of reducing or potentially eliminating water consumption in traditional thermoelectric power plant cooling systems. The UMD team will assess the performance and cost of state-of-the-art technology, including manufacturing processes involved. They will then model and run computer simulations on many different novel HX designs that can radically enhance air-side heat transfer, eventually down-selecting to two. Ultimately, the team will create and test the two selected one kilowatt prototype designs.

UNIVERSITY OF MARYLAND
Energy Research Center

University of Maryland Energy Research Center ..... ARPA·E AWARDEE Booth 517

Dr. Eric Wachsman
ewach@umd.edu
www.energy.umd.edu

Safe, Low-Cost, High-Energy-Density, Solid-State Li-Ion Batteries

The University of Maryland (UMD) will develop ceramic materials and processing methods to enable high-power, solid-state, lithium-ion batteries. While most lithium-ion batteries are liquid based, solid-state batteries have a greater abuse tolerance that reduces the need for heavy protective components. UMD will leverage multi-layer ceramics processing methods to produce a solid-state battery pack with lower weight and longer life.

University *of* Massachusetts Amherst

University of Massachusetts, Amherst ..... ARPA·E AWARDEE Booth 740

www.cns.umass.edu/timbr

Development of a Dedicated, High-Value Biofuels Crop

The University of Massachusetts, Amherst will develop an improved oilseed crop that uses carbon more efficiently than traditional crops. The plant will incorporate features that significantly improve photosynthesis and also allow the plant to produce useful, high-energy fuel molecules directly within leaves and stems, in addition to seeds. This will allow a substantial increase in production of fuel per acre of planted land.

University of Michigan — ARPA-E AWARDEE — Booth 1024

Stephen W. Ragsdale
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www.umich.edu

Anaerobic Bioconversion of Methane to Methanol

The University of Michigan will create a biological approach to activate methane, which is the first step in producing a liquid fuel from natural gas. Current approaches to methane activation require the addition of energy and oxygen, but the University of Michigan will engineer a methane-activation pathway inside of a methanogenic, or methane generating, microorganism that eliminates the need for supplemental inputs. If successful, the University of Michigan's biocatalyst will convert natural gas to a liquid fuel in a manner that is more efficient and cost effective than existing biological processes.

University of Minnesota — ARPA-E AWARDEE — Booth 239

Jian-Ping Wang
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www.umn.edu

Synthesis and Phase Stabilization of Body Center Tetragonal (BCT) Metastable Fe-N Anisotropic Nanocomposite Magnet- A Path to Fabricate Rare-Earth-Free Magnet

A joint University of Minnesota and Oak Ridge National Laboratory interdisciplinary team aggressively developed an early stage prototype of bulk iron-nitride permanent magnet material. This new material has the potential to be the "holy grail" of magnets as the highest energy density magnet from earth abundant raw materials. This project will provide the basis for an entirely new class of rare earth free magnets for electric vehicle and wind turbine applications capable of eliminating the need for costly and scarce rare earth materials. The ultimate goal of this project is to demonstrate magnetic properties on a prototype bulk magnet exceeding state-of-the-art commercial magnets.

University of Minnesota — ARPA-E AWARDEE — Booth 337

www.umn.edu

Flexible Molecular Sieve Membranes

The University of Minnesota will develop an ultra-thin separation membrane to improve the production of biofuels, plastics, and other industrial materials. Today's separation methods are energy intensive and costly. If fully implemented by industry, such a new class of membranes could reduce U.S. energy consumption by as much as 3%.

University of Minnesota
Driven to Discover℠

University of Minnesota/California Institute of Technology ..... ARPA·E AWARDEE Booth 720

www.me.umn.edu/labs/solar

Solar Fuels via Partial Redox Cycles with Heat Recovery

The University of Minnesota/Caltech team has developed a prototype solar thermochemical reactor for the continuous production of synthesis gas by splitting water and carbon dioxide. The goal is to achieve solar-to-fuel conversion efficiencies of 10% through advances in development of ceria-based redox materials, and innovations in high temperature gas heat recovery.

UNLV

University of Nevada, Las Vegas (UNLV) ..... ARPA·E AWARDEE Booth 929

www.unlv.edu

Lithium-Rich Anti-Perovskites as Superionic Solid Electrolytes

The University of Nevada, Las Vegas (UNLV) will develop a new, fire-resistant electrolyte to make today's Lithium-ion (Li-ion) vehicle batteries safer. Today's Li-ion batteries use a flammable liquid electrolyte that can catch fire when overheated or overcharged. UNLV will replace this flammable electrolyte with a fire-resistant, solid rock-like material called lithium-rich anti-perovskite. If successful, this new electrolyte technology would help make vehicle batteries safer in an accident while also increasing performance by extending vehicle range and acceleration.

University of Notre Dame ..... ARPA·E AWARDEE Booth 326

www.nd.edu

PolarJFET Novel Vertical GaN Power Transistor

The University of Notre Dame will develop an innovative high-efficiency gallium nitride (GaN) power switch. Notre Dame's design is significantly smaller and operates at much higher performance levels than conventional power switches, making it ideal for use in a variety of power electronics applications. Notre Dame will also reuse expensive GaN materials and utilize conventional low-cost production methods to keep costs down. If successful, Notre Dame's miniature, high-performance, low-cost GaN power transistors could make silicon switches obsolete.

University of Pittsburgh

University of Pittsburgh and GE Global Research ..... ARPA·E AWARDEE Booth 738

Robert Enick
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www.pitt.edu

CO_2 Thickeners to Improve the Performance of CO_2 Enhanced Oil Recovery and CO_2 Fracturing

The team will develop a compound to thicken or gel liquid or supercritical carbon dioxide (CO_2). This thickened CO_2 would improve the performance of enhanced oil recovery (EOR), where the low viscosity of CO_2 results in poor sweep of the oil-bearing formation. Gelled CO_2 could also be a viable replacement for water during hydraulic fracturing of tight shales.

University of South Carolina ..... ARPA·E AWARDEE Poster 9

www.sofccenter.com

A Novel Intermediate-temperature Bifunctional Ceramic Fuel Cell Energy System

The University of South Carolina will develop an intermediate-temperature, ceramic-based fuel cell that will both generate and store electrical power with high efficiencies. The device will incorporate a newly discovered ceramic electrolyte and nanostructured electrodes that enable it to operate at temperatures lower than 500˚C. The fuel cell's unique design includes an iron-based layer that stores electrical charge like a battery, enabling a faster response to changes in power demand.

University of Southern California ..... ARPA·E AWARDEE Booth 1240

Sri Narayan
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www.usc.edu

An Inexpensive Metal-free Organic Redox Flow Battery for Grid-scale Storage

The University of Southern California will develop a water-based, metal free, grid-scale, flow battery. Flow batteries store chemical energy in external tanks instead of within the battery container. With innovative designs and materials, this battery has the potential to reduce cost, increase durability, and promote greater renewable energy deployment.

University of Tennessee..... ARPA·E AWARDEE Booth 1143

Scott Lenaghan
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www.utk.edu

Development of a Switchgrass (Panicum virgatum L.) Transformable Cell Suspension Culture and Screening System for Rapid Assessment of Cell Wall Genes for Improved Biomass for Biofuels

The University of Tennessee will develop a technology that enables high throughput bioengineering and trait testing in switchgrass. This development will significantly reduce the time required to engineer switchgrass to maximize biofuel production.

University of Texas at Austin ..... ARPA·E AWARDEE Booth 343

Evan Fleming
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Thermal Batteries for Electric Vehicles

University of Texas at Austin, in collaboration with SinoEV, has developed a fully functional and rechargeable thermal storage system for providing heating and/or cooling to the cabin of an electric vehicle. At the heart of the system lie two thermal batteries (one hot and one cold), each with a low-cost phase change material (PCM). PCM thermal conductance is enhanced via ultra-thin, low volume fraction graphite foam.

University of Texas at Austin ..... ARPA-E AWARDEE Booth 714

www.utexas.edu/research/cem

Novel Free Piston Linear Motor Compressor for Natural Gas Home Refueling Appliances

The University of Texas (UT) at Austin will develop an at-home natural gas refueling system that compresses gas with a single piston. Unlike current four piston compressors, UT Austin's highly integrated single-piston system will use fewer moving parts, leading to a more reliable, lighter, and cost effective compressor.

University of Texas at Dallas ..... ARPA-E AWARDEE Booth 941

www.utdallas.edu

Double-Stator Switched Reluctance Motor Technology

General Atomics and the University of Texas at Dallas (UT-Dallas) will develop a new type of electric motor with the potential to efficiently power a next generation class of electric vehicles. Unlike many of today's electric vehicle motors which use expensive, imported rare earth magnets, in this project the team will develop a motor that uses no rare earth materials, but is light, compact, and potentially delivers more power than many of today's vehicle motors at a substantially lower cost. This project will focus on improving the performance and enhancing the manufacturability of the unique "double stator" motor design, which has initially been investigated at UT-Dallas, which can smoothly and efficiently deliver high power to a car or truck.

University of Tulsa ..... ARPA-E AWARDEE Booth 1016

Todd Otanicar
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www.utulsa.edu

Plasmonic Nanoparticle Enhanced Liquid Filters for Optimal Solar Conversion

The University of Tulsa will develop a hybrid solar converter that captures non-visible wavelengths of light to heat a fluid containing light-absorbing nanoparticles that are far too small to be seen with the naked eye. The fluid would also transmit the part of the spectrum most easily converted to electricity to a solar cell and passes waste heat back to the fluid. This heat in the fluid can be stored to provide low-cost solar energy beyond the time when the sun is shining.

University of Utah ..... ARPA-E AWARDEE Booth 1028

Kent Udell
udell@mech.utah.edu
www.utah.edu

A Thermal Battery System Using Waste Heat Recharge

A team from the University of Utah has developed an advanced thermal battery system for climate control in electric vehicles (EVs) or parked internal combustion engine (ICE) vehicles. The battery will provide heating and cooling to EVs without draining the electric battery or to vehicles such long-haul trucks during long stops. Recharge using waste heat from an ICE has been demonstrated.

THE UNIVERSITY OF UTAH®

University of Utah ..... ARPA·E AWARDEE Booth 939

www.utah.edu

Electrodynamic Sorting of Light Metals and Alloys

The University of Utah is developing an electromagnetic light metal sorting technology that distinguishes multiple grades of scrap metals. Current light metal sorting technologies cannot distinguish between different types of alloy grades. If successful, the University of Utah's sorting technique will enable the recycling of typically discarded light metal by determining alloy grades, reducing the need for manufacturing new metals.

THE UNIVERSITY OF UTAH®

University of Utah ..... ARPA·E AWARDEE Booth 1030

www.utah.edu

A Novel Chemical Pathway for Titanium Production

The University of Utah will develop a new, simplified thermo-chemical manufacturing method to produce titanium from abundant, domestic ores. The new thermo chemical process uses magnesium hydride for titanium extraction, requiring less energy than conventional methods and simplifying the extraction process. If successful, the University of Utah's process will significantly reduce energy inputs and costs compared to conventional titanium production methods.

W ELECTRICAL ENGINEERING
UNIVERSITY of WASHINGTON

University of Washington - University of Michigan ..... ARPA·E AWARDEE Booth 543

www.washington.edu

Energy Positioning: Control and Economics

The University of Washington and the University of Michigan are developing an integrated system to match well-positioned energy storage facilities with precise control technologies so the electric grid can more easily include energy from renewable power sources like wind and solar. Because renewable energy sources provide intermittent power, it is difficult for the grid to efficiently allocate those resources without developing solutions to store their energy for later use. The two universities are working with utilities, regulators, and the private sector to position renewable energy storage facilities in locations that optimize their ability to provide and transmit electricity where and when it is needed most. Expanding the network of transmission lines is prohibitively expensive, so combining well-placed storage facilities with robust control systems to efficiently route their power will save consumers money and enable the widespread use of safe, renewable sources of power.

W

University of Washington (UW) ..... ARPA·E AWARDEE Booth 325

www.washington.edu

Novel Biocatalyst for Conversion of Natural Gas into Diesel Fuel

The University of Washington will develop microbes that convert methane found in natural gas into liquid diesel fuel. These microbes enable small-scale gas-to-liquid conversion at lower cost than current methods, which require infrastructure that is too expensive to deploy at smaller scales. Small-scale conversion would leverage abundant, domestic natural gas resources and reduce U.S. dependence on foreign oil.

University of Washington (UW) ..... ARPA·E AWARDEE Booth 237

Venkat Subramanian
vsubram@uw.edu
www.depts.washington.edu/maple

Optimal Operation and Management of Batteries Based on Real-Time Predictive Modeling and Adaptive Battery Management Techniques

University of Washington will develop a predictive battery management system that uses innovative modeling software to optimize battery use. The system will predict optimal charge and discharge of the battery in real-time, enhancing battery performance and improving battery safety, charge-rate, and usable capacity.

UT-Austin/Heliotrope Technologies ..... ARPA·E AWARDEE Booth 1022

www.heliotropetech.com

Low-Cost Solution Processed Universal Smart Window Coatings

The University of Texas at Austin will collaborate with Heliotrope Technologies to develop low-cost window coatings that control both light and heat entering buildings. Individually blocking infrared (heat) and visible (light) will significantly enhance both the energy efficiency of buildings and the comfort of occupants. Solution deposition strategies will be used to dramatically reduce manufacturing cost.

Utah State University ..... ARPA·E AWARDEE Booth 942

Regan Zane
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power.usu.edu

Robust Cell-level Modeling and Control of Large Battery Packs

Utah State University and its partners are developing electronic hardware and control software to create an advanced battery management system that actively maximizes the lifetime and safety of each cell in a battery pack. This unique approach to cell-level battery management provides cost reduction by leveraging hardware for multiple purposes. The system could reduce electric vehicle battery pack cost by 25% or more.

Valparaiso University ..... ARPA·E AWARDEE Booth 1142

Luke Venstrom
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www.valpo.edu

Solar Thermal Electrolytic Production of Mg from MgO

Valparaiso University is developing a novel electrochemical cell that produces magnesium using thermal and electrical energy. Valparaiso's advanced hybrid process uses concentrated solar power or natural gas for heating, minimizing the electricity requirement for magnesium separation. Valparaiso's system could significantly reduce carbon dioxide emissions and electricity consumption compared to conventional magnesium production.

Varentec, Inc. — ARPA·E AWARDEE — Booth 1136

www.varentec.com

Compact Dynamic Phase Angle Regulators for Transmission Power Routing

Varentec is developing compact, low-cost transmission power controllers with fractional power rating for controlling power flow on transmission networks. The technology will enhance grid operations through improved use of current assets and by dramatically reducing the number of transmission lines that have to be built to meet increasing contributions of renewable energy sources like wind and solar. The proposed transmission controllers would allow for the dynamic control of voltage and power flow, improving the grid's ability to dispatch power in real time to the places where it is most needed. The controllers would work as fail-safe devices whereby the grid would be restored to its present operating state in the event of a controller malfunction instead of failing outright. The ability to affordably and dynamically control power flow with adequate fail-safe switchgear could open up new competitive energy markets which are not possible under the current regulatory structure and technology base.

Vorbeck Materials Corp. — ARPA·E AWARDEE — Booth 913

www.vorbeck.com

Energy-Efficient Hybrid Medium- and Heavy-Duty Vehicle Power Systems

Vorbeck Materials Corp. will develop a low-cost, fast-charging storage battery for hybrid vehicles. The battery cells are based on lithium-sulfur chemistries, which have a greater energy density compared to today's lithium-ion batteries. If successful, the system has the potential to capture more breaking energy, increasing the efficiency of hybrid vehicles by up to 20% while also reducing cost and emissions.

Xilectric, Inc — ARPA·E AWARDEE — Booth 1238

Steve Weiss
steve.weiss@xilectric.com
www.xilectric.com

Low-Cost Transportation Batteries

Xilectric will reinvent Thomas Edison's battery chemistries for today's electric vehicles. This reinvented battery will cost less than the battery that starts today's gas powered cars. This battery uses an innovative chemistry based on domestically available aluminum and magnesium and simple construction to increase performance and lower cost.

Yale University — ARPA·E AWARDEE — Booth 327

www.yale.edu

Dual-Junction Solar Cells for High-Efficiency at Elevated Temperature

Yale University will develop a dual-junction solar cell that can operate efficiently at temperatures above 400°C, unlike today's solar cells which lose efficiency rapidly above 100°C. The team's efficient dual-junction design, which allows the cell to collect a wider range of the light spectrum, could provide reliability over the 25-year lifetime needed in the field. Yale's high-temperature solar cells will fully utilize the solar spectrum to convert some wavelengths of light into electricity while using the remainder to provide dispatchable heat when the sun is not shining.

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The American Society of Mechanical Engineers (ASME)

Yale

Yale University ..... ARPA·E AWARDEE **Booth 521**

Menachem Elimelech
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www.yale.edu/env/elimelech

Closed-Loop System Using Waste Heat for Electricity

Yale is developing a system to generate electricity using low-temperature waste heat from power plants, industrial facilities, and geothermal wells. In Yale's closed-loop system, waste heat separates an input salt water stream into two output streams, one with high salt concentration and one with low salt concentration. After separation, the two streams are recombined and the energy released upon mixing is captured. The mixed saltwater stream is then sent back to the waste heat source, allowing the process to begin again. Yale's system for generating electricity from low-temperature heat could considerably increase the efficiency of power generation systems.

Showcase Index by Type

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ARPA-E AWARDEES

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Showcase Index by Technology Order

ENERGY STORAGE, STATIONARY

ENERGY STORAGE, PORTABLE

INDUSTRIAL EFFICIENCY

OTHER

RENEWABLE POWER GENERATION

Showcase Index by Technology Order

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STATIONARY STORAGE: GRID-SCALE BATTERIES

THERMAL ENERGY UTILIZATION

TRADITIONAL POWER GENERATION

TRANSPORTATION STORAGE: NATURAL GAS

TRANSPORTATION STORAGE: NON-BATTERY

TRANSPORTATION STORAGE: VEHICLE BATTERIES

Showcase Index by Technology Order

VEHICLE DESIGNS & MATERIALS: ENGINES & MOTORS

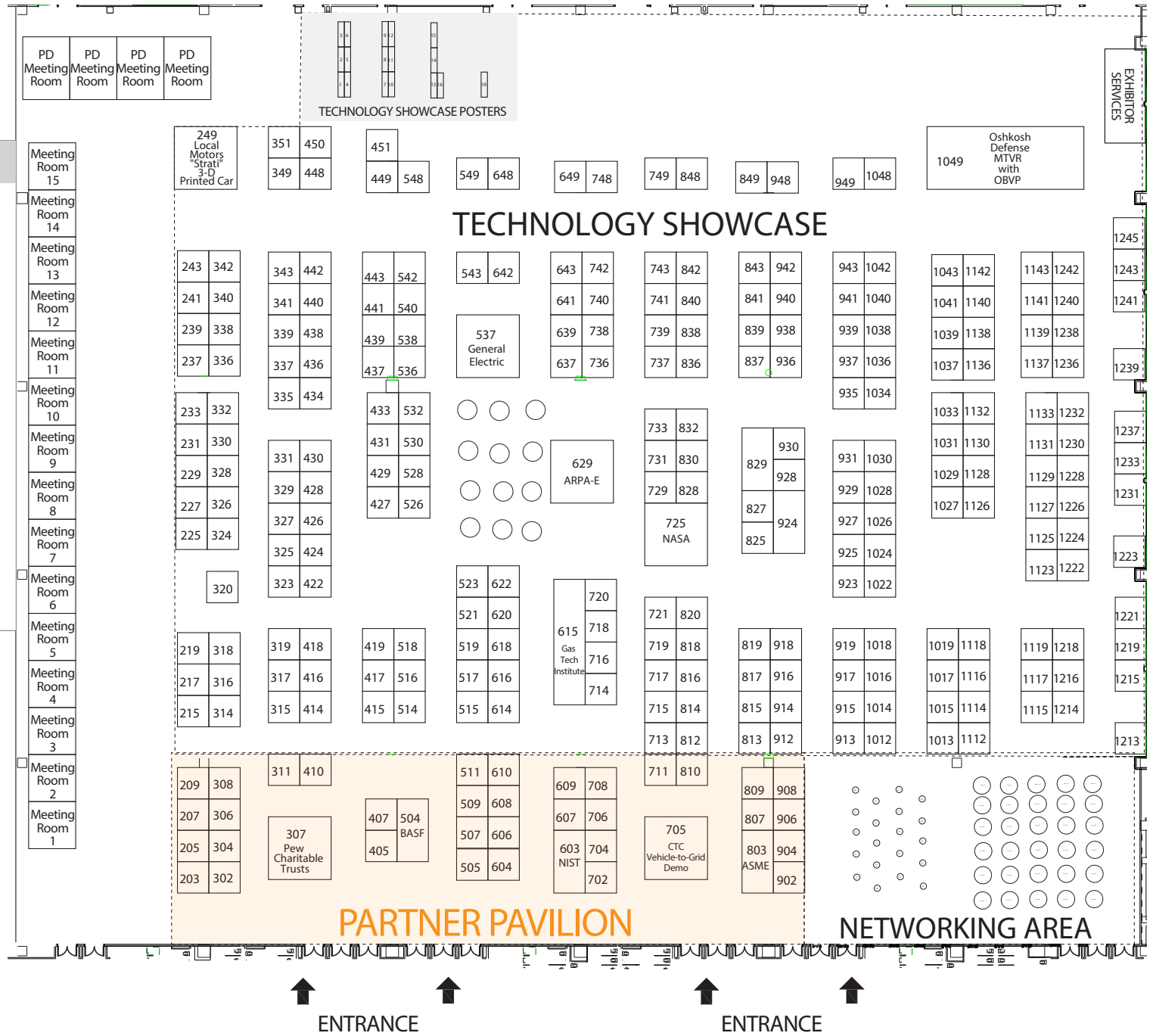
VEHICLE TECHNOLOGIES

WATER

Technology Showcase Floorplan

MEETING ROOMS

1. BASF Corporation
2. Chevron
3. General Electric
4. Lockheed Martin
5. Robert Bosch, LLC
6. Siemens
7. SolarReserve
8. The Pew Charitable Trusts
9. United Technologies Research Center
10. Reserved for CAP
11. Reserved for CAP
12. Reserved for CAP
13. Reserved for CAP
14. Reserved for CAP
15. Reserved for CAP



Technology Showcase Hours

Technology Showcase Hours of Operation

Tuesday:

7:30–9:30 a.m.
(Continental Breakfast offered from 7:30–9:30 a.m.)

12:00–3:30 p.m.
(Lunch offered from 12:00–1:30 p.m.)

5:00–7:30 p.m.
(Reception from 5:00–7:30 p.m.)

Wednesday

7:30–9:30 a.m.
(Continental Breakfast offered from 7:30–9:30 a.m.)

12:15–2:30 p.m.
(Lunch from 12:30–1:30 p.m.)

Advocate for Innovation

What does it take to build a clean energy economy? Visit Booth 307 to speak with members of The Pew Charitable Trusts' Clean Energy Business Network — Go Electric, FreeWire Technologies, LuminAID, and NBD Nanotechnologies — and learn how you can advocate for policies to help the industry grow.

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