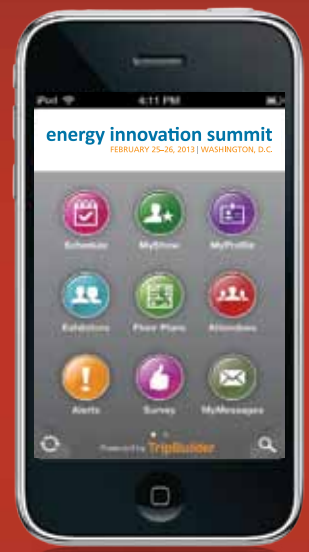
The premier event dedicated to
transformative energy solutions

4th annual
energy innovation summit
FEBRUARY 25–27, 2013 | WASHINGTON, D.C.

The 2013 Summit goes mobile. Get it now.

powered by TripBuilder®

Plug www.tripbuilder.com/arpae2013apps into your phone's browser. This link will automatically detect your phone type and take you to the right place to download the app.



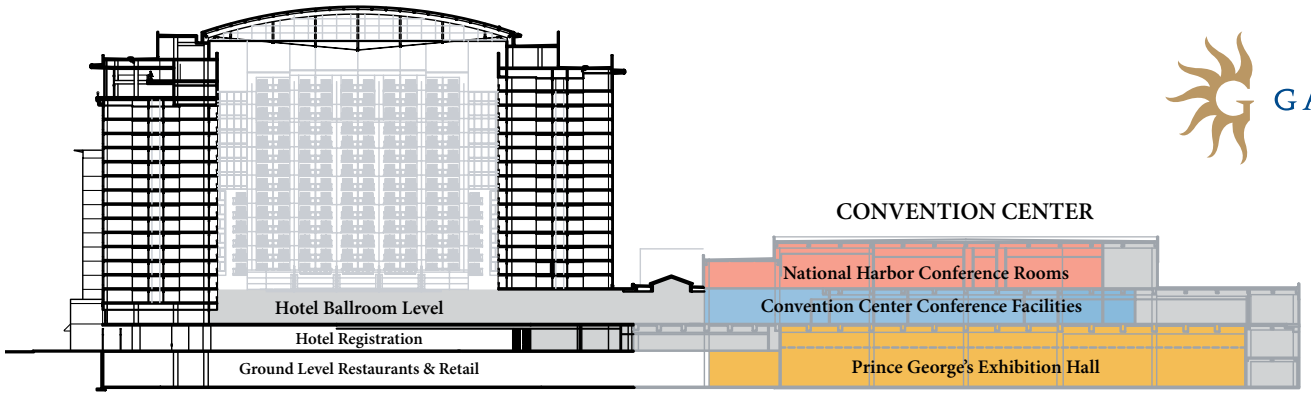
Or, just snap this QR Code & download the app now!

Maximize your time at the show with TripBuilder EventMobile™. Easily view the Schedule, Exhibitors, Speakers, Instant Alerts and more! You can even create personalized lists to target what you want to see, hear & do.

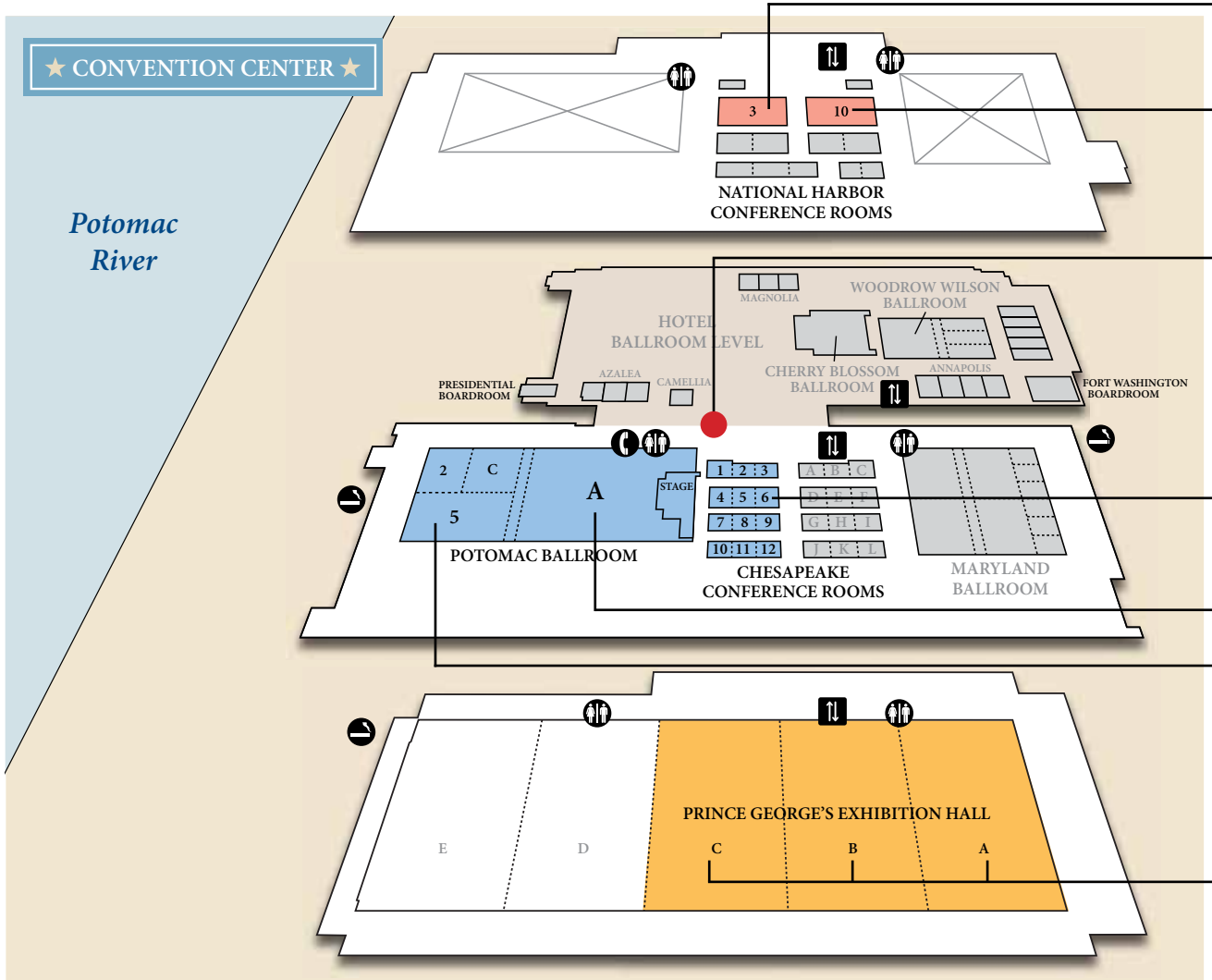
energy innovation summit
FEBRUARY 25–26, 2013 | WASHINGTON, D.C.

TripBuilder EventMobile

Gaylord National Floorplan



GAYLORD NATIONAL®
RESORT & CONVENTION CENTER
on the Potomac



National Harbor 3
Government Networking & Panel Session Room

National Harbor 10
Government Networking

Summit Registration & Information Desk

Monday: 7:00 a.m.-6:00 p.m.
Tuesday: 7:00 a.m.-6:00 p.m.
Wednesday: 7:30 a.m.-4:00 p.m.

Chesapeake 6
Student Program Room

Potomac A
General Session & Panel Session Room

Potomac C, 2, 5
Panel Session Rooms

Prince George's Exhibit Hall A-C
Technology Showcase

Tuesday
Lunch: 10:50 a.m. – 1:10 p.m.
Reception: 5:00 p.m. – 8:00 p.m.

Wednesday
Breakfast: 7:30 a.m. – 8:45 a.m.
Lunch & Closing: 11:45 a.m. – 1:45 p.m.

Table of Contents

SECTION 1: ABOUT THE SUMMIT

SECTION 2: SUMMIT AGENDA

SECTION 3: SESSION DESCRIPTIONS

SECTION 4: SUMMIT PARTNERS & TECHNOLOGY SHOWCASE

Energy Solutions

With the world's population projected to surpass 9 billion by 2050, now is the time to prepare for a secure energy future. We invite you to collaborate with our global teams to find science-driven, sustainable energy solutions.

From renewable energy sources like photovoltaics, wind, biofuels, and fuel cells to the application of advanced materials making the exploration, production and transportation of oil and gas more efficient, DuPont products & services help provide better performance, reliability, lower cost, improved safety and a reduced environmental footprint. Our offerings support energy-enabling technologies in energy storage and throughout the electricity generation, distribution and conversion processes.

We are focused on developing innovative and economically viable solutions for the world's energy needs across multiple technologies. Together we can find the right solutions to secure a brighter, cleaner energy future.

Visit www.dupont.com for more information about DuPont Energy solutions.

SECTION 1
ABOUT THE SUMMIT

Overview of the 2013 Energy Innovation Summit

General Information

About the Technology Showcase

About the Gaylord National

About the Energy Innovation Summit

Overview of the 2013 Energy Innovation Summit

The purpose of the 2013 Energy Innovation Summit is to showcase transformative energy solutions and to encourage collaborative innovation in the field of energy.

For the past three years the Summit has been the premier event dedicated to transformative energy solutions. The Summit has helped push many breakthrough technologies to the marketplace and has played a key role in maintaining the position of the United States as the leader in energy development.

In its fourth year, the Summit is proud to highlight the following new additions:

- **Monday Night Future Energy Pitching Session**: Watch eight early-stage energy technology startups pitch their products and gain insight from top venture capital investors regarding how to pitch effectively.
- **Student/Company Recruiting Reception**: Companies have the opportunity to meet with pre-vetted graduate students seeking careers in the energy field.
- **Small Group Networking (optional)**: During the Monday evening networking event, Summit attendees have the opportunity to meet in the following sub-groups: Electricity Generation, Fuels, Transportation, and Efficiency. Look for the appropriate kiosk in the foyer.
- **Crowdsourced Panel**: You voted for the panel topic and speakers you'd like to see in the Summit's first-ever crowdsourced session. The winning panel, *Getting from "Cool" to "Scale": How Do We Ensure that New Materials Change the Future of Energy Technologies?*, will take place on Wednesday, at 1:45 p.m. in Potomac A.
- **Demonstrations in the Technology Showcase**: Technology Showcase participants can sign-up at the exhibitor service desk during showcase hours to give live Technology Demonstrations on stage in the Exhibit Hall. Availability is on a first-come, first-served basis and Show Management will announce when the demonstrations are taking place.

SIEMENS

A new perspective on a changing energy system: the power matrix

siemens.com/energy

Our energy system is in a state of radical change. As the share of distributed power generation grows, so does the system's complexity. Consumers are increasingly becoming power producers themselves and feed their surplus into the grid.

The linear energy conversion chain has turned into a multifaceted system with countless new actors.

Visit us at Booth #803 to learn more and discuss energy innovation opportunities.

Answers for energy.

About the Energy Innovation Summit

• **Mobile Application**: Use our new mobile app to:

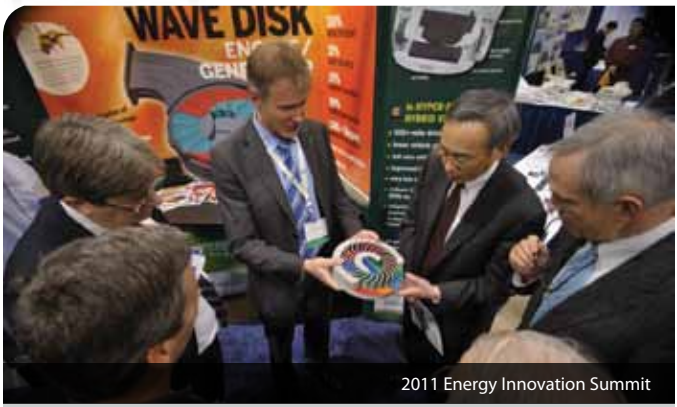
–Easily view event information and receive instant alerts right on your mobile phone.

–Interact with other attendees via our messaging and matchmaking tool.

–Maximize your time at the Summit with the MyShow personalization tools.

–View speaker biographies, panel descriptions, Technology Showcase participant profiles and more!

To use the app, visit **www.tripbuilder.com/arpae2013apps** on your phone's browser. The URL automatically detects your phone type and takes you to the right place to download the app. Or, just snap this QR Code and download the app now!



2011 Energy Innovation Summit

"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, Secretary, U.S. Department of Energy

General Information

Registration and Information Desk Hours (Potomac Foyer)

Monday: 7:00 a.m. – 6:00 p.m.
Tuesday: 7:00 a.m. – 6:00 p.m.
Wednesday: 7:30 a.m. – 4:00 p.m.

Questions?

If you have any questions or special needs, please visit the Summit Registration Desk during the hours posted above and someone will assist you.

Press/Media Check-in

Check-in at the Press Registration counter in Potomac Foyer. Press must wear their Summit Press badge at all times. Press registration allows full access to the Technology Showcase and any session posted on the agenda. The following rooms are also available to the press:

Press Filing Room – Chesapeake 2
Press Conference Room – Chesapeake 1

Summit Badges

Summit badges must be worn at all times while attending sessions or Summit special events. The back of each badge contains a QR code that is only functional for exhibitors who have a lead retrieval device that reads the code. Allowing your badge to be scanned by an exhibitor gives them 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 Attire

Summit attire is business casual.

Agenda Changes

Agenda changes are posted on the mobile app and on a digital monitor located by the Registration Desk.

Visit **www.tripbuilder.com/arpae2013apps** on your phone's browser. This url automatically detects your phone type and directs you to the right place to download the app. Or, just scan this QR Code and download the app now!

Summit Twitter Hashtag and Surveys

The 2013 Energy Innovation Summit uses Twitter in multiple ways to encourage interaction among speakers, attendees, and the public.

The Summit's Official Twitter Hashtag is #eis13. Please include it in your tweets as you share your thoughts, speaker quotes, and other information about the Summit.

We are showing a stream of the tweets that include the hashtag throughout the Summit, so you are encouraged to use it to connect with others, promote your booth, and engage in dialogue.

Wireless Access

Summit attendees may enjoy complimentary wireless access in all meeting rooms and public spaces. Please log into the 'Gaylord Conventions' wireless network. Opening your internet browser automatically redirects you to the Gaylord log-on page. Be aware before connecting to this wireless network that it is public and unsecured. Use the following information to log in:

Username: ARPAE
Password: Summit

Open Meeting Rooms

Open meeting rooms are available for impromptu meetings. If you would like to reserve any of the following rooms for a meeting, please post on the sign outside the door as well as on the message board located at the Summit Registration Desk. These rooms are available on a first-come, first-served basis.

Monday – Wednesday

Chesapeake 3 (Conference room setup for up to 20, screen and projector provided in-room)

Tuesday – Wednesday

National Harbor 10 (Classroom setup for 48, screen and projector provided in-room)
National Harbor 11 (U-Shape setup for 24, no AV)
National Harbor 1 (Conference room setup for 10, no AV)

General Information

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 Technology Forums.

Presentation Access After the Summit

All Summit attendees will receive access to the recorded Summit sessions by Monday, March 4, 2013. To access the recorded Summit sessions, please visit **http://www.prolibraries.com/arpa-e/events/2013energysummit.** If you have already registered, login. If you have not already registered, click the register button. Once you are logged in, click on the "On Demand" button to access the archived sessions.

Photography and Video Recording

All sessions at the Summit are being recorded, as well as broadcast live to a virtual audience. Also note that videotaping and photographing of general attendance may take place at the Summit. Technology Forums reserves the right to copy, edit, exhibit, publish, and/or distribute photos (and videos) of attendees, and as an attendee you waive the right to inspect or approve the finished product wherein your likeness, name, image and sound of voice appears. Additionally, no compensation is given for participation.

Only approved media may video or photograph any session. 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.

2012 Energy Innovation Summit

OIL COMPANIES SHOULD THINK MORE LIKE TECHNOLOGY COMPANIES.

WE AGREE.

Dr. John Kelly III
Senior Vice President
IBM Research
IBM

John McDonald
Vice President
& Chief Technology Officer
Chevron

Our future depends on innovation to operate cleaner, safer, and smarter.
Each year, we spend billions on technologies to develop oil and gas more intelligently, bring new forms of energy to market, and invest in energy start-ups with bright ideas for the future.
So we don't just think like a technology company.
We are one.
Learn more at chevron.com/weagree

About the Technology Showcase

The Technology Showcase at the 2013 Energy Innovation Summit presents America's next generation of transformational energy technologies. The Technology Showcase includes ARPA-E awardees and a select group of other participants. Come meet with the companies and research organizations poised to transform our energy future.

The Technology Showcase Features:

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

This is much more than your standard row after row of poster presentations!

Unlike other conferences where anyone who pays the booth fee may participate, the participants in the Technology Showcase must pass a thorough vetting process to be included. Our vetting process ensures that you are meeting with the best in the industry.

Demonstrations in the Technology Showcase

Technology Showcase participants may sign-up at the exhibitor service desk during showcase hours to give live Technology Demonstrations on stage in the exhibit hall. Availability is on a first-come, first-served basis and Show Management will announce when the demonstrations are taking place.

Technology Showcase Hours of Operation

Tuesday

Lunch	10:50 a.m. – 1:10 p.m.
Reception	5:00 p.m. – 8:00 p.m.

Wednesday

Continental Breakfast	7:30 a.m. – 8:45 a.m.
Lunch and Closing	11:45 a.m. – 1:45 p.m.

Women in the Energy Sector

Wednesday, 7:30-8:30 a.m.

Join ARPA-E Deputy Director Cheryl Martin at the ARPA-E booth for a special networking event for women in the energy sector.

About the Gaylord National

GAYLORD NATIONAL®
RESORT & CONVENTION CENTER
on the Potomac

2013 Energy Innovation Summit Venue - Gaylord National

Hotel Concierge Services (Hotel Lobby)

Sunday – Thurs 7:00 a.m.-10:15 p.m.
Friday – Sat 7:30 a.m.-11:15 p.m.
• City Attraction Guides
• Restaurant Reservations

Consider it Done

The "Consider It Done" button, located on every guest phone, 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)

11th Hour Technology Center is centrally located on the main floor of the Convention Center.

Hours of Operations:

Open every day, 7:00 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 that are 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, otherwise please 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 $14 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 get your validation ticket at Summit Registration Desk. When leaving the parking garage, please provide your validation ticket.

Gaylord National, Interior Atrium

Let's stamp "Made in USA" on clean energy.

Clean energy is a worldwide opportunity. America's clean energy businesses need farsighted, consistent policies that support innovation, investment, deployment and manufacturing to succeed in a fiercely competitive global marketplace. The Pew Clean Energy Business Network is working for that future. Please join us.

Join the Pew Clean Energy Business Network.

Visit booth 1008.

THE PEW CHARITABLE TRUSTS

www.PewTrusts.org/CleanEnergy

SECTION 2
SUMMIT AGENDA

Agenda at a Glance

MONDAY, FEBRUARY 25

7:00 a.m.-6:00 p.m.	Summit Registration & Information Desk Hours	*Potomac Foyer*
12:00 -12:15 p.m.	Summit Kickoff	*Potomac A*
12:15-12:30 p.m.	ARPA-E Leadership Welcome	*Potomac A*
12:30-12:50 p.m.	Keynote Presentation: Dr. Hans Rosling, Professor, International Health, Karolinska Institute; Edutainer, Gapminder.org	*Potomac A*
1:00-1:45 p.m.	**TECHNOLOGY DISCUSSIONS WITH ARPA-E PROGRAM DIRECTORS** **Future of Electricity** *Potomac A* **Future of Materials** *Potomac C* **Future of Transportation** *Potomac 2* **Future of Fuels** *Potomac 5*	
1:45-2:00 p.m.	Networking Break	*Potomac Foyer*
2:00-2:45 p.m.	**PANEL SESSIONS** **Strategic Partnerships: Models that Work** *Potomac A* **Are There Military Applications in Your Future?** *Potomac C* **In Your Backyard: Taking Advantage of Regional Resources to Move Technologies Forward** *Potomac 2* **If You Build it, Will They Come? A Look into What Drives Customers** *Potomac 5*	
2:45-4:30 p.m.	**GOVERNMENT AGENCY NETWORKING PROGRAM**	*National Harbor 3 & 10*
	Visit National Harbor 3 to Visit the Following Agencies **U.S. Department of Defense Agencies** Air Force Army Marine Corps (USMC) Navy (OPNAV N45) Office of Naval Research (ONR) Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OASD/OEPP) Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) **Other U.S. Federal Agency** National Aeronautics and Space Administration (NASA)	**Visit National Harbor 10 to Visit the Following Agencies** **U.S. Department of Energy Agencies** Grid Tech Team Office of Energy Efficiency and Renewable Energy (EERE) Office of Fossil Energy Office of Nuclear Energy Office of Science Technology Transfer Office **Other U.S. Federal Agencies** Department of Agriculture (USDA) Department of Transportation / Volpe National Science Foundation (NSF)
4:30-5:30 p.m.	**PANEL SESSIONS** **Selling the Future State: What to Talk about When Your Product Isn't a Product Yet** *Potomac A* **Walking Before You Run: Real Benefits of First Markets** *Potomac C* **Hire, Rent or Borrow: How to Access the Right Talent When You Are Starting Out** *Potomac 2* **Get Smart about IP: Pros, Cons and Costs of Your Patent Strategy** *Potomac 5*	
5:30-7:30 p.m.	Opening Networking Reception	*Potomac Foyer*
6:30-8:30 p.m.	Future Energy Pitching Session	*Potomac A*
8:30-9:00 p.m.	Coffee and Dessert	*Potomac Foyer*

TUESDAY, FEBRUARY 26

7:00 a.m.-6:00 p.m.	Summit Registration & Information Desk Hours	*Potomac Foyer*
7:45-8:45 a.m.	Continental Breakfast	*Potomac Foyer*
9:00-9:20 a.m.	ARPA-E Presentation: Dr. Cheryl Martin, Deputy Director, ARPA-E	*Potomac A*
9:20-9:45 a.m.	Keynote Presentation	*Potomac A*
9:45-9:50 a.m.	Awardee Video	*Potomac A*
9:50-10:20 a.m.	Fireside Chat	*Potomac A*
10:20-10:30 a.m.	Congressional Comment: Chris Coons, U.S. Senator, Delaware	*Potomac A*
10:30-10:50 a.m.	Keynote Presentation: Ellen Kullman, Chair and Chief Executive Officer, DuPont	*Potomac A*
10:50 a.m.-1:10 p.m.	Technology Showcase and Lunch	*Technology Showcase*
1:10-1:15 p.m.	Awardee Video	*Potomac A*
1:15-1:45 p.m.	Fireside Chat Moderator: Steve Clemons, Washington Editor at Large, The Atlantic Elon Musk, Chief Executive Officer and Product Architect, Tesla Motors; Chief Executive Officer, SpaceX Dr. Steven Chu, Secretary, U.S. Department of Energy	*Potomac A*
1:45-1:50 p.m.	Awardee Video	*Potomac A*
1:50-2:10 p.m.	Keynote Presentation: Mitch Daniels, President, Purdue University; Former Governor, Indiana	*Potomac A*
2:10-2:30 p.m.	Keynote Presentation: T. Boone Pickens, Founder, BP Capital	*Potomac A*
2:30-2:45 p.m.	Networking Break	*Potomac Foyer*
2:45-3:45 p.m.	**PANEL SESSIONS** **The Evolution of Energy Technology Funding Models - What's Next?** *Potomac A* **Breaking Through the 'Grid'-lock** *Potomac C* **Developing the Developing World Smarter** *Potomac 5* **How Low Can You Go? Will Technology Provide Low Capital Models for the Scale-up of Energy?** *National Harbor 3*	
3:45-4:00 p.m.	Networking Break	*Potomac Foyer*
4:00-5:00 p.m.	**PANEL SESSIONS** **Taking Your First Test Flight: Leveraging Testing Facilities to Advance Early Stage Technologies** *Potomac A* **Square Pegs, Round Holes: When Technology Outpaces Policy** *Potomac C* **Energy as a Tactical Advantage: Next-generation Requirements from the Theater** *Potomac 5* **Preventing and Responding to Energy Outages: New Technologies Pave the Way** *National Harbor 3*	
5:00-8:00 p.m.	Technology Showcase and Reception	*Technology Showcase*

Please see pages 56-57 for the Student Program Agenda

Agenda at a Glance

WEDNESDAY, FEBRUARY 27

7:30 a.m.-4:00 p.m.	Summit Registration & Information Desk Hours			*Potomac Foyer*
7:30-8:30 a.m.	Special Networking Event: Women In the Energy Sector			*ARPA-E Booth 626 in Technology Showcase*
7:30-8:45 a.m.	Technology Showcase and Continental Breakfast			*Technology Showcase*
9:00-9:05 a.m.	Opening Remarks: Dr. Cheryl Martin, Deputy Director, ARPA-E			*Potomac A*
9:05-9:25 a.m.	Keynote Presentation: Mayor Michael Bloomberg, 108th Mayor, New York City			*Potomac A*
9:25-9:30 a.m.	Congressional Comment: Lamar Alexander, U.S. Senator, Tennessee			*Potomac A*
9:30-9:35 a.m.	Congressional Comment: Lisa Murkowski, U.S. Senator, Alaska			*Potomac A*
9:35-10:05 a.m.	The Only Constant is Change: Energy and the Global Perspective Moderator: John Podesta, Chair, Center for American Progress Dr. David F. Gordon, Head of Research; Director, Global Macro Analysis, Eurasia Group Blythe Masters, Head of Global Commodities and Corporate & Investment Bank Regulatory Affairs, J.P. Morgan			*Potomac A*
10:05-10:10 a.m.	Awardee Video			*Potomac A*
10:10-10:30 a.m.	Keynote Presentation: Dr. Arati Prabhakar, Director, Defense Advanced Research Projects Agency (DARPA)			*Potomac A*
10:30-10:35 a.m.	Congressional Comment: Ron Wyden, U.S. Senator, Oregon			*Potomac A*
10:35-10:50 a.m.	Networking Break			*Potomac Foyer*
10:50-11:10 a.m.	Keynote Presentation: Dr. Steven Chu, Secretary, U.S. Department of Energy			*Potomac A*
11:10-11:15 a.m.	Awardee Video			*Potomac A*
11:15-11:45 a.m.	Fireside Chat Moderator: John Podesta, Chair, Center for American Progress Nick Akins, President and Chief Executive Officer, American Electric Power Daniel Poneman, Deputy Secretary, U.S. Department of Energy			*Potomac A*
11:45 a.m.-1:45 p.m.	Technology Showcase and Lunch			*Technology Showcase*
1:45-2:45 p.m.	**PANEL SESSIONS**			
	Crowdsourced Panel - Getting from "Cool" to "Scale": How Do We Ensure that New Materials Change the Future of Energy Technologies? *Potomac A*	The Influence of New Collaboration Models on Innovation *Potomac C*	Energy on the Field: Sports as Early Adopters of Energy Technologies *Potomac 5*	
2:45-3:00 p.m.	Networking Break			*Potomac Foyer*
3:00-4:00 p.m.	**PANEL SESSIONS**			
	Distributed Energy Meets Distributed Information - Control of the Future Grid *Potomac A*	Working with Less: New Technology Development to Deal with Water Demands of Energy and Agriculture *Potomac C*	Accelerating Energy Efficiency Scale-up: What it Takes to Succeed *Potomac 5*	
4:00-4:30 p.m.	Summit Wrap Up			*Potomac A*
4:30-5:30 p.m.	Leadership Networking Reception			*Potomac Foyer*

Coffee Breaks Provided by Agrivida

SPECIAL NETWORKING EVENT

WOMEN IN THE ENERGY SECTOR

Wednesday, February 27, 7:30-8:30 a.m.

Join ARPA-E Deputy Director Dr. Cheryl Martin at the ARPA-E booth in the Technology Showcase.

Summit Agenda: MONDAY

Please see pages 56-57 for the Student Program Agenda.

MONDAY, FEBRUARY 25

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

Registration & Information Desk Hours..... Potomac Foyer

12:00-12:15 p.m.

Summit Kickoff.....Potomac A

12:15-12:30 p.m.

ARPA-E Leadership Welcome ..... Potomac A

12:30-12:50 p.m.

Keynote Presentation.....Potomac A

- *Dr. Hans Rosling, Professor, International Health, Karolinska Institute; Edutainer, Gapminder.org*

1:00-1:45 p.m.

TECHNOLOGY DISCUSSIONS WITH ARPA-E PROGRAM DIRECTORS

Future of Electricity .....Potomac A

- *Dr. Howard Branz, Program Director, ARPA-E*
- *Dr. Timothy Heidel, Assistant Program Director, ARPA-E*
- *Dr. Mark Johnson, Program Director, ARPA-E*
- *Dr. Karma Sawyer, Assistant Program Director, ARPA-E*

Future of Materials .....Potomac C

- *Dr. James Klausner, Program Director, ARPA-E*
- *Dr. John Lemmon, Program Director, ARPA-E*
- *Dr. Elizabeth Santori, Fellow, ARPA-E*
- *Dr. Amul Tevar, Fellow, ARPA-E*

Future of Transportation.....Potomac 2

- *Dr. Dane Boysen, Program Director, ARPA-E*
- *Dr. Ilan Gur, Program Director, ARPA-E*
- *Dr. Ping Liu, Program Director, ARPA-E*
- *Dr. Bradley Zamft, Fellow, ARPA-E*

Future of Fuels .....Potomac 5

- *Dr. Jonathan Burbaum, Program Director, ARPA-E*
- *Dr. Robert Conrado, Senior Fellow, ARPA-E*
- *Dr. Ramon Gonzalez, Program Director, ARPA-E*
- *Dr. William Regan, Fellow, ARPA-E*
- *Dr. Bryan Willson, Program Director, ARPA-E*

1:45-2:00 p.m.

Networking Break..... Potomac Foyer

Continued to next page >>

MONDAY (CONTINUED)

2:00-2:45 p.m.

PANEL SESSIONS

Strategic Partnerships: Models that Work.....Potomac A

Panelists address what to look for in a successful strategic partnership, touching on the "lifecycle" of successful strategic partnerships — starting at partnership initiation, continuing through the construction and execution of the partnership, and ending at follow-through.

- *Moderator: Beth Comstock, GE*
- *Lisa Caswell, eMeter*
- *D. Larry Clark, Lockheed Martin Space Systems*
- *Ken Geisler, Siemens*
- *Dr. Brian Hennings, Lynntech Inc.*

Are There Military Applications in Your Future? .....Potomac C

This panel focuses on what companies should be aware of as they attempt to penetrate the military installation energy market. Special focus is given to funding sources and contracting considerations, as well as examples of resources available to help.

- *Moderator: Dr. Jeffrey Marqusee, Environmental Security Technology Certification Program, U.S. Department of Defense*
- *Deborah Jelen, Electricore, Inc.*
- *Kevin Madden, Honeywell Building Solutions*
- *Rodney Mateer, Deloitte Financial Advisory Services, LLP*
- *Dr. Michael West, Advantek Consulting Engineering, Inc*

In Your Backyard: Taking Advantage of Regional Resources to Move Technologies Forward.....Potomac 2

Panelists examine the ways regional resources can help early-stage technologists assess the commercial viability of their technologies. The discussion highlights different regional models set up across the country, who and how they engage, and examples of successful outcomes.

- *Moderator: Miles O'Brien, PBS*
- *Amy Francetic, Clean Energy Trust*
- *Bill Hagstrand, NorTech*
- *Brian Steel, University of California, Berkeley*
- *Fred Walti, Los Angeles Cleantech Incubator and Clean Tech Los Angeles*

If You Build it, Will They Come? A Look into What Drives Customers.....Potomac 5

This panel examines market drivers in the energy technology space. Particular focus is given to the question: "What does it take for new technologies to successfully enter such a large, price-sensitive market?"

- *Moderator: Kevin Bullis, Technology Review*
- *Dr. Dan Ariely, Duke University*
- *George Colony, Forrester Research*
- *Dr. Rolf Stromberger, BMW of North America, LLC*

2:45-4:30 p.m.

GOVERNMENT AGENCY NETWORKING PROGRAM ..... NATIONAL HARBOR 3 &10

Connect with leaders and program directors from federal government agencies. See page 48-53 for a listing of participating government agencies.

MONDAY (CONTINUED)

4:30-5:30 p.m.

PANEL SESSIONS

Selling the Future State: What to Talk about When Your Product Isn't a Product Yet.....Potomac A

Panelists explore why painting a picture of the possible is such a critical step on the path to gain the funding and partnerships necessary for future success. In addition, key points from the discussion will help you master the art of pitching a product that has yet to be created.

- *Moderator: Katie Fehrenbacher, GigaOM*
- *Dave Blakely, IDEO*
- *Dr. Saul Griffith, Otherlab*

Walking Before You Run: Real Benefits of First Markets.....Potomac C

Learn how companies use smaller markets with considerably shorter development cycles to get started. This alternative "stepping stone" approach has dual advantages, allowing companies to not only grow the top line more quickly but also to address production issues on a smaller scale, reducing both technical and economic risks.

- *Moderator: Dr. Desmond (Des) King, Chevron Technology Ventures*
- *Dr. Kathy Ayers, Proton OnSite*
- *F. Neal Hunter, Cree*
- *Emily Liggett, Novatorque, Inc.*
- *Dr. Sven Strohband, Khosla Ventures*

Hire, Rent or Borrow: How to Access the Right Talent When You Are Starting Out.....Potomac 2

Panelists discuss both the practices and pitfalls of resource management for entrepreneurs and startups, addressing the questions, "Where can I find the right technical expertise and facilities to help build my company?" and "How can I avoid common mistakes in hiring?"

- *Moderator: Dr. Errol Arkilic, National Science Foundation*
- *Jennifer Crystal Boulanger, Opower*
- *William Farris, National Renewable Energy Laboratory*
- *Kimberly Gibson, Edison Welding Institute*
- *Phil Giudice, Ambri*

Get Smart about IP: Pros, Cons and Costs of Your Patent Strategy.....Potomac 5

Not all patents have equal value. Deciding what should and should not be patented, figuring out how much to pay for patents, and determining whether there is a patent roadblock controlled by others, are all crucial decisions for new ventures. This panel provides insights about protecting and valuing your technology.

- *Moderator: Dr. Robert D. Atkinson, Information Technology and Innovation Foundation*
- *Erin-Michael Gill, MDB Capital*
- *Sarah Harris, AOL*
- *Brian P. O'Shaughnessy, RatnerPrestia*
- *Dr. David Parekh, United Technologies Research Center*

Continued to next page >>

MONDAY (CONTINUED)

5:30-7:30 p.m.

Opening Networking Reception ..... Potomac Foyer

Small Group Networking (optional): During the Monday evening networking event, Summit attendees have the opportunity to meet in the following sub-groups: International, Electricity Generation, Fuels, Transportation, and Efficiency. Look for the appropriate kiosk in the foyer.

6:30-8:30 p.m.

Future Energy Pitching Session .....Potomac A

Future Energy is a series of pitch events that connect entrepreneurs, researchers, and private investors in the energy industry to develop and commercialize radical solutions to the world's energy challenges. The Future Energy Pitching Session features eight early-stage energy technology startups presenting to a panel of top venture capital investors. Investors provide feedback and actionable advice to the startups in real-time. All Summit attendees are invited to attend and vote for their favorite startup. The startup that receives the most audience votes will be acknowledged as the pitch competition winner. See page 54-55 for details.

8:30-9:00 p.m.

Coffee and Dessert ..... Potomac Foyer

TUESDAY, FEBRUARY 26

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

7:45-8:45 a.m.
Continental Breakfast ..... **Potomac Foyer**

9:00-9:20 a.m.
ARPA-E Presentation ..... **Potomac A**
- *Dr. Cheryl Martin, Deputy Director, ARPA-E*

9:20-9:45 a.m.
Keynote Presentation ..... **Potomac A**

9:45-9:50 a.m.
Awardee Video ..... **Potomac A**

9:50-10:20 a.m.
Fireside Chat ..... **Potomac A**

10:20-10:30 a.m.
Congressional Comment ..... **Potomac A**
- *Chris Coons, U.S. Senator, Delaware*

10:30-10:50 a.m.
Keynote Presentation ..... **Potomac A**
- *Ellen Kullman, Chair and Chief Executive Officer, DuPont*

10:50 a.m.-1:10 p.m.
Technology Showcase and Lunch ..... **Technology Showcase**

1:10-1:15 p.m.
Awardee Video ..... **Potomac A**

1:15-1:45 p.m.
Fireside Chat ..... **Potomac A**
- *Moderator: Steve Clemons, Washington Editor at Large, The Atlantic*
- *Elon Musk, Chief Executive Officer and Product Architect, Tesla Motors; Chief Executive Officer, SpaceX*
- *Dr. Steven Chu, Secretary, U.S. Department of Energy*

1:45-1:50 p.m.
Awardee Video ..... **Potomac A**

1:50-2:10 p.m.
Keynote Presentation ..... **Potomac A**
- *Mitch Daniels, President, Purdue University; Former Governor, Indiana*

2:10-2:30 p.m.
Keynote Presentation ..... **Potomac A**
- *T. Boone Pickens, Founder, BP Capital*

Continued to next page >>

TUESDAY (CONTINUED)

2:30-2:45 p.m.

Networking Break..... Potomac Foyer

2:45-3:45 p.m.

PANEL SESSIONS

The Evolution of Energy Technology Funding Models—What's Next? .....Potomac A

Panelists examine recent trends in energy technology funding, the roles of strategic investors and some of the models through which they are engaging in investment for technology development outside of their own R&D centers.

- *Moderator: Will Coleman, OnRamp Capital*
- *Grant Allen, ABB Technology Ventures*
- *Christina Karapataki, Schlumberger*
- *Ben Rogers, Broadscale*
- *Steven Taub, GE Energy Financial Services*

Breaking Through the 'Grid'-lock.....Potomac C

This panel explores how the implementation of innovative technologies that could transform the electric industry is being impeded. Panelists examine what is creating the market barriers and who needs to act to eliminate those barriers.

- *Moderator: Clive Crook, Bloomberg View*
- *Lauren Azar, U.S. Department of Energy*
- *David Mohler, Duke Energy*
- *Cheryl Roberto, Ohio Public Utilities Commission*
- *Audrey Zibelman, Viridity Energy Inc.*

Developing the Developing World Smarter ..... Potomac 5

The introduction of technologies in developing economies often represents double-bottom line opportunities. Panelists discuss opportunities for first deployment of new energy technology in the developing world and how such technologies might subsequently gain traction in U.S. markets.

- *Moderator: Keith Johnson, Wall Street Journal*
- *Dr. Alex Dehgan, U.S. Agency for International Development*
- *Dr. Kate Steel, Google.org*
- *Richenda Van Leeuwen, United Nations Foundation*

How Low Can You Go? Will Technology Provide Low Capital Models for the Scale-up of Energy? ..... National Harbor 3

Modern advances in technology suggest that a radical shift in the production of energy technology is now becoming possible. Panelist focus on the essential questions, "What factors drive the decision to build big or small? How have recent advances in technology altered this choice? What is the terminal value of standardizing small-scale production?"

- *Moderator: Bryan Walsh, Time Magazine*
- *Dr. Klaus Lackner, Columbia University*
- *Dr. Paul Lorenzini, NuScale Power, LLC*
- *Jeff McDaniel, Oxford Catalysts and Velocys*
- *Rachel Sheinbein, CMEA Capital*
- *Dr. Garrett van Ryzin, Columbia University*

3:45-4:00 p.m.

Networking Break..... Potomac Foyer

TUESDAY (CONTINUED)

4:00-5:00 p.m.

PANEL SESSIONS

Taking Your First Test Flight: Leveraging Testing Facilities to Advance Early Stage Technologies .....Potomac A

Testing energy technologies within realistic scenarios is a key intermediate step in moving your technology from the laboratory toward the market. Panelists discuss strategies for successfully navigating your technology's first exposure to real-world conditions.

- *Moderator: Bart Gordon, K&L Gates*
- *Tore Amundsen, Technology Center Mongstad*
- *Dr. Geoffrey S. Kinsey, Fraunhofer Center for Sustainable Energy Systems*
- *Frank Lambert, National Electric Energy Testing Research and Applications Center*
- *Stephen Selkowitz, Lawrence Berkeley National Laboratory*

Square Pegs, Round Holes: When Technology Outpaces Policy.....Potomac C

New technologies invariably test the limits of current policy. Discussion is centered on the key question, "Will the newest energy technologies fit into the current policy framework, or will the frameworks need to adapt?"

- *Moderator: Coral Davenport, National Journal*
- *Dr. Matt Carr, Biotechnology Industry Organization*
- *Dr. Arshad Mansoor, Electric Power Research Institute*
- *Dr. Clark A. Miller, Arizona State University*

Energy as a Tactical Advantage: Next-generation Requirements from the Theater .....Potomac 5

Energy markets, fiscal needs, and evolving military threats challenge the Department of Defense's heavy reliance on energy, and create the imperative for transforming how DOD uses energy. This panel focuses on the DOD's long term objectives which illustrate where technology innovations will be required to deliver on the military's goals.

- *Moderator: Annie Snider, Greenwire*
- *Captain Jim Goudreau, U.S. Navy*
- *Dr. Mark T. Maybury, U.S. Air Force*
- *Colonel Peter Newell, U.S. Army*
- *Lieutenant Colonel Richard Schilke, U.S. Marine Corps*

Preventing and Responding to Energy Outages: New Technologies Pave the Way.....National Harbor 3

There is significant need for technologies to improve on existing emergency responses, provide new flexibility to responders, and better information for decision makers. This panel discusses various needs within disaster response and will give technologists new possible avenues of development in a complex and highly regulated field.

- *Moderator: Scott Clavenna, Greentech Media*
- *Anthony Lucas, U.S. Department of Energy*
- *Jalal Mapar, U.S. Homeland Security Advanced Research Projects Agency*
- *Major Brandon Newell, U.S. Marine Corps*
- *National Grid*

5:00-8:00 p.m.

Showcase and Reception..... Technology Showcase

WEDNESDAY, FEBRUARY 27

7:30 a.m.-4:00 p.m.

Registration & Information Desk Hours..... Potomac Foyer

7:30-8:30 a.m.

Special Networking Event: Women In the Energy Sector.....ARPA-E Booth 626 in Technology Showcase

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

7:30-8:45 a.m.

Technology Showcase & Continental Breakfast..... Technology Showcase

---

9:00-9:05 a.m.

Opening Remarks.....Potomac A

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

9:05-9:25 a.m.

Keynote Presentation.....Potomac A

- *Mayor Michael R. Bloomberg, 108th Mayor, New York City*

9:25-9:30 a.m.

Congressional Comment.....Potomac A

- *Lamar Alexander, U.S. Senator, Tennessee*

9:30-9:35 a.m.

Congressional Comment.....Potomac A

- *Lisa Murkowski, U.S. Senator, Alaska*

9:35-10:05 a.m.

The Only Constant is Change: Energy and the Global Perspective.....Potomac A

- *Moderator: John Podesta, Chair, Center for American Progress*
- *Dr. David F. Gordon, Head of Research; Director, Global Macro Analysis, Eurasia Group*
- *Blythe Masters, Head of Global Commodities and Corporate & Investment Bank Regulatory Affairs, J.P. Morgan*

10:05-10:10 a.m.

Awardee Video .....Potomac A

10:10-10:30 a.m.

Keynote Presentation.....Potomac A

- *Dr. Arati Prabhakar, Director, Defense Advanced Research Projects Agency*

10:30-10:35 a.m.

Congressional Comment.....Potomac A

- *Ron Wyden, U.S. Senator, Oregon*

10:35-10:50 a.m.

Networking Break..... Potomac Foyer

WEDNESDAY (CONTINUED)

10:50-11:10 a.m.

Keynote Presentation ..... Potomac A

- *Dr. Steven Chu, Secretary, U.S. Department of Energy*

11:10-11:15 a.m.

Awardee Video ..... Potomac A

11:15-11:45 a.m.

Fireside Chat ..... Potomac A

- *Moderator: John Podesta, Chair, Center for American Progress*
- *Nick Akins, President and Chief Executive Officer, American Electric Power*
- *Daniel Poneman, Deputy Secretary, U.S. Department of Energy*

11:45 a.m.-1:45 p.m.

Technology Showcase and Lunch ..... Technology Showcase

1:45-2:45 p.m.

PANEL SESSIONS

Crowdsourced Panel - Getting from "Cool" to "Scale": How Do We Ensure that New Materials Change the Future of Energy Technologies? ..... Potomac A

New materials – such as carbon nanotubes, graphene, and ionic liquids –need to be made cheaply, consistently, and at an industrial scale to have an impact on energy. Panelists discuss how advances in manufacturing of advanced materials will impact the future of new energy technologies.

- *Moderator and Panelists To Be Announced at Summit*

The Influence of New Collaboration Models on Innovation ..... Potomac C

New models for collaboration on innovation in R&D have emerged that seek to tap into external expertise, cooperate on novel ideas, and provide new paths to market. Panelists discuss examples of collaboration models, including open innovation, while also exploring how these trends will change the way innovation occurs in the energy sector.

- *Moderator: Andrew Zolli, PopTech*
- *Dr. Svetlana Dimovski, BASF North America*
- *Jon A. Fredrickson, InnoCentive, Inc.*
- *Chantal Hendrzak, PJM Interconnection*
- *Jim Newton, TechShop*

Energy on the Field: Sports as Early Adopters of Energy Technologies ..... Potomac 5

From the early use of efficient lighting and video displays for stadiums to the early incorporation of ultralight, ultrastrong materials in equipment, the sports world has provided a proving ground for new technologies. Panelists discuss how recent advances in energy technologies are finding fertile ground for early adoption in sports applications.

- *Moderator: Mike Richter, Healthy Planet Partners*
- *Leonard Bonacci, Philadelphia Eagles*
- *Dr. Mike Lynch, NASCAR*
- *Jennifer Regan, AEG*
- *Jason Twill, Green Sports Alliance*

Continued to next page >>

WEDNESDAY (CONTINUED)

2:45-3:00 p.m.

Networking Break..... Potomac Foyer

3:00-4:00 p.m.

PANEL SESSIONS

Distributed Energy Meets Distributed Information Control of the Future Grid .....Potomac A

The future electric grid will have a greater number of distributed energy resources and there will be an explosion of distributed information at various time-scales. A challenge will be to use this distributed information to operate the electric grid while maintaining, if not improving, reliability, security, and resilience. This panel discusses the challenges in information and electric grid architectures, networks, algorithms, and controls.

- *Moderator: Jeff St. John, Greentech Media*
- *Ron Ambrosio, IBM Research*
- *Dr. David Sun, Alstom Grid*
- *Dr. Jeffrey Taft, Cisco Connected Energy Networks*
- *Geisha J. Williams, Pacific Gas and Electric Company*

Working with Less: New Technology Development to Deal with Water Demands of Energy and Agriculture.....Potomac C

The global scale and growth of both energy needs and agricultural production are pushing the limits of available resources. This panel looks at technologies that reduce the demand for and increase the supply of fresh water. Panelists address the key question, "What are the current prospects for water technologies, including use, reuse, and reduction?

- *Moderator: David Biello, Scientific American*
- *Ben Grumbles, U.S. Water Alliance*
- *Dr. Jacqueline Heard, Monsanto Company*
- *Ken Mortensen, SPX Cooling Technologies*
- *Carlos A. Riva, Poseidon Water*

Accelerating Energy Efficiency Scale-up: What it Takes to Succeed .....Potomac 5

Energy efficiency has had significant investment, but while operational savings are immediate and payback periods for efficiency investments are short, adoption has been slower than anticipated. This panel discusses the current state of energy efficiency investment, challenges to move these technologies to scale in the marketplace, and what it will take to succeed.

- *Moderator: Matthew Wald, The New York Times*
- *Andy Baynes, Nest Labs*
- *Tushar Dave, Enlightened, Inc.*
- *Claire Broido Johnson, Next Step Living*
- *Steve Vassallo, Foundation Capital*

4:00-4:30 p.m.

Summit Wrap Up.....Potomac A

4:30-5:30 p.m.

Leadership Networking Reception..... Potomac Foyer

Attendees are encouraged to participate. The Summit concludes at 5:30 p.m.

SECTION 3
SESSION DESCRIPTIONS

Strategic Partnerships: Models that Work

Monday | 2:00-2:45 p.m. | Potomac A

Panel Description:

Successful strategic partnerships enable both partners to explore options that are not accessible to either party individually, resulting in a "win-win" outcome that makes both businesses stronger in the long run. On the other hand, unsuccessful partnerships can lead to expensive disputes over intellectual property, the loss of both key employees and customers, and the neglect of other opportunities, resulting in a "lose-lose" outcome that weakens both parties. Because of these stakes, strategic partnerships can result in extensive and complex negotiations. This panel will address what to look for in a successful strategic partnership. It will touch on the "lifecycle" of successful strategic partnerships; starting at partnership initiation, continuing through the construction and execution of the partnership, and ending at follow-through.

Panelists:

MODERATOR

BETH COMSTOCK
Senior Vice President, Chief Marketing Officer, GE

KEN GEISLER
Vice President, Business Strategy, Smart Grid Division, Siemens

LISA CASWELL
President, eMeter, A Siemens Business

DR. BRIAN HENNINGS
Vice President, Operations, Lynntech Inc.

D. LARRY CLARK
Senior Manager, Spacecraft Technology Development Laboratory, Lockheed Martin Space Systems Company

Are There Military Applications in Your Future?

Monday | 2:00-2:45 p.m. | Potomac C

Panel Description:

The U.S. Department of Defense is the largest single user of energy in the U.S., which makes for an obvious target in the adoption of new products and approaches in energy. However, moving from research breakthroughs through test beds and into field deployment involves crossing a number of important hurdles. This panel will focus on what companies need to know to move most readily and successfully into DoD supply contracts. Special focus is given to details like audits and data generation that are necessary in order to successfully complete contracting, as well as examples of resources available to help in that transition.

Panelists:

MODERATOR

DR. JEFFREY MARQUSEE
Executive Director, Strategic Environmental Research and Development Program (SERDP) and Director, Environmental Security Technology Certification Program (ESTCP), U.S. Department of Defense

KEVIN MADDEN
Vice President, Federal Systems Group, Honeywell Building Solutions

RODNEY MATEER
Director, Government Contracting Services, Deloitte Financial Advisory Services, LLP

DEBORAH JELEN
Executive Director, Electricore, Inc.

DR. MICHAEL WEST
Principal, Chief Executive Officer, Advantek Consulting Engineering, Inc.

In Your Backyard: Taking Advantage of Regional Resources to Move Technologies Forward

Monday | 2:00-2:45 p.m. | Potomac 2

Panel Description:

Proximity to regional resources is helpful for early stage technologists as they assess the commercial viability of their technologies. These resources - ranging from consulting services to incubators to funding opportunities -- all can assist in moving technologies towards the market. This panel will highlights different models set up across the country, who/how they engage and examples of successful outcomes, and how you can find resources to help you!

Panelists:

MODERATOR

MILES O'BRIEN
Science Correspondent, PBS

BRIAN STEEL
Co-Director, Cleantech to Market, Energy Institute at Haas, University of California, Berkeley

AMY FRANCETIC
Executive Director, Clean Energy Trust

FRED WALTI
Executive Director, Los Angeles Cleantech Incubator and Clean Tech Los Angeles

BILL HAGSTRAND
Director, Cluster Acceleration, NorTech

If You Build it, Will They Come? A Look into What Drives Customers

Monday | 2:00-2:45 p.m. | Potomac 5

Panel Description:

New energy technologies are developed to increase the number of energy alternatives available to consumers, while at the same time striving to provide performance that at least equals current energy technologies. To adopt new alternatives, consumers must have sufficient motivation to overcome both inertia and the perception of risk inherent in the unknown. This panel examines market drivers in the energy technology space. Particular focus will be given to the question: "What does it take for new technologies to successfully enter such a large, price-sensitive market?"

Panelists:

MODERATOR

KEVIN BULLIS
Senior Editor, Energy, Technology Review

GEORGE COLONY
Chairman and Chief Executive Officer, Forrester Research

DR. DAN ARIELY
James B. Duke Professor of Psychology and Behavioral Economics, Duke University

DR. ROLF STROMBERGER
Vice President, Business Environment Strategy, BMW of North America, LLC

Selling the Future State: What to Talk about When Your Product Isn't a Product Yet

Monday | 4:30-5:30 p.m. | Potomac A

Panel Description:

Whether you are an academic researcher, startup entrepreneur, or corporate R&D manager, your new technology will live or die based on how well you sell it. This panel explores why selling the future is such a critical step on the path to creating the future, and help you master the art of pitching a product that has yet to be created.

Panelists:

MODERATOR

KATIE FEHRENBACHER
Senior Writer, GigaOM

DR. SAUL GRIFFITH
Co-Founder and Principal Scientist, Otherlab

DAVE BLAKELY
Director of Technology Strategy, IDEO

Walking Before You Run: Real Benefits of First Markets

Monday | 4:30-5:30 p.m. | Potomac C

Panel Description:

Because the energy industry consists of multibillion-dollar market segments, capturing even a fraction of the market offers an attractive economic proposition for investors. Still, a large addressable market can be both a blessing and a curse. New entrants must achieve scaled production to service even a sliver of the market, and these capital-intensive facilities must be operational before turning a positive cash flow. How else to proceed? In this panel, we will learn how companies use smaller markets with considerably shorter development cycles to get started. This alternative "stepping stone" approach has dual advantages, allowing companies to not only grow the top line more quickly but also to address production issues on a smaller scale, reducing both technical and economic risks. This discussion addresses the key question: "What characteristics exemplify a good stepping stone market as opposed to just a distraction?"

Panelists:

MODERATOR

DR. DESMOND (DES) KING
President, Chevron Technology Ventures

EMILY LIGGETT
Chief Executive Officer, Novatorque, Inc.

DR. KATHY AYERS
Chief Technology Officer, Proton OnSite

DR. SVEN STROHBAND
Partner, Chief Technology Officer, Khosla Ventures

F. NEAL HUNTER
Co-Founder and Former Chief Executive Officer, Cree, Inc.

Hire, Rent or Borrow: How to Access the Right Talent When You Are Starting Out

Monday | 4:30-5:30 p.m. | Potomac 2

Panel Description:

To be successful, any entrepreneur has to consider carefully all resources, including people, facilities, and equipment, and should seek to access these resources as flexibly as possible. Hiring too many, too soon (or even too few, too late) can mean the difference between a spectacular success and a dismal failure. Similarly, paying too much for space or equipment (or paying for the wrong kinds of either) can doom even the best technology. This panel discusses both the practices and pitfalls of resource management, and seeks to address the questions, "Where can I find the right technical expertise and facilities to help build my company?" and "How can I avoid common mistakes in hiring?"

Panelists:

MODERATOR

DR. ERROL ARKILIC
Program Manager, National Science Foundation

KIMBERLY GIBSON
Director, Advanced Energy Manufacturing Center, Edison Welding Institute

JENNIFER CRYSTAL BOULANGER
Director, Talent Acquisition, Opower

PHIL GIUDICE
Chief Executive Officer, Ambri

WILLIAM FARRIS
Associate Laboratory Director, Innovation, Partnering & Outreach, National Renewable Energy Laboratory

Get Smart about IP: Pros, Cons and Costs of Your Patent Strategy

Monday | 4:30-5:30 p.m. | Potomac 5

Panel Description:

Not all patents have equal value. Some can be the foundation for growing a strong business, while others provide a false sense of value that becomes evident only in retrospect. Further, only demonstrably new inventions can be patented. Such demonstration is complex because, inevitably, all inventions build upon the work of those that have invented before. Deciding what should and should not be patented, figuring out how much to pay for patents, and determining whether there is a patent roadblock controlled by others, are all crucial decisions for new ventures. This panel addresses the decision-making process in choosing how to protect an invention and will also discuss the difference between patentability and patent infringement.

Panelists:

MODERATOR

DR. ROBERT D. ATKINSON
President, Information Technology and Innovation Foundation

BRIAN P. O'SHAUGHNESSY ESQUIRE
Shareholder, RatnerPrestia

ERIN-MICHAEL GILL
Chief, Intellectual Property, MDB Capital

DR. DAVID PAREKH
Vice President, Research and Director, United Technologies Research Center

SARAH HARRIS
Vice President and Deputy General Counsel, Intellectual Property, AOL

The Evolution of Energy Technology Funding Models - What's Next?

Tuesday | 2:45-3:45 p.m. | Potomac A

Panel Description:

How energy technologies are financed, from the earliest stages of research through deployment at scale, has changed significantly in recent years. The enthusiasm of "cleantech" venture investors, especially when faced with the cash-flow challenges of more capital-intensive technologies, has waned. At the same time, the number of strategic investors from both inside and outside of the U.S. has increased. Further, the models for early- to mid-stage investment have continued to evolve. This panel examines the roles of strategic investors and some of the models through which they are engaging in investment for technology development outside of their own R&D centers.

Panelists:

MODERATOR
WILL COLEMAN
OnRamp Capital

BEN ROGERS
Managing Partner, Broadscale

GRANT ALLEN
Senior Vice President, ABB Technology Ventures

STEVEN TAUB
Senior Vice President, Venture Capital, GE Energy Financial Services, Inc.

CHRISTINA KARAPATAKI
Early Stage Technology Venture Advisor, Schlumberger

Breaking Through the 'Grid'-lock

Tuesday | 2:45-3:45 p.m | Potomac C

Panel Description:

Many innovative technologies under development could transform the electric industry, offering a more robust, reliable and flexible electric delivery system than that developed over the last century. However, the market is not ready to embrace all of those technologies. Often, the motivations and interests of the critical players are not aligned which impedes traction on implementation. This panel investigates the types of innovative technologies being affected, what is creating the market barriers, and who needs to act to eliminate those barriers.

Panelists:

MODERATOR

CLIVE CROOK
Columnist and Member of the Editorial Board, Bloomberg View

CHERYL ROBERTO
Former Commissioner, Ohio Public Utilities Commission

LAUREN AZAR
Senior Advisor, Office of the Secretary, U.S. Department of Energy

AUDREY ZIBELMAN
Founder, President and Chief Executive Officer, Viridity Energy Inc.

DAVID MOHLER
Vice President, Emerging Technology, Duke Energy

Developing the Developing World Smarter

Tuesday | 2:45-3:45 p.m | Potomac 5

Panel Description:

In developing new technologies for electricity applications, cost parity with existing technical solutions requires the achievement of less than $0.10/kWh for energy and $1/W for power generation capacity in the developed world (U.S. Grid). By comparison, cost parity with existing technical solutions (or no service) can often be greater than $1.00/kWh for energy and $5/W for power. Thus, the introduction of technologies in developing economies often represents double-bottom line opportunities: economies of scale can drive down manufacturing costs to the point where they may subsequently be produced for the U.S. and the developed world, and the standard of living is raised in the developing word from increased access to electricity. However, significant challenges exist related to diffuse market channels, poor financing structures, inter- and intra- country policy barriers and lack of market structures. In this panel, we discuss opportunities for new energy technology first-deployment in the developing world and how technologies initially deployed internationally might subsequently migrate back to U.S. markets.

Panelists:

MODERATOR

KEITH JOHNSON
Staff Reporter, Wall Street Journal

DR. KATE STEEL
Associate, Energy and Sustainability, Google. org

DR. ALEX DEHGAN
Science and Technology Adviser, U.S. Agency for International Development

RICHENDA VAN LEEUWEN
Executive Director, Energy Access Initiative, Energy and Climate, United Nations Foundation

How Low Can You Go? Will Technology Provide Low Capital Models for the Scale-up of Energy?

Tuesday | 2:45-3:45 p.m | National Harbor 3

Panel Description:

Cost reductions for both energy-production and energy-use technologies have historically stemmed from "economies of scale". To reach such economies, producers and users take divergent paths: Producers reduce operating costs through larger (and more capital intensive) installations (e.g., oil refineries), while users reduce capital costs through standardization of equipment (e.g., automobiles). Modern advances in automation and communication technology suggest that a radical shift in production, from a world focused on efficiency of size to one focused on efficiency of numbers, is now becoming possible. In this new world, production becomes decentralized by focusing the economies of scale on the means of production rather than on production itself. This panel discussion focuses on the essential questions, "What factors drive the decision to build big or small? How have recent advances in technology altered this choice? What is the terminal value of standardizing small-scale production?"

Panelists:

MODERATOR

BRYAN WALSH
Senior Editor, Time Magazine

JEFF MCDANIEL
Commercial Director, Oxford Catalysts and Velocys

DR. KLAUS LACKNER
Director, Lenfest Center for Sustainable Energy and Department Chair, Earth and Environmental Engineering, Columbia University

RACHEL SHEINBEIN
Partner, Energy and Materials, CMEA Capital

DR. GARRETT VAN RYZIN
Paul M. Montrone Professor and Chair, Decision, Risk and Operations, Graduate School of Business, Columbia University

DR. PAUL LORENZINI
Co-Founder, Retired Chief Executive Officer, NuScale Power, LLC

Taking Your First Test Flight: Leveraging Testing Facilities to Advance Early Stage Technologies

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

Panel Description:

Testing energy technologies under real-world conditions is a key intermediary step in moving your technology from the laboratory towards the market. If you understand a technology's realistic performance and capabilities, you will be able to test your initial assumptions and identify the most critical engineering challenges as you scale up. Bringing technologies onto testing sites and facilities also allows you to build relationships with regulators, process engineers, and even potential investors– all of whom can provide invaluable advice. Discussion is centered on the strategies for successfully navigating your technology's first exposure to real-world conditions, such as process irregularities, contaminants, and fluctuating demand loads.

Panelists:

MODERATOR

BART GORDON
Partner, K&L Gates; Former Representative, Tennessee

FRANK LAMBERT
Principal Research Engineer, Associate Director & Systems Analysis Program Manager, National Electric Energy Testing Research and Applications Center, Georgia Tech

TORE AMUNDSEN
Chief Executive Officer, Technology Center, Mongstad

STEPHEN SELKOWITZ
Senior Advisor for Building Science, Lawrence Berkeley National Laboratory

DR. GEOFFREY S. KINSEY
Director, Photovoltaic Technologies, Fraunhofer Center for Sustainable Energy Systems

Square Pegs, Round Holes: When Technology Outpaces Policy

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

Panel Description:

New technologies invariably test the limits of current policy, regardless of the field. New pharmaceutical agents, new communication strategies, and new methods to create and distribute energy all require proactive policy approaches. In energy, for example, alternative fuels must be defined broadly enough to encompass new technologies without being so broad as to blur the distinction between alternative and conventional sources. Similarly, as technology development in areas such as information routing algorithms and high performance materials enable new ways of transmitting or routing energy, these approaches will also challenge the current regulatory frameworks. At the same time, policy must also take into account public interest, including safety and economic impact, to either promote or discourage the adoption of these new technologies. Panelists address the key question, "Will the newest energy technologies fit into the current policy framework, or will the frameworks need to adapt?"

Panelists:

MODERATOR

CORAL DAVENPORT
Energy and Environment Correspondent, National Journal

DR. ARSHAD MANSOOR
Senior Vice President, Research and Development, Electric Power Research Institute

DR. MATT CARR
Managing Director, Industrial and Environmental Section, Biotechnology Industry Organization

DR. CLARK A. MILLER
Associate Director, Consortium for Science, Policy and Outcomes, Arizona State University

Energy as a Tactical Advantage: Next-generation Requirements from the Theater

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

Panel Description:

The U.S. Department of Defense is the single largest consumer of energy in the U.S., and seventy-five percent of this energy is "operational energy" used to power vehicles, ships, aircraft, and tactical power generation systems. Energy markets, fiscal needs, and evolving military threats will challenge this heavy reliance on energy, and create the imperative for transforming how the Department uses energy in military operations. To this end, the Defense Department aims to reduce operational demand, to identify superior sources of energy, and to improve the energy security of military operations. Significant work is currently underway to deliver on all three of these goals, but further challenges remain. This panel discussion focuses on long term objectives which illustrate where significantly different ways of thinking about the solutions and the accompanying technology innovations will be required to deliver on the military's goals.

Panelists:

MODERATOR
ANNIE SNIDER
Reporter, Greenwire

COLONEL PETER NEWELL
Director, Rapid Equipping Force, U.S. Army

CAPTAIN JIM GOUDREAU
Director, Navy Energy Coordination Office, U.S. Navy

LIEUTENANT COLONEL RICHARD SCHILKE
Requirements and Technology Branch Head, Marine Corps Expeditionary Energy Office, U.S. Marine Corps

DR. MARK T. MAYBURY
Chief Scientist, U.S. Air Force

Preventing and Responding to Energy Outages: New Technologies Pave the Way

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

Panel Description:

Restoration of power after an event is a major issue for utilities and governments. Time to restoration can significantly affect both public safety and cost of recovery. There is significant need for technologies to improve on existing responses, provide new flexibility to responders, and better information for decision makers. This panel will explore potential opportunities, such as temporary transformers, distributed asset sensor networks, rapidly deployed microgrids and crowd-sourced information streamlining for first responders. This panel discusses various needs within disaster response and will give technologists new possible avenues of development in a complex and highly regulated field.

Panelists:

MODERATOR

SCOTT CLAVENNA
Chief Executive Officer and Co-Founder, Greentech Media

JALAL MAPAR
Division Director, Science and Technology Directorate, U.S. Department of Homeland Security Advanced Research Projects Agency

ANTHONY LUCAS
Federal Program Manager, Infrastructure Security and Energy Restoration, U.S. Department of Energy

MAJOR BRANDON NEWELL
Technology Lead, Expeditionary Energy Office, U.S. Marine Corps

TBD
National Grid

Crowdsourced Panel - Getting from "Cool" to "Scale": How Do We Ensure that New Materials Change the Future of Energy Technologies?

Wednesday | 1:45-2:45 p.m. | Potomac A

Panel Description:

Recent scientific advances have produced many novel materials, such as carbon nanotubes, graphene, and ionic liquids, whose physical properties confer significant advantages in a wide range of energy applications. We know which new materials provide breakthrough properties, but the challenge is that we lack the know-how to implement this knowledge at a practical level. To have an impact on energy, these new materials need to be made cheaply, consistently, and at an industrial scale. This panel discusses how advances in manufacturing of advanced materials will impact the future of new energy technologies.

Moderator and Panelists To Be Announced at Summit

The Influence of New Collaboration Models on Innovation

Wednesday | 1:45-2:45 p.m. | Potomac C

Panel Description:

With an increasingly diverse global innovation landscape, researchers are at a growing risk of overlooking key opportunities developed outside their cubicles and walls. New models for collaboration on innovation in R&D have emerged that seek to tap into external expertise, cooperate on novel ideas, and provide new paths to market. Panelists discuss examples of collaboration models, including open innovation, while also exploring how these trends will change the way innovation occurs in the energy sector.

Panelists:

MODERATOR
ANDREW ZOLLI
Executive Director and Curator, PopTech

CHANTAL HENDRZAK
Director, Applied Solutions, PJM Interconnection

DR. SVETLANA DIMOVSKI
Manager, Open Innovation and Science Relations, BASF North America

JIM NEWTON
Chairman and Founder, TechShop

JON A. FREDRICKSON
Vice President, Government, InnoCentive, Inc.

Energy on the Field: Sports as Early Adopters of Energy Technologies

Wednesday | 1:45-2:45 p.m. | Potomac 5

Panel Description:

In sports, teams and athletes are always looking to gain competitive advantage to put them over the top. Over the years, individual players, teams, and leagues have sought to gain competitive and financial advantage by being the first to adopt the most advanced technologies, and many of these technologies are related to energy. From the early use of highly efficient lighting and video displays for stadiums to the early incorporation of ultralight, ultrastrong materials (such as carbon-fiber reinforced composites) in equipment, the sports world has always needed to be at the leading edge, and has provided an invaluable proving ground for new technologies. Today, ballparks and stadiums are using their public status to help lead the way toward an efficient, sustainable, and renewable future. Panelists discuss how recent advances in energy technologies are finding fertile ground for early adoption in sports applications.

Panelists:

MODERATOR

MIKE RICHTER
Founding Partner and Chief Executive Officer, Healthy Planet Partners

JENNIFER REGAN
Director, Global Sustainability, AEG

LEONARD BONACCI
Vice President, Event Services and Operations, Philadephia Eagles

JASON TWILL
Co-Founder, Green Sports Alliance

DR. MIKE LYNCH
Managing Director, Green Innovation, NASCAR

Distributed Energy Meets Distributed Information - Control of the Future Grid

Wednesday | 3:00-4:00 p.m. | Potomac A

Panel Description:

The future electric grid will have a vastly greater number of distributed energy resources: PV generators, micro-generators, storage, electric vehicles, fuel cells, flexible loads, etc. Major advances in power electronics will pave the way to novel opportunities for distributed control of the electric grid. Along with ubiquitous sensing and communications, there will be an explosion of distributed information at various time-scales. A major challenge will be to use this distributed information on energy generation, transmission/distribution, and consumption to operate the electric grid while maintaining, if not improving, reliability, security, and resilience. And this must be done while providing economic benefits to consumers and society. Panelists address the challenges in information and electric grid architectures, networks, algorithms, and controls to achieve these goals.

Panelists:

MODERATOR

JEFF ST. JOHN
Senior Editor, Smart Grid, Greentech Media

DR. JEFFREY TAFT
Chief Architect, Cisco Connected Energy Networks

RON AMBROSIO
Chairman, GridWise Architecture Council and Global Research Leader, Energy and Utilities Industry, IBM Research

GEISHA J. WILLIAMS
Executive Vice President, Electric Operations, Pacific Gas and Electric Company

DR. DAVID SUN
Chief Scientist, Network Management Solutions, Alstom Grid

Working with Less: New Technology Development to Deal with Water Demands of Energy and Agriculture

Wednesday | 3:00-4:00 p.m. | Potomac C

Panel Description:

The global scale and growth of both energy needs and agricultural production are pushing the limits of available resources. Nowhere is this more evident than at the "energy-water nexus", a concept that refers to the use of fresh water for many energy-related purposes, including high capacity cooling for power production and hydraulic fracturing to release inaccessible underground resources. This demand directly competes with the use of fresh water for agriculture, not only for food but also for biofuel production. This session looks at technologies that reduce the demand for and increase the supply of fresh water. The panel will address the key question, "What are the current prospects for water technologies, including use, reuse, and reduction?

Panelists:

MODERATOR

DAVID BIELLO
Associate Editor, Environment and Energy, Scientific American

KEN MORTENSEN
Manager, Research and Development, SPX Cooling Technologies

BEN GRUMBLES
President, U.S. Water Alliance

CARLOS A. RIVA
Chief Executive Officer, Poseidon Water

DR. JACQUELINE HEARD
Investment Director, Monsanto Growth Ventures, Monsanto Company


Vision
United Technologies Research Center (UTRC) partners with United Technologies business units and external research organizations to expand the boundaries of science and technology through research and innovation, delivering technology options that meet and anticipate the needs of the marketplace.
Find out more at www.utrc.utc.com.
United Technologies
OTIS
SIKORSKY
UTC CLIMATE, CONTROLS & SECURITY
UTC PROPULSION & AEROSPACE SYSTEMS
PRATT & WHITNEY
UTC AEROSPACE SYSTEMS
UNITED TECHNOLOGIES RESEARCH CENTER

Accelerating Energy Efficiency Scale-up: What it Takes to Succeed

Wednesday | 3:00-4:00 p.m. | Potomac 5

Panel Description:

Energy efficiency has been an area of significant investment due to the large potential markets associated with improving both commercial and consumer energy consumption. Approaches to improved efficiency are diverse, and include using energy more intelligently through improved controls and software, using less energy for the same benefit through more efficient lighting and HVAC systems, and reducing the energy load in buildings through improved building materials. However, even though the operational savings for customers are immediate and the payback periods for efficiency investments are generally short, adoption has been slower than anticipated. Some start-ups companies, however, are succeeding in the market while other, earlier stages ones, are positioning themselves to navigate these challenges. A number of venture capital and strategic investors continue to be investing in this sector. Panelists discuss the current state of energy efficiency investment, the challenges to move these technologies to scale in the marketplace and what it will take to succeed.

Panelists:

MODERATOR

MATTHEW WALD
The New York Times

CLAIRE BROIDO JOHNSON
Chief, New Markets and Services, Next Step Living

ANDY BAYNES
Director, Business Development and Energy Efficiency, Nest Labs

STEVE VASSALLO
General Partner, Foundation Capital

TUSHAR DAVE
Chief Executive Officer, Enlightened, Inc.

Government Agency Networking Program

Monday | 2:45 p.m. – 4:30 p.m. | National Harbor 3 & 10

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

See the list below of participating United States Government Agencies and their focus areas.

★ Visit National Harbor 3 to Visit the Following Agencies

U.S. DEPARTMENT OF DEFENSE AGENCIES

Air Force

The United States Air Force plays a significant role in our nation's strategy to become energy independent and improve its energy security posture. The Air Force is committed to enhancing its mission capability by adopting energy efficient technologies and practices for its operations and exploring alternative energy solutions to support its critical infrastructure at home and abroad. Energy is a critical part of every aspect of the Air Force's operations and the Air Force is interested in new technologies that will improve resiliency, reduce demand and provide flexibility thereby assuring that the Air Force has energy supplies to accomplish the mission. The Air Force's senior leader on energy program, Deputy Assistant Secretary Kevin Geiss, will discuss Air Force priorities, accomplishments to date, areas of future interest, and ways for industry to engage.

Army

The United States Army's ability to accomplish our mission on a global scale depends on secure, uninterrupted access to power and energy. The Army is aggressively pursuing power and energy advancements in an effort to enhance mission effectiveness and maintain operational readiness at all times. We are focusing our energy efforts on Soldier Power, which is the energy and associated systems required for a dismounted Soldier; Basing Power, which is the fuel, water, and energy needed at our installations and base camps; and Vehicle Power, which is the energy associated with our air-ground-tactical and non-tactical vehicles. Smart investment in renewable energy and energy efficient technologies will help ensure the Army of tomorrow has uninterrupted access to energy, water, land, and natural resources.

Marine Corps

The United States Marine Corps was established by an Act of Congress on 10 November 1775. The early focus was on ship detachments, navy yard barracks and provisional force for expeditionary service ashore. The National Security Act of 1947 directed the Marine Corps to conduct: the seizure or defense of advanced naval bases and other land operations to support naval campaigns; the development of tactics, techniques and equipment used by amphibious landing forces; and such other duties as the President may direct today: an amphibious, expeditionary, air-ground-logistics taskforce.

Navy's Energy and Environmental Readiness Programs

The United States Navy is deeply committed to reducing energy use, integrating alternative fuels into our systems, and adopting energy efficiency as a means of increasing combat capability. We work with industry, academia, and federal agencies to incorporate advanced, drop-in replacements for petroleum and expand renewable energy use. We recognize energy as a strategic resource, critical to our mission. Through an aggressive strategy, the Navy will ensure energy independence for the long haul- which will protect Sailors and Marines, make us more effective in defending our nation and allies, and help enable sustainable use of the world's precious resources for future generations.

Office of Naval Research (ONR)

The Office of Naval Research's Power and Energy Focus Area invests in research and technology to meet the energy challenges for the Department of Navy. ONR has partnered with the Department of Energy, Department of Agriculture and all DoD Services to ensure innovative, state-of-the-art, Science and Technology 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)

The Department of Defense is the single largest consumer of energy in the U.S., and seventy-five percent of this energy is "operational energy" used to power vehicles, ships, aircraft, and tactical power generation systems. Energy markets, fiscal needs, and evolving military threats will challenge this heavy reliance on energy, and create the imperative for transforming how the Department uses energy in military operations. The Department's Operational Energy Strategy and supporting Implementation Plan identify how to achieve energy security for the warfighter by assuring that U.S. forces have a reliable supply of energy for 21st century military missions. First, the Department will reduce demand for energy

in military operations by increasing the efficiency of energy use. Second, the Department will expand and secure energy supplies for military operations by diversifying its energy sources. Finally, the Department will build energy security into the future force by integrating operational energy considerations into the full range of planning and force development activities. The Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs is promoting operational energy innovation to meet the above stated goals. To accelerate technical progress, the Department has been identifying energy-relevant technology areas requiring additional investment and aligning science and technology (S&T) investment portfolios to address these issues. Some areas where the Department is looking to make further investments include: portable energy generation technologies (solar, waste-to-energy); modeling and simulation tools for energy usage; increased engine fuel efficiency; improvements to environmental control systems; and flexible and adaptive power distribution.

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

SERDP and ESTCP are the Department of Defense's environmental research and installation energy test bed programs. The programs harness the latest science and technology to develop and demonstrate innovative, cost-effective, and sustainable solutions. These innovations improve DoD's environmental and energy performance, reduce costs, and enhance mission capabilities. SERDP and ESTCP's Energy and Water program area supports the demonstration of innovative technologies to reduce DoD's installation energy consumption and carbon footprint, improve energy security, and facilitate water conservation. The 90+ projects address technologies such as building energy efficiency, energy management systems, smart microgrids, and distributed energy generation.

OTHER U.S. FEDERAL AGENCY

National Aeronautics and Space Administration (NASA)

Since its inception in 1958, NASA has accomplished many great scientific and technological feats in air and space. NASA technology also has been adapted for many non-aerospace uses by the private sector. NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general. Perhaps more importantly, our exploration of space has taught us to view Earth, ourselves, and the universe in a new way.

★ Visit **National Harbor 10** to Visit the Following Agencies

U.S. DEPARTMENT OF ENERGY AGENCIES

Grid Tech Team

The Grid Tech Team (GTT), established by the Office of the Undersecretary of Energy, was tasked with coordinating grid-related activities across the Department and accelerating modernization of the electric power system. In this role, the GTT will provide thought-leadership, convene relevant stakeholders, facilitate open dialogues, and coordinate results and actions. It is not tasked with dictating solutions. The GTT advocates a comprehensive, holistic systems approach that balances technical and institutional solutions with sensitivities to regulatory, policy, and market challenges.

Office of Energy Efficiency and Renewable Energy (EERE)

The Office of Energy Efficiency and Renewable Energy (EERE) accelerates development and facilitates deployment of energy efficiency and renewable energy technologies and market-based solutions that strengthen U.S. energy security, environmental quality, and economic vitality. EERE drives energy innovation through strong private and public sector relationships with researchers, industries, businesses, universities, and laboratories. We envision a prosperous future where energy use and generation are efficient, secure, clean, and affordable.

Office of Fossil Energy

Ensuring that we can continue to rely on clean, affordable energy from our traditional fuel resources is the primary mission of DOE's Office of Fossil Energy. The Office of Fossil Energy is responsible for several high-priority initiatives including implementation of the Clean Coal Power Initiative to develop a new generation of environmentally sound clean coal technologies, the Fossil Energy elements of the American Recovery and Reinvestment Act of 2009, and the Nation's Strategic Petroleum Reserve and Northeast Home Heating Oil Reserve, both key emergency response tools available to the President to protect Americans from energy supply disruptions.

Office of Nuclear Energy

The Office of Nuclear Energy (NE) promotes nuclear power as a resource capable of meeting the Nation's energy, environmental and national security needs by resolving technical and regulatory barriers through research, development and demonstration.

Office of Science

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. Our researchers have won 113 Nobel Prizes and over 800 R&D 100 Awards over the past six decades. 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—including supercomputers, large-scale x-ray light sources, neutron scattering sources, and sophisticated facilities for nanoscience and genomic sequencing—serving more than 26,500 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.

Technology Transfer Office

DOE's Technology Transfer Office (TTO) works with the Department's National Laboratories and single-purpose research facilities to accelerate the process of moving innovative discoveries to the private sector and to increase the economic impact of these discoveries. The TTO develops and implements policy on technology transfer mechanisms such as Cooperative Research and Development Agreements (CRADA), Work for Others Agreements (WFO), technical assistance agreements, Agreements for Commercializing Technology (ACT), User Facility Agreements, and Intellectual Property licensing. The office is primarily focused on enabling strong partnerships and collaborations between DOE and the private sector to increase commercial outcomes of DOE's technology transfer program.

OTHER U.S. FEDERAL AGENCIES

Department of Agriculture (USDA)

The United States Department of Agriculture (USDA) is working in every way to encourage and support the development, production, and delivery of clean, renewable, domestically produced energy. Our efforts cover the entire renewable energy supply chain: research and development activities; financial assistance to agriculture and forest producers for raising and harvesting energy crops; financing biorefineries that will produce renewable sources of fuel and power; and providing technical and financial assistance to agricultural producers and rural small business to assist them in becoming more energy efficient. We are working to lead the way for a clean energy future for our country.

Department of Transportation / Volpe

Part of the United States Department of Transportation's Research and Innovative Technology Administration, Volpe, The National Transportation Systems Center, is a critical resource for innovation in transportation. Our mission is to improve the nation's transportation system by anticipating emerging transportation issues and to serve as a center of excellence for informed decision making. The Center for Environmental and Energy Systems (EES) within Volpe provides critical data and analyses to support energy independence, innovations in the movement of people and goods, and transportation-related climate-change mitigation and adaptation. The Energy Analysis and Sustainability division within EES researches alternative energy sources, their conversion to motive energy, and the resulting sustainability across all modes of our transportation system.

National Science Foundation (NSF)

Since its creation over 60 years ago, the National Science Foundation (NSF) has profoundly impacted our Nation's innovation ecosystem by funding the transformative, fundamental research that has become the agency's hallmark. NSF investments in fundamental research have led to path-breaking advances, from nanotechnology and new materials to Internet technologies and complex systems theory, and NSF's continuing commitment to supporting a wide range of fields and disciplines helps to secure and sustain U.S. competitiveness and economic growth. Similarly, NSF's strong support for science, technology, engineering, and mathematics (STEM) education at all levels provides the nation with a globally-competitive workforce. The NSF Directorate for Engineering supports frontier basic research and education across all fields of engineering. The Directorate 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 programs advance innovation research that leverages findings from academic research and builds collaboration between academia, small business, and large industry with the goal of commercializing new technologies.

Future Energy Pitching Session

Monday | 6:30 p.m. – 8:30 p.m. | Potomac A
Coffee and Dessert | 8:30 p.m. – 9:00 p.m. | Potomac Foyer

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 an accompanying online community for national and international participation.

Monday night's Future Energy Pitching Session features eight early-stage energy technology startups presenting to a panel of top venture capital investors. Investors provide feedback and actionable advice to the presenters, and the audience can vote for their favorite startup.

After the Pitching Session, please stay for coffee and dessert in the Potomac Foyer.

Panelists:

DAVID MILLER
Clean Energy Venture Group

David Miller is a founder and Executive Managing Director of Clean Energy Venture Group (CEVG). An engineer by training, he brings over 20 years of technology startup management experience and over a dozen years of seed stage investing experience. He is on the board of directors or advisory board of several clean energy companies, including Azima DLI, Next Step Living, MyEnergy, and Cambrian Innovation and has mentored many others. He is also a research affiliate at MIT's Sloan School of Management.

RICHARD SMITH
Shell International

Richard Smith has spent 12 years turning ideas into products and businesses. He has worked around the world and in companies from large multinational Oil giants to small startups. He currently works for Shell GameChanger Team in Houston where he is responsible for finding, filtering and funding revolutionary technology and business models, that are related to the energy industry. He is a Chartered Engineer and is the named inventor on more than 10 patents.

Future Energy Pitching Session

YANEV SUISSA
New Enterprise Associates

Yanev Suissa joined NEA officially in 2010, having worked with the firm since 2009. He currently works with the boards of Solidfire, Bridge International Academies, Bandgap Engineering, and Boulder Wind Power for NEA. In the tech space, he focuses on earlier stage investments, including enterprise and cloud solutions, digital media, and consumer technologies. In the energy space, he focuses on both supply and demand side solutions across all renewable technologies while simultaneously providing regular advice to energy companies within NEA's portfolio.

DAVID WELLS
Kleiner Perkins Caufield & Byers

David Wells joined Kleiner Perkins Caufield & Byers in 2006 as a partner in the firm's greentech practice. He builds relationships with scientists, entrepreneurs and technologists, creating knowledge maps and sourcing investment opportunities across the entire greentech landscape with a focus on disruptive order-of-magnitude and tipping-point innovations in the physical sciences. He has helped bring many ventures through the KPCB investment process, including due diligence, investment structuring, team building and goal setting for companies including Aquion Energy, FloDesign Wind Turbine, Modular Wind Energy, Primus Power, Siluria Technologies, Solidia Technologies and several ventures still in the stealth stage.

Participating Companies:

COMPANY	PRESENTER	PROJECT
BDL Water	Stuart E. Forrest	Frack Water Treatment
HEVO Power	Jeremy McCool	Wireless Charging for Electric Vehicles
OtherLab	Tucker Gilman	Natural Gas Vehicle Tanks
Thin Sheet Zeolite	Wei Liu	Gas and Biofuel Dehydration
Altenera	Chase McCarthy	Oscillating Reed Wind Harvester
Gravaton Energy Resources	Mike Brewer	Ambient Air Thermal Generation
Transatomic Power	Russ Wilcox	Uranium Molten Salt Reactor
Pacific Air Conditioning	Craig McKenzie	Solar Compressor Pump

FUTURE ENERGY PITCHING SESSION PLATINUM PARTNER

Shell GameChanger

HOSTED BY

FUTURE ENERGY powered by Ultra Light Startups

Student Program

The Student Program at the Energy Innovation Summit is a unique opportunity for student energy leaders to engage with companies looking for new talent.

Student/Company Networking Reception

Monday | 2:45-4:30 p.m. | Chesapeake 6

An opportunity for graduate students to network with companies looking for new talent and for companies to meet the next generation of energy leaders. List of participating companies:

3M | BASF Corporation North America | Climate-KIC | DuPont | Gas Technology Institute | General Electric | General Motors | Electric Power Research Institute | Johnson Controls, Inc. | Pratt & Whitney Rocketdyne | Siemens | United Technologies Research Center

Student Panel - Learning from Failure, Fast: Lessons from the Field on Leveraging Setbacks to Advance Your Career

Tuesday | 11:05 a.m.-12:05 p.m. | Chesapeake 6

Joining a start-up or founding your own company after graduation is exciting—but doing so comes with inherent risks. Regardless of your major, you can't learn everything in school, including what to do if your venture fails. However, failure ultimately benefits those who are persistent, resilient, and willing to learn from experience. Hear from practitioners with real-world experience in adapting quickly from setbacks to propel themselves to the next breakthrough.

Presenters:

MODERATOR

SARAH WOOD
Executive Director, PRIME (Program-related Investment Makers: Energy)

DR. DAN STEINGART
Assistant Professor, CUNY Energy Institutel, The City College New York

MATTHEW M. NORDAN
Vice President, Venrock

ELIZABETH WAYMAN
U.S. Department of Energy

Student Panel - Where it Starts: The Role of Universities in Testing Renewable Energy Initiatives

Wednesday | **12:45-1:45 p.m.** | **Chesapeake 6**

Testing under real-world conditions is a key step in moving energy technologies successfully toward the market. This panel explores the specific role of universities in piloting successful renewable energy initiatives that can give us insights into how these efforts can be applied to the off-campus world. We examine both the "why" and "how" of successful energy programs, focusing on specific case studies and exploring how energy clubs can contribute to the successful adoption of renewable energy initiatives.

Presenters:

MODERATOR
FUZZ HOGAN
New America Foundation

FRANS NAUTA
Deputy Director, Entrepreneurship Program, Cimate-KIC

HEATHER HENRIKSEN
Director, Office for Sustainability, Harvard University

DR. LARA PIERPOINT
AAAS Congressional Science & Engineering Fellow, U.S. Senate Committee on Energy and Natural Resources

STUDENT PROGRAM PARTNER

DUPONT®

The miracles of science™

Constellation shares the visions of innovative companies that are helping to shape our energy future. Through Constellation Technology Ventures, we invest in business and technology that complement our focus on sustainable solutions and our leadership position in competitive energy markets. Together, we can provide creative energy solutions that will benefit our world for generations to come.

www.constellation.com

Constellation℠
An Exelon Company

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

CRACK THE CODE

Champions Announced at Leadership Reception
Wednesday | 5:00 p.m.

Visit exhibitors and reach 50 points to be acknowledged as a Crack the Code Champion.

The game is simple to play.

Step 1: Click on the "Crack the Code" icon on the Summit Mobile Application.

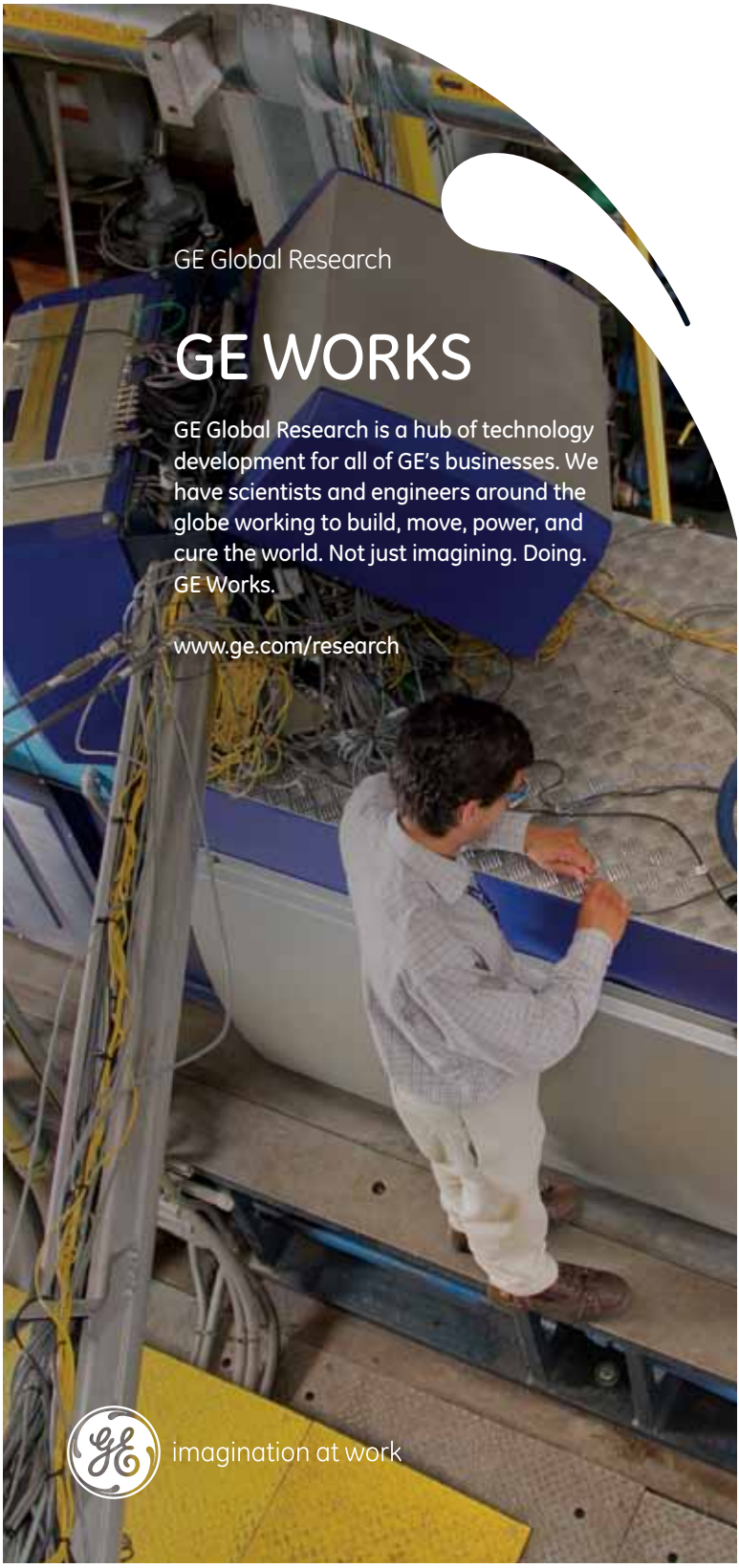
Step 2: Visit exhibitors and ask them for their "Game Code" and enter the code beneath their exhibitor listing.

Points

- Visiting exhibits in the partner pavilion will give participants 2 points each.
- Visiting exhibits in the Technology Showcase will give participants 1 point each.

Step 3: Each time a correct game code is entered, a checkmark will appear in the upper right corner for that exhibitor.

Step 4: Once you reach 50 points, you will be recognized as a Crack the Code Champion.



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

2013 Summit Partners

Gold Partner

MASSACHUSETTS CLEAN ENERGY CENTER

Student Program Partner

DUPONT
The miracles of science™

Silver Partners

BASF The Chemical Company

Chevron

Constellation An Exelon Company

GE

Case Western Reserve University | Great Lakes Energy Institute

LOCKHEED MARTIN

SIEMENS

The PEW Charitable Trusts

United Technologies Research Center

Future Energy Pitching Session Platinum Partner

Shell GameChanger

Bronze Partners

ACKINETICS

AsahiKASEI

BOSCH Invented for life

BRIGHT CAPITAL

DNV

ERNST & YOUNG Quality In Everything We Do

GOODWIN PROCTER

MDB CAPITAL GROUP

YTC AMERICA INC.

Patron Partners

Battelle The Business of Innovation

ESA ELECTRICITY STORAGE ASSOCIATION

GENERAL ATOMICS

QUALLION Powering Life.

USSynthetic

2013 Summit Partners

Technology Development Partners

Argonne National Laboratory

ASU LightWorks — Arizona State University — Light Inspired Solutions

cecet

CNST Center for Nanoscale Science & Technology

Technology Centre Mongstad

EPRI Electric Power Research Institute

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

NorTech

SOFI Solar Fuels Institute

Northwestern University

ISEN Initiative for Sustainability and Energy at Northwestern

Oak Ridge National Laboratory

Pacific Northwest National Laboratory — Proudly Operated by Battelle Since 1965

Sandia National Laboratories

Coffee Break

Agrivida

Bag

The Pew Charitable Trusts

Magnets

American Elements

Student Lanyard

DuPont — The miracles of science™

Media Partners

Earth Techling

Government Executive

greentechmedia

MIT Technology Review

Scientific American™

Government Agency Partners

U.S. Department of Defense Agencies

ONR

SERDP | ESTCP

U.S. Department of Energy Agencies

U.S. Department of Energy — Energy Efficiency & Renewable Energy

U.S. Department of Energy — Office of Science

Other Government Agencies

USDA

Volpe

NASA

NSF

2013 Summit Partners

Supporting Partners

Battelle
The Business of Innovation

SOLVING TOMORROW'S CHALLENGES, TODAY

As the world's largest independent research and development organization, Battelle is uniquely equipped to solve the challenges that our customers face today, and the ones waiting for them in the future. From **Security** to **Life Sciences** and from **Energy** to **Environment**, Battelle is investing in what matters most to our customers and reinvesting in the future of technology.

www.battelle.org

GOLD PARTNER

Massachusetts Clean Energy Center ..... Booth 404

http://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 seed 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.

STUDENT PROGRAM PARTNER

The miracles of science™

DuPont

STUDENT LANYARD PARTNER

http://www2.dupont.com/energy/en-us/en/index.html

DuPont (NYSE: DD) has been bringing world-class science and engineering to the global marketplace in the form of innovative products, materials, and services since 1802. The company believes that by collaborating with customers, governments, NGOs, and thought leaders we can help find solutions to such global challenges as providing enough healthy food for people everywhere, decreasing dependence on fossil fuels, and protecting life and the environment.

SILVER PARTNERS

BASF Corporation North America ..... Booth 605

http://www.basf.com/group/corporate/us/en/

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, Ludwigshafen, Germany. BASF is the world's leading chemical company: The Chemical Company. Its portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. We combine economic success, social responsibility and environmental protection. Through science and innovation we enable our customers to meet the current and future needs of society. Our products and system solutions contribute to conserving resources, ensuring healthy food and nutrition and helping to improve the quality of life. We create chemistry for a sustainable future.

Chevron Technology Ventures ..... Booth 1003

www.chevron.com

Chevron is one of the world's leading integrated energy companies and conducts business worldwide. Our success is driven by our people and their commitment to get results the right way—by operating responsibly, executing with excellence, applying innovative technologies and capturing new opportunities for profitable growth. We are involved in virtually every facet of the energy industry. We explore for, produce and transport crude oil and natural gas; refine, market and distribute transportation fuels and lubricants; manufacture and sell petrochemical products; generate power and produce geothermal energy; provide energy efficiency solutions; and develop the energy resources of the future.

Constellation

constellation.com

Constellation, an Exelon company, is the leading competitive supplier of power, natural gas and energy products and services in United States. Constellation Technology Ventures is the venture arm of Constellation, seeking investment opportunities in businesses and technologies that can benefit from Constellation's leadership position, broad sales channels, and unmatched presence in competitive energy markets. Constellation Technology Ventures is focused on helping startup companies bridge the chasm between the early adopters and mainstream energy markets. Example of sectors of interest include: renewable generation, energy storage, energy efficiency, smart grid, and distributed behind the meter solutions.

General Electric Global Research..... Booth 1006

www.ge.com/research

GE Global Research is the hub of technology development for all of GE's businesses. Our scientists and engineers redefine what's possible, 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 on the web at www.ge.com/research and our blog, edisonsdesk.com where you'll hear our researchers today, talking about technology for tomorrow.

Great Lakes Energy Institute at Case Western Reserve University ..... Booth 607

energy.case.edu

Great Lakes Energy Institute at CWRU connects faculty to create sustainable energy solutions through translational research and education. Since 2008, GLEI has helped catalyze a four-fold increase in energy research, win awards from federal and state agencies, attract over $10 million in gifts, work with over 100 industry partners, and encourage multidisciplinary proposals from throughout the university. At the heart are over 90 engaged faculty from engineering, arts & sciences, business, and law. GLEI's work supports all types of energy, with particular focus in energy power management, energy generation, and storage and conversion.

Lockheed Martin ..... Booth 1005

www.lockheedmartin.com

Government's leading provider, Lockheed Martin delivers mission solutions, information systems and global services when and where they're needed most. We partner closely with our customers understanding and supporting the needs of citizens and soldiers worldwide. Powered by innovation, guided by integrity; Lockheed Martin helps customers achieve their most challenging goals.

Siemens ..... Booth 803

www.siemens.com

Siemens Corporation is a U.S. subsidiary of Siemens AG, a global powerhouse in electronics and electrical engineering, operating in the industry, energy, healthcare, and infrastructure and cities sectors. For more than 160 years, Siemens has built a reputation for leading-edge innovation and the quality of its products, services and solutions. With 360,000 employees in 190 countries, Siemens reported worldwide revenue of approximately $120 billion in fiscal 2011. Siemens in the USA reported revenue of $20 billion and employs approximately 60,000 people throughout all 50 states and Puerto Rico.

The Pew Charitable Trusts..... Booth 1008

BAG PARTNER

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 stimulate civic life. Pew's Clean Energy Program works to accelerate clean energy solutions that improve the economy, national security and the environment.

United Technologies Research Center

United Technologies Research Center.....Booth 408

http://myutrc.utc.com

United Technologies Research Center delivers advanced technologies to the businesses of United Technologies Corporation (UTC) to improve the performance, energy efficiency and cost of UTC products and processes. UTC provides a broad range of high-technology products and services to the global aerospace and building systems industries. Its commercial businesses are Otis elevators and escalators as well as UTC Climate, Controls & Security, a leading provider of heating, ventilation, air conditioning, fire and security systems, building automation and controls. The company's aerospace businesses are Sikorsky aircraft and UTC Propulsion & Aerospace Systems, which includes Pratt & Whitney and UTC Aerospace Systems.

FUTURE ENERGY PITCHING SESSION PLATINUM PARTNER

Shell GameChanger

Shell

http://www.shell.com

Shell is a global group of energy and petrochemicals companies. Shell helps to meet the world's growing demand for energy in economically, environmentally and socially responsible ways. At Shell we are finding ways to deliver more, cleaner energy and helping find ways to use it more efficiently. Shell GameChanger is looking for people with ideas and supporting expertise to partner with us and redefine the future of energy. We bridge the space between traditional Shell and wildly innovative ideas. We invest in novel, early stage ideas that could impact the Energy System to get them from idea to "proof of concept."

BRONZE PARTNERS

AC KINETICS

AC Kinetics.....Booth 604

www.ackinetics.com

AC Kinetics develops proprietary motor drive software (ACKS) that increases AC induction motor performance and energy efficiency simultaneously, overcoming a major industry roadblock. The algorithms run in real time on standard drive hardware for motorized consumer, industrial, and transportation equipment. ACKS can be integrated seamlessly with AC drive products currently available from major manufacturers. Based on our hardware-proven nonlinear optimization algorithms, the drive software automatically configures itself to a particular motor and application, requiring no hand-tuning which results in suboptimal performance and energy usage. Motor energy consumption is always minimized for the same work output, while dynamic performance is increased.

AsahiKASEI

Asahi Kasei America

http://www.ak-america.com

Creating for Tomorrow

To do all that we can in every era to help the people of the world make the most of life and attain fulfillment in living. Since our founding, we have always been deeply committed to contributing to the development of society, boldly anticipating the emergence of new needs. This is what we mean by "Creating for Tomorrow."

BOSCH
Invented for life

Bosch..... Booth 1107

www.bosch.us

In the U.S., Canada and Mexico, the Bosch Group manufactures and markets automotive original equipment and aftermarket products, industrial drives and control technology, power tools, security and communication systems, packaging technology, thermotechnology, household appliances, solar energy, healthcare telemedicine and software solutions. Having established a regional presence in 1906, Bosch employs over 22,000 associates in more than 100 locations, with sales of $9.8 billion in fiscal year 2011.

BRIGHT CAPITAL

Bright Capital

www.bright-capital.com

Bright Capital is an independent venture capital firm that invests globally in a wide range of promising companies. The firm works as a merchant venturing entity in a multi-corporate model, building bridges between Silicon Valley, Arab world, Russia & CIS, South Eastern Asia. Its investments are made across multiple product types in energy and resource efficiency, clean technology, industrial biotech.

DNV

Det Norske Veritas (DNV).....Booth 804

www.dnv.com

Det Norske Veritas (http://www.dnv.com) is a leading risk management company. Its mission is to safeguard life, property and the environment. Established in 1864, the company has a global presence with a network of more than 10,000 technical, business and risk experts working out of 300 offices in 100 countries. Recognized for its independence and integrity, DNV is a highly respected validation and verification firm, providing trust and confidence to all stakeholder groups.

ERNST & YOUNG
Quality In Everything We Do

Ernst & Young

www.ey.com/cleantech

From start-ups to large corporations and national governments, organizations worldwide are embracing cleantech as a means of growth, efficiency, sustainability and competitive advantage. Ernst & Young's Global Cleantech Center offers you a worldwide team of professionals in assurance, tax, transaction and advisory services who understand the business dynamics of cleantech. We have the experience to help you make the most of opportunities in this marketplace, and address any challenges. Whichever sector or market you're in, we can provide the insights you need to realize the benefits of cleantech.

GOODWIN PROCTER

Goodwin Procter ..... Booth 503

www.goodwinprocter.com

Goodwin Procter LLP is one of the nation's leading law firms, with offices in Boston, Hong Kong, London, Los Angeles, New York, San Diego, San Francisco, Silicon Valley and Washington, D.C. The firm provides corporate law and litigation services, and our Clean Tech Practice brings together a team of specialists in environmental law, energy, intellectual property, tax, real estate, technology, private equity, corporate finance and litigation. Our expertise allows us to help clients capitalize on opportunities in this evolving market while minimizing the risks inherent in such a venture.

MDB CAPITAL GROUP

MDB Capital ..... Booth 1104

http://www.mdb.com/

MDB Capital Group is Wall Street's only intellectual property-focused investment bank, with over 15 years of experience launching disruptive technology companies into the public markets. We maximize value disruptive technology companies by optimizing their positioning to attract growth capital, strengthening their IP portfolios to sustain competitive advantage, and connecting them with our base of like-minded, high-quality investors. Our public venture process combined with our deep expertise have grown several of our small and microcap clients to valuations of over $1 billion.

YTC AMERICA INC.

YTC America, Inc. ..... Booth 507

www.ytca.com

YTC America Inc. (YTCA) is the North American corporate research and development center of Yazaki Corporation, a global company with operations in 38 countries, employing in excess of 150,000 people. Our primary mission is to conduct leading edge materials research and technology development. The company is also involved in development of next-generation vehicle connectivity systems. YTCA is responsible for developing leading edge technologies and products to support current business and create new business opportunities for Yazaki group companies worldwide. Our company vision is to develop advanced technology to make human life comfortable and safer for current and future generations.

PATRON PARTNERS

40South Energy ..... Booth 904

www.40southenergy.com

Michele Grassi in 2005 he had an idea for an innovative method for extracting energy from waves. After the initial preliminary studies, in 2008 he created 40South Energy Ltd in London to commercialize the machines globally. The wave energy converters that we build constitute a generation jump with respect to the previous ones, in terms of survivability, reliability, load factor and cost. During 2012 we sold the first R115/150kW machines. One of these R115 machines was sold to one of the major Utilities in the world. During 2013 we will be developing and building the first prototype of R380/500kW.

Battelle
The Business of Innovation

Battelle

http://www.battelle.org

Steel industrialist Gordon Battelle provided for the Battelle Memorial Institute in his 1923 last will and testament after a career devoted to the idea that science and research can solve problems in business and society as a whole. His vision became the Institute's mission when it opened its doors six years later. Today, Battelle's shared values are founded on the belief that superior business performance and high ethical and community standards can go hand-in-hand.

ESA
ELECTRICITY STORAGE ASSOCIATION

Electricity Storage Association .....Booth 603

www.electricitystorage.org

The Electricity Storage Association (ESA) is the world's premier energy storage trade organization. Our members include utilities, technology developers and manufacturers, national laboratories, system designers and academia using the ESA as the leading forum to promote a better understanding of the benefits of storage in the electricity grid. Long considered the leading technical resource on storage related issues, ESA members actively engage in numerous activities to promote the development and commercialization of competitive and reliable energy storage systems.

GENERAL ATOMICS

General Atomics

www.ga.com

General Atomics (GA) is an advanced technology company with more than a half century of experience in developing innovative, real-world systems for challenging defense and energy applications. Throughout its corporate history, GA has been recognized for its ability to meet major multidisciplinary technical challenges, resulting in world-class, first-of-a-kind systems. Transformational energy technologies include novel grid-scale energy storage and distribution systems and high power, high efficiency conversion, collection, and distribution technologies for utility-scale wind and solar.

QUALLION
Powering Life.

Quallion LLC .....Booth 506

www.quallion.com

Quallion LLC designs, fabricates and manufactures state-of-the-art lithium ion cells and battery packs, and develops new battery chemistries for the military, aerospace, medical and automotive industries. Leveraging its core engineering capabilities, Quallion has established itself as a leader in applications where advanced battery technology, safety, reliability, and custom engineering are most valued.

US Synthetic.....Booth 906

www.ussynthetic.com/diamondtechnology

Diamond has been used as an advanced engineering material in a variety of industries such as energy, aerospace, car manufacturing, mining and many other custom applications. Due to its extreme hardness, wear resistance, and thermal conductivity, diamond is an ideal choice for extreme conditions and harsh operating environments.

TECHNOLOGY DEVELOPMENT PARTNERS

Argonne National Laboratory.....Booth 508

www.anl.gov

Argonne National Laboratory is a leading center of basic and applied research. With more than 1,400 scientists and engineers, Argonne quickly assembles cross-disciplinary teams from many fields to address major national challenges in energy and the environment. Argonne is managed by UChicago Argonne, LLC for the U.S. Department of Energy.

ASU LightWorks.....Booth 407

www.asulightworks.com

Arizona State University, one of the nation's largest universities, has the ideal geographical location to become the light innovation capital of the world. Through integrated interdisciplinary efforts and cross-functional systems, LightWorks' mission is to pull light-inspired research at ASU under one strategic framework. Our multidisciplinary effort is to leverage ASU's unique strengths, particularly in renewable energy fields including artificial photosynthesis, biofuels, and next generation photovoltaics. The LightWorks initiative at Arizona State University is supported by ASU's Office of Knowledge Enterprise Development (OKED). OKED advances research, innovation, entrepreneurship at ASU and economic development in Arizona and beyond.

Projects Include: Energy Efficient Electrochemical Capture and Release of Carbon Dioxide | Cyanobacteria Designed for Solar-Powered Highly Efficient Production of Biofuels | Renewable Power Generation- Wind Optimiztion through "Smart Sensing"

CECET - Center for Evaluation of Clean Energy Technology.....Booth 1203

www.cecet.com

CECET provides manufacturers and developers in the Renewable Energy industry with access to resources that facilitate faster commercialization of clean energy technology. CECET, with a pool of experts from Academia and the renewable energy industry, provides much needed support and guidance to start-ups and companies requiring financial and technological assistance in the product development process and leads them to market success. Companies in the renewable energy industry can count on CECET to streamline their product development cycle, remove barriers to market success and to assist with writing effective grant/funding requests.

Center for NanoscaleScience and Technology.....Booth 708

http://www.nist.gov/cnst/

The NIST Center for Nanoscale Science and Technology (CNST) supports the U.S. nanotechnology enterprise from discovery to production by providing industry, academia, NIST, and other government agencies with access to world-class nanoscale measurement and fabrication methods and technology. The CNST's shared-use NanoFab gives researchers economical access to and training on a state-of-the-art tool set required for cutting-edge nanotechnology development. The simple application process is designed to get projects started in a few weeks. Looking beyond the current state of the art, CNST research is creating the next generation of nanoscale measurement instruments and methods, which are made available through collaboration.

CO2 Technology Centre..... Booth 1103

www.tcmda.com

CO2 Technology Centre Mongstad is the world's largest facility designed for testing and improving CO2 capture technologies, a vital part of the CCS value chain. At TCM, located on the West Coast of Norway, we will focus on testing and improving CO2 capture technology and take technology development one step further. The knowledge gained through demonstration and testing will prepare the ground for global CO2 capture initiatives. TCM is a joint venture between the Norwegian state, Statoil, Shell and Sasol.

Electric Power Research Institute (EPRI).....Booth 908

www.epri.com

The Electric Power Research Institute (EPRI) conducts research and development for the global electricity sector. An independent, nonprofit organization, EPRI brings together outside experts as well as its own scientists and engineers to help address challenges in electricity generation, delivery, and use, including health, safety, and the environment. EPRI also provides analyses to formulate long-range research and development planning, and supports research in emerging technologies. Representing more than 90% of the electricity generated and delivered in the US, international participation now extends to over 30 countries. **Projects Include: Electricity Transmission & Distribution | Renewables | Electric Vehicles**

NIST.....Booth 807

www.nist.gov

Founded in 1901 and now part of the U.S. Department of Commerce, NIST is one of the nation's oldest physical science laboratories. Congress established the agency to remove a major handicap to U.S. industrial competitiveness at the time—a second-rate measurement infrastructure that lagged behind the capabilities of England, Germany, and other economic rivals. Today, NIST measurements support the smallest of technologies—nanoscale devices so tiny that tens of thousands can fit on the end of a single human hair—to the largest and most complex of human-made creations, from earthquake-resistant skyscrapers to wide-body jetliners to global communication networks. We invite you to explore www.nist.gov to learn about our current projects, to find out how you can work with us, or to make use of our products and services.

NorTech .....Booth 504

www.nortech.org

NorTech is a technology-based economic development organization that is working towards the revitalization of Northeast Ohio by accelerating the growth of regional innovation clusters in targeted emerging industries. Serving 21 counties in Northeast Ohio, NorTech works as an intermediary to connect small, large and mid-size companies and universities for business, funding and research opportunities that result in job creation and capital attraction. NorTech is currently focused on three industries: advanced energy, flexible electronics and water technologies. **Projects Include: Intelligent Energy Exchange (IEE): Re-Configurable Energy Storage | Catacel Stackable Structural Reactor | Paragon Robotics - Halo/s**

Northwestern University - Initiative for Sustainability and Energy, Solar Fuels Institute .....Booth 704

http://www.solar-fuels.org/

Northwestern University and members Solar Fuels Institute (SOFI) are pleased to introduce the first global solar fuels translational research consortium. SOFI's goal is the development of efficient, cost-effective photocatalytic systems that use the energy of sunlight to produce liquid fuels. Solar fuels technology has enormous potential to furnish carbon-neutral energy to satisfy the expected growth of global energy requirements over the next several decades. It can provide near-term fungible fuels that will enable industry to take full economic advantage of existing infrastructure, while delivering a clear path toward new fuels for the future. **Projects Include: Light-driven Water Splitting for Clean Electrons and Hydrogen | Light-driven Carbon Dioxide Reduction for Fuels out of Thin Air | A Global Solar Fuels Knowledge Map**

Oak Ridge National Laboratory ..... Booth 1007

www.ornl.gov

ORNL is a multiprogram science and technology laboratory managed for the U.S. Department of Energy by UT-Battelle, LLC. ORNL's mission is to deliver scientific discoveries and technical breakthroughs that will accelerate the development and deployment of solutions in clean energy and global security, and in doing so create economic opportunity for the nation. ORNL also performs other work for the Department of Energy, including isotope production, information management, and technical program management, and provides research and technical assistance to other organizations. DOE's Office of Science is accountable for the effective stewardship and management of ORNL.

Pacific Northwest National Laboratory ..... Booth 1108

www.pnnl.gov

Pacific Northwest National Laboratory is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, the environment and national security. PNNL employs 4,900 staff, has an annual budget of nearly $1.1 billion, and has been managed by Ohio-based Battelle since the lab's inception in 1965.

Sandia National Laboratories

Sandia National Laboratories ..... Booth 706

www.sandia.gov

Sandia National Laboratories is operated and managed by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation. Sandia Corporation operates Sandia National Laboratories as a contractor for the U.S. Department of Energy's National Nuclear Security Administration (NNSA) and supports numerous federal, state, and local government agencies, companies, and organizations. Technologies developed at Sandia prevent the use and spread of weapons of mass destruction, protect our national infrastructures, defend our nation against terrorism threats, keep U.S. soldiers and military bases from harm, and ensure the stability of our nation's energy and water supplies.

Projects Include: Microsystems Enabled Photovoltaics (MEPV) | Nonflammable Electrolytes for Lithium-ion Batteries

EARLY STAGE VENTURE PARTNER

GreenStart ..... Booth 204

http://greenstart.com/

Greenstart is an early stage venture firm focused on cleanweb - companies innovating at the intersection of information technology and clean technology. Greenstart portfolio companies get exclusive access to Greenstart's in-house design studio, which offers product design, business model research, and brand design services. Greenstart's booth will be shared with 3 portfolio companies: GELI, a software platform to operate and network grid batteries, Root3 Technologies, a software solution to optimize energy generation at non-utility energy plants, and Sylvatex, a cleantech company with a unique IP for reducing refinery costs and incorporating renewables into diesel fuel.

COFFEE BREAK PARTNER

Agrivida

AGRIVIDA, Inc.

www.agrivida.com

Agrivida, Inc., headquartered in Medford, Massachusetts, is the commercial leader in developing high-performance industrial enzymes and engineered crops for optimized production of biofuels, bio-based chemicals, and animal feed products. The company has entered into research and development agreements with the U.S. Department of Energy (DOE), ARPA–E, the USDA, and other partner companies. With expertise in protein engineering, molecular biology, plant biotechnology, agronomy, and chemical engineering, Agrivida is leading the industry in the development of innovative, sustainable crops and processes to meet energy needs and protect the environment.

MAGNET PARTNER

American Elements

www.americanelements.com/Chloride_nitrate_etc_page.html

American Elements is the world's manufacturer of engineered & advanced materials with a catalog of over 12,000 materials including rare earth metals, alloys, compounds and nanoparticles; high purity metals, chemicals, semiconductors and minerals; and crystal-grown materials for commercial & research applications including automotive, aerospace, military, medical, electronic, and green/clean technologies. American Elements maintains research and laboratory facilities in the U.S. and manufacturing/warehousing in the U.S., Europe, China & Brazil. The complete catalog of advanced and engineered materials can be found at americanelements.com.

MEDIA PARTNERS

EarthTechling

www.earthtechling.com

EarthTechling reports on green technologies such as wind power, electric cars and home energy management for consumers. We combine original reporting and a strong partner network to bring to our readers a mix of informative writing on this topic.

Government Executive

www.govexec.com

Government Executive is a monthly business magazine and website serving senior executives and managers in the federal government's departments and agencies. Our subscribers are high-ranking civilian and military officials who are responsible for defending the nation and carrying out the many laws that define the government's role in our economy and society. Government Executive's essential editorial mission is to cover the business of the federal government and its huge departments and agencies - dozens of which dwarf the largest institutions in the private sector.

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, smart grid, 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. GTM has operations in Boston, New York, and San Francisco. For more information, visit: greentechmedia.com, follow us on twitter: @greentechmedia, or like us on Facebook: facebook.com/greentechmedia.

MIT Technology Review

MIT Technology Review

http://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 in six languages and on a variety of digital and print platforms. We publish MIT Technology Review magazine, the world's oldest technology magazine (established 1899); daily news, analysis, opinion, and video; and Business Reports, which explains how new technologies are transforming companies, disrupting markets, or creating entirely new industries.

SCIENTIFIC AMERICAN™

Scientific American

www.scientificamerican.com

SCIENTIFIC AMERICAN is the world's leading source and authority for science and technology information for science-interested citizens, delivering understandable, credible and provocative content to an audience of more than 5 million people worldwide. The magazine is independently ranked among the Top 10 US consumer media* for "Most Credible" and "Most Objective." Founded in 1845 on the commitment to bring first-hand developments in modern science to our audience, SCIENTIFIC AMERICAN is the oldest continuously published magazine in the United States. SA boasts over 140 Nobel laureate authors in our 165 years -- the most of any consumer magazine.

SUPPORTING PARTNERS

ACCT CANADA

ACCT Canada

www.acctcanada.ca

ACCT Canada is Canada's pre-eminent organization in all matters related to the interface of academic research-industry engagement and research discovery mobilization. ACCT Canada provides a unique nation-wide platform for all proponents in the Canadian innovation ecosystem to collaborate at the institution-industry interface to ensure that Canada is a significant player on the international innovation stage. One of ACCT Canada's highest priorities is to strengthen Canada's innovation ecosystem by facilitating active collaboration among its network of technology transfer and industry engagement practitioners, together with partner organizations, for the purpose of better mobilizing, transferring, translating and diffusing newly discovered knowledge and inventions.

Advanced Energy Economy (AEE)

www.aee.net

Advanced Energy Economy (AEE) is an association of business leaders who are making the global energy system more secure, clean, and affordable. Advanced energy encompasses a broad range of products and services that constitute the best available commercial technologies for meeting energy needs today and tomorrow. AEE's mission is to influence public policy, foster advanced energy innovation and business growth, and provide a unified voice for a strong U.S. advanced energy industry. Our members include companies involved in technology development; component and product manufacturing; project and infrastructure development; equipment installation; and engineering, finance, and advisory services.

American Council On Renewable Energy (ACORE)

www.acore.org

ACORE, a 501(c)(3) non-profit membership organization, is dedicated to building a secure and prosperous America with clean, renewable energy. ACORE provides a common educational platform for a wide range of interests in the renewable energy community, focusing on technology, finance and policy. We convene thought leadership forums and create energy industry partnerships to communicate the economic, security and environmental benefits of renewable energy. Additional information is available at www.acore.org.

American Energy Innovation Council

www.americanenergyinnovation.org/

The American Energy Innovation Council (AEIC) is a group of prominent business leaders who came together starting in 2010 to highlight the importance of innovating in energy and to call for a more vigorous public and private sector commitment to energy technology innovation.

American Public Power Association

www.publicpower.org

APPA is dedicated to advancing the interests of the nation's public power systems by providing exceptional advocacy, education, and information services. For more information visit www.PublicPower.org.

BIO .....Booth 406

www.bio.org

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, along with industry-leading investor and partnering meetings held around the world. BIO produces BIOtechNOW, an online portal and monthly newsletter chronicling "innovations transforming our world."

CALSTART

www.calstart.org

CALSTART is a member-supported organization of more than 140 firms, fleets and agencies worldwide dedicated to supporting a growing high-tech, clean transportation industry that cleans the air, creates jobs, cuts imported oil and reduces global warming emissions. CALSTART provides services and consulting to spur advanced transportation technologies, fuels, systems and the companies that make them. Visit www.calstart.org to learn more.

Center for Science, Policy, and Outcomes (CSPO)

www.cspo.org

The Consortium for Science, Policy and Outcomes at Arizona State University is an interdisciplinary intellectual network aimed at enhancing the contribution of science and technology to society's pursuit of equality, justice, freedom and overall quality of life. CSPO creates knowledge and methods, educates students, cultivates public discourse and fosters policies to help decision makers and institutions grapple with the immense power and importance of science and technology as society charts a course for the future. For more information about CSPO, visit online at CSPO.org.

Chambers for Innovation and Clean Energy (CICE) .....Booth 306

www.chambersforinnovation.com.

Chambers for Innovation and Clean Energy (CICE) is a national clean energy information hub and network for local chambers of commerce. Created and led by local chambers, CICE helps fellow chambers and their member companies navigate and prosper in the clean energy space – at no cost to chambers. We believe clean energy is a powerful economic development tool for chambers and communities. We share best practices, connect chambers with energy experts and high-level decision makers, promote the clean energy work of local chambers, and help chambers find incentives and financing for new clean energy initiatives.

Clean Edge

www.cleanedge.com

Clean Edge, Inc. (www.cleanedge.com), founded in 2000, is a leading research and advisory firm devoted to the clean-tech sector. For more than a decade, the firm has delivered timely data, expert analysis, and comprehensive insights to key industry stakeholders including industry firms, investors, governments, and non-profits. With full-time staff in the San Francisco Bay Area and Portland, Oregon, the firm offers unique insight and intelligence on emerging and developing clean-tech trends, opportunities, and challenges through its unparalleled suite of indexing, benchmarking, and advisory services.

+ CLEAN ENERGY TRUST

Clean Energy Trust ..... Booth 308

www.cleanenergytrust.com

The Clean Energy Exchange is a web platform for the clean energy community to share information, access data and explore economic opportunities. Developed by the Clean Energy Trust, the Exchange is the digital convener of the national clean energy ecosystem. thecleanenergyexchange.org. The Clean Energy Trust accelerates the development of Midwest clean energy businesses by connecting entrepreneurs, researchers and early stage companies with the expertise and capital needed to become sustainable.

CLEAN TECH OPEN

Cleantech Open

http://www.cleantechopen.org" www.cleantechopen.org

The Cleantech Open runs the world's largest cleantech accelerator. Our mission is to find, fund and foster entrepreneurs with big ideas that address today's most urgent energy, environmental and economic challenges. Since 2006 our one-of-a-kind annual Accelerator & Competition has helped over 700 companies bring their ideas to fruition by providing them with training, mentoring, relationships and funding opportunities to help grow them into world-class cleantech companies. These companies have since raised $770M. Fueled by a network of more than 3,000 volunteers, the Cleantech Open unites the best clean tech ideas with the resources they need.

Collegiate Energy Association

Collegiate Energy Association (CEA)

www.collegeenergy.org

The Collegiate Energy Association (CEA) is a global community of nearly 100 university-based energy clubs, each of which provides a forum for students to learn about energy. With undergraduate, graduate, and professional student organizations across Asia, North America, and Europe, the CEA empowers energy clubs to exchange ideas and collaborate. Learn more at www.collegeenergy.org

CCIA
Colorado Cleantech Industry Association

Colorado Cleantech Industry Association

www.coloradocleantech.com

The Colorado Cleantech Industry Association represents the interests of the state's cleantech industry. Our mission is to further establish Colorado as a world leader in clean technology by providing representation and advocacy, a unified voice, relevant programming and capacity development. The CCIA was launched in 2009, we represent approximately 180 members and we are the only statewide cleantech organization to focus on economic development for renewable energy and energy efficiency technologies. We are proud to be industry led and industry focused.

DEED

www.publicpower.org/deed

DEED is dedicated to improving the operation and services of public power utilities by supporting and demonstrating its members' innovative activities through research, funding, and education. For more information visit www.PublicPower.org/DEED.

Electricity Storage Association (ESA)

www.electricitystorage.org

The non-profit Electricity Storage Association (ESA) is the world's premier energy storage trade organization. The membership includes utilities, equipment developers and manufacturers, National Laboratories, system designers and academia using the ESA as the leading forum to promote a better understanding of the benefits of storage in the electricity grid. Long considered the leading technical resource on storage related issues, ESA members actively engage in numerous activities to facilitate this effort. These efforts are designed to promote the development and commercialization of competitive and reliable energy storage systems.

Environmental Entrepreneurs (E2)

www.e2.org

Environmental Entrepreneurs (E2) is a national community of business leaders who promote sound environmental policy that builds economic prosperity. E2 is the independent business voice for the environment. We provide a non-partisan resource for understanding the business perspective on environmental issues. Working with our public and private partners, E2 shapes state and national policy that's good for the economy and for the environment.

Fuel Cell and Hydrogen Energy Association

www.fchea.org

The Fuel Cell and Hydrogen Energy Association (FCHEA) is the trade association for the fuel cell and hydrogen energy industry, and is dedicated to the commercialization of fuel cells and hydrogen energy technologies. Fuel cells and hydrogen energy technologies deliver clean, reliable power to leading edge corporate, academic and public sector users, and FCHEA members are helping to transform the our energy future. FCHEA represents the full global supply chain, including universities, government laboratories and agencies, trade associations, fuel cell materials, components and systems manufacturers, hydrogen producers and fuel distributors, utilities and other end users.

Gas Turbine Association

www.gasturbine.org

The Gas Turbine Association serves as a unified voice for the gas turbine industry. The GTA leads gas turbine industry efforts to support research and development initiatives in the national interest, to assure that energy and environmental regulations are reasonable and technically sound, and to support the electric power industry in its quest to provide secure, reliable, clean and affordable electric power to the nation.

GUIRR

www.nas.edu/guirr

The Government-University-Industry Research Roundtable (GUIRR) is a joint body of the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine that brings together the senior-most representatives from government, universities, and industry to define and explore critical cross-cutting issues related to the national and global science and technology agenda. This forum is designed to facilitate candid dialogue among participants, to foster self-implementing activities, and, where appropriate, to carry awareness of consequences to the wider public.

IEE

www.edisonfoundation.net/iee

IEE is an Institute of the Edison Foundation focused on advancing the adoption of innovative and efficient technologies among electric utilities and their technology partners that will transform the power grid. IEE promotes the sharing of information, ideas, and experiences among regulators, policymakers, technology companies, thought leaders, and the electric power industry. IEE also identifies policies that support the business case for adoption of cost-effective technologies. IEE's members (see attached list of investor owned utilities) are committed to an affordable, reliable, secure, and clean energy future.

Information Technology and Innovation Foundation (ITIF)

www.itif.org

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based non-partisan think tank whose mission is to formulate and promote public policies to advance technological innovation and productivity internationally, in Washington, and in the states.

International Green Energy Council

www.greenergycouncil.com

The National Green Energy Council is an association of individuals and companies that promote "Green" forms of energy production, renewable energy sources, sustainable design practices and advanced thinking in utilizing education and information for the promotion of being better stewards of our environment. The GEC is comprised of inventors, renewable energy companies, developers, material suppliers, consultants, lending institutions, utilities, installers, designers, manufacturers, engineers, inspectors, consultants and others involved in and out of the "green" community. Our mission is to initiate, defend, and otherwise support environmentally sound initiatives that support sustainable energy and sustainable industry practices in all their forms.

Licensing Executives Society

http://www.lesusacanada.org/

LES (USA & Canada) is a welcoming business community that empowers, connects, and celebrates IP professionals through: Education, Best Practices, Networking, Participation and Mentoring. LES represents a highly diverse community of nearly 5,000 IP, business development and technology professionals that collaborate across multiple industries to create a unique networking and learning environment. Register for the Spring Meeting, 5/14-16, Seattle, and save $200!

National Hydropower Association

www.hydro.org

The National Hydropower Association (NHA) is a nonprofit national association dedicated to promoting the growth of clean, affordable U.S. hydropower. It seeks to secure hydropower's place as a climate-friendly, renewable and reliable energy source that serves national environmental, energy, and economic policy objectives.

National Venture Capital Association-NVCA

www.nvca.org

As the voice of the U.S. venture capital community, the National Venture Capital Association (NVCA) empowers its members and the entrepreneurs they fund by advocating for policies that encourage innovation and reward long-term investment. As the venture community's preeminent trade association, NVCA serves as the definitive resource for venture capital data and unites its 400 plus members through a full range of professional services.

New England Clean Energy Council

www.cleanenergycouncil.org

The New England Clean Energy Council's mission is to accelerate New England's clean energy economy to global leadership by building an active community of stakeholders and a world-class cluster of clean energy companies. The Council represents close to 400 member and affiliate member organizations, including clean energy companies, venture investors, major financial institutions, universities, industry associations, utilities, labor and large commercial end-users. The Council's ranks now include clean energy CEOs, representatives from most of the region's top 10 law firms, and partners from most of the top New England venture capital firms (with a total of over $8 billion under management).

Northeast Sustainable Energy Association (NESEA)

www.NSEA.org

NESEA is the region's leading membership organization promoting sustainable energy practices in the built environment. We embrace whole systems thinking as the path to sustainability. We connect professionals to create a diverse, multi-disciplinary network, promote sustainable energy solutions for the built environment, and celebrate successes and proven results in the industry. We accomplish this through our BuildingEnergy Conference, the BuildingEnergy Masters Series on-line courses, our $10,000 Zero Net Energy Award, the Green Buildings Open House tour, and membership support.

Pike Research

www.navigant.com/pikeresearch

Pike Research, a part of Navigant Consulting's global Energy Practice, is a market research and consulting group that provides in-depth analysis of global clean technology markets. The team's research methodology combines supply-side industry analysis, end-user primary research and demand assessment, and deep examination of technology trends to provide a comprehensive view of the Smart Energy, Smart Utilities, Smart Transportation, Smart Industry, and Smart Buildings sectors.

Prescience International's Environmental Business Cluster (EBC).....Booth 405

www.prescienceintl.com

The Environmental Business Cluster (EBC) is an award-winning cleantech incubator managed by Prescience International, a firm dedicated to accelerating the commercialization and global adoption of science and technology. Located in the heart of the Silicon Valley, the EBC provides commercialization support and facilities for emerging cleantech companies. The EBC's suite of services includes expert coaching and strategic counsel, focused educational and networking programs, targeted access to investors, strategic partners and industry networks, attractive furnished office space, equipment, conference rooms and training facilities.

U.S. Energy Association (USEA)

www.usea.org

The United States Energy Association (USEA) is the U.S. Member Committee of the World Energy Council (WEC). USEA is an association of public and private energy-related organizations, corporations, and government agencies. USEA represents the broad interests of the U.S. energy sector by increasing the understanding of energy issues, both domestically and internationally.

UIDP

www.uidp.org

The University-Industry Demonstration Partnership (UIDP) is an organization of universities and companies who seek to build a stronger relationship between these parties. UIDP provides a unique forum for university and industry representatives to meet and discuss operational and strategic issues such as contracting, intellectual property, and compliance matters. These conversations might otherwise never take place, and they serve to help university representatives better understand the culture and constraints of their industry counterparts, and vice versa. This initiative is supported by the National Academies' Government-University-Industry Research Roundtable (GUIRR).

GOVERNMENT AGENCY PARTICPANTS

Visit the following U.S. Government Agencies will be staffing an exhibit in the Technology Showcase. For a complete listing and description of all Government Partners see pages 48-53.

★ U.S. Department of Defense Agencies ★

Air Force ..... Booth 724

www.af.mil

The Air Force plays a significant role in our nation's strategy to become energy independent and improve its energy security posture. The Air Force is committed to enhancing its mission capability by adopting energy efficient technologies and practices for its operations and exploring alternative energy solutions to support its critical infrastructure at home and abroad. Energy is a critical part of every aspect of the Air Force's operations and the Air Force is interested in new technologies that will improve resiliency, reduce demand and provide flexibility thereby assuring that the Air Force has energy supplies to accomplish the mission. The Air Force's senior leader on energy program, Deputy Assistant Secretary Kevin Geiss, will discuss Air Force priorities, accomplishments to date, areas of future interest, and ways for industry can engage.

Army ..... Booth 726

www.army.mil

The Army's ability to accomplish our mission on a global scale depends on secure, uninterrupted access to power and energy. The Army is aggressively pursuing power and energy advancements in an effort to enhance mission effectiveness and maintain operational readiness at all times. We are focusing our energy efforts on Soldier Power, which is the energy and associated systems required for a dismounted Soldier; Basing Power, which is the fuel, water, and energy needed at our installations and base camps; and Vehicle Power, which is the energy associated with our air-ground-tactical and non-tactical vehicles. Smart investment in renewable energy and energy efficient technologies will help ensure the Army of tomorrow has uninterrupted access to energy, water, land, and natural resources.

Marine Corps ..... Booth 728

http://www.usmc.mil

One of the most significant challenges facing the Marine Corps is reducing the need for fuel, water, and battery resupply on the battlefield. Energy efficient wearable power management and light-weight portable power solutions have the potential to simplify power distribution and reduce the quantity of batteries dismounted Marines carry by integrating all power and communication into a single system. In addition, enabling Marines to produce clean drinking water without resupply in austere environments increases combat effectiveness. In May 2012, the Marine Corps invited industry to the Experimental Forward Operating Base (ExFOB) at Camp Lejeune, NC to demonstrate wearable power generation and individual water purification solutions. Following the demonstration, the ExFOB Team spearheaded an effort to combine some of the most promising

technologies demonstrated at ExFOB into a single integrated solution – the Marine Austere Patrolling System (MAPS). MAPS is a true "joint" effort, bringing together stakeholders from across the Marine Corps, DoD, and private industry to address these critical capability gaps.

Navy Energy and Environmental Readiness Programs....Booth 732

http://greenfleet.dodlive.mil/energy/task-force-energy/

The Navy is deeply committed to reducing energy use, integrating alternative fuels into our systems, and adopting energy efficiency as a means of increasing combat capability. We work with industry, academia, and federal agencies to incorporate advanced, drop-in replacements for petroleum and expand renewable energy use. We recognize energy as a strategic resource, critical to our mission. Through an aggressive strategy, the Navy will ensure energy independence for the long haul-which will protect Sailors and Marines, make us more effective in defending our nation and allies, and help enable sustainable use of the world's precious resources for future generations.

Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs (OASD/OEPP).....Booth 829

http://energy.defense.gov/

The Department of Defense is the single largest consumer of energy in the U.S., and seventy-five percent of this energy is "operational energy" used to power vehicles, ships, aircraft, and tactical power generation systems. Energy markets, fiscal needs, and evolving military threats will challenge this heavy reliance on energy, and create the imperative for transforming how the Department uses energy in military operations. The Department's Operational Energy Strategy and supporting Implementation Plan identify how to achieve energy security for the warfighter by assuring that U.S. forces have a reliable supply of energy for 21st century military missions. First, the Department will reduce demand for energy in military operations by increasing the efficiency of energy use. Second, the Department will expand and secure energy supplies for military operations by diversifying its energy sources. Finally, the Department will build energy security into the future force by integrating operational energy considerations into the full range of planning and force development activities.

SERDP and ESTCP.....Booth 831

www.serdp-estcp.org

SERDP and ESTCP are the Department of Defense's environmental research and installation energy test bed programs. The programs harness the latest science and technology to develop and demonstrate innovative, cost-effective, and sustainable solutions. These innovations improve DoD's environmental and energy performance, reduce costs, and enhance mission capabilities. SERDP and ESTCP's Energy and Water program area supports the demonstration of innovative technologies to reduce DoD's installation energy consumption and carbon footprint, improve energy security, and facilitate water conservation. The 90+ projects address technologies such as building energy efficiency, energy management systems, smart microgrids, and distributed energy generation.

★ U.S. Department of Energy Agencies ★

ARPA-E ..... Booth 626

http://www.doe.gov/gc/services/arpa-e-resources

The U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) has hosted the Energy Innovation Summit for the past three years. It brings together the nation's most innovative minds to team together on potential breakthroughs in energy technologies. ARPA-E funds transformational projects that create entirely new ways to source, distribute, and use energy. Its unique approach combines world-class Program Directors with multi-disciplinary teams to identify promising solutions to the nation's most critical energy problems. By leveraging the best practices of academia, business, and government, ARPA-E can fast-track new innovative technologies toward the marketplace.

Grid Tech Team ..... Booth 826

http://energy.gov/oe/office-electricity-delivery-and-energy-reliability

The Grid Tech Team (GTT), established by the Office of the Undersecretary of Energy, was tasked with coordinating grid-related activities across the Department and accelerating modernization of the electric power system. In this role, the GTT will provide thought-leadership, convene relevant stakeholders, facilitate open dialogues, and coordinate results and actions. It is not tasked with dictating solutions. The GTT advocates a comprehensive, holistic systems approach that balances technical and institutional solutions with sensitivities to regulatory, policy, and market challenges.

Office of Energy Efficiency and Renewable Energy ..... Booth 828

http://www.eere.energy.gov/

The Office of Energy Efficiency and Renewable Energy (EERE) accelerates development and facilitates deployment of energy efficiency and renewable energy technologies and market-based solutions that strengthen U.S. energy security, environmental quality, and economic vitality. EERE drives energy innovation through strong private and public sector relationships with researchers, industries, businesses, universities, and laboratories. We envision a prosperous future where energy use and generation are efficient, secure, clean, and affordable.

Office of Fossil Energy ..... Booth 929

www.fossil.energy.gov

Ensuring that we can continue to rely on clean, affordable energy from our traditional fuel resources is the primary mission of DOE's Office of Fossil Energy. The Office of Fossil Energy is responsible for several high-priority initiatives including implementation of the Clean Coal Power Initiative to develop a new generation of environmentally sound clean coal technologies, the Fossil Energy elements of the American Recovery and Reinvestment Act of 2009, and the Nation's Strategic Petroleum Reserve and Northeast Home Heating Oil Reserve, both key emergency response tools available to the President to protect Americans from energy supply disruptions.

Office of Nuclear Energy .....Booth 824

www.ne.doe.gov

The Office of Nuclear Energy (NE) promotes nuclear power as a resource capable of meeting the Nation's energy, environmental and national security needs by resolving technical and regulatory barriers through research, development and demonstration.

Office of Science .....Booth 923

http://science.energy.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. Our researchers have won 113 Nobel Prizes and over 800 R&D 100 Awards over the past six decades. 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—including supercomputers, large-scale x-ray light sources, neutron scattering sources, and sophisticated facilities for nanoscience and genomic sequencing—serving more than 26,500 researchers from universities, government laboratories, and industry each year.

Technology Transfer Office.....Booth 927

Dr. Karina Edmonds

http://techtransfer.energy.gov/

DOE's Technology Transfer Office (TTO) works with the Department's National Laboratories and single-purpose research facilities to accelerate the process of moving innovative discoveries to the private sector and to increase the economic impact of these discoveries. The TTO develops and implements policy on technology transfer mechanisms such as Cooperative Research and Development Agreements (CRADA), Work for Others Agreements (WFO), technical assistance agreements, Agreements for Commercializing Technology (ACT), User Facility Agreements, and Intellectual Property licensing. The office is primarily focused on enabling strong partnerships and collaborations between DOE and the private sector to increase commercial outcomes of DOE's technology transfer program.

★ Other U.S. Federal Agencies ★

Department of Agriculture.....Booth 823

http://www.usda.gov/wps/portal/usda/usdahome?navid=ENERGY

The U.S. Department of Agriculture (USDA) is working in every way to encourage and support the development, production, and delivery of clean, renewable, domestically produced energy. Our efforts cover the entire renewable energy supply chain: research and development activities; financial assistance to agriculture and forest producers for raising and harvesting energy crops; financing biorefineries that will produce renewable sources of fuel and power; and providing technical and financial assistance to agricultural producers and rural small business to assist them in becoming more energy efficient. We are working to lead the way for a clean energy future for our country.

National Aeronautics and Space Administration (NASA) .....Booth 827

www.nasa.gov

Energy and sustainability are key elements of NASA's efforts to: pioneer and prove new flight technologies that improve our ability to explore with practical applications on Earth; focus on International Space Station (ISS) operations and human exploration beyond low Earth orbit; and explore the Earth, solar system and universe beyond, chart the best route of discovery, and reap the benefits of Earth and space exploration for society. In addition to leading important discussions on energy innovation and best practices, NASA is conducting cutting-edge research in the development of clean energy technologies for NASA mission needs. Our renewable energy focus is on advancing biofuels, solar, and wind technologies that also help reduce our nation's dependence on petroleum-based fuels. NASA continues to make strides in the innovative transportation, storage, measurement, processing and employment of hydrogen as a rocket propellant, and future exploration approaches to derive hydrogen as fuel for transportation, electrical power and crewmember breathable oxygen.

National Science Foundation (NSF).....Booth 825

Cecile Gonzalez

http://www.nsf.gov

Since its creation over 60 years ago, the National Science Foundation (NSF) has profoundly impacted our Nation's innovation ecosystem by funding the transformative, fundamental research that has become the agency's hallmark. NSF investments in fundamental research have led to path-breaking advances, from nanotechnology and new materials to Internet technologies and complex systems theory, and NSF's continuing commitment to supporting a wide range of fields and disciplines helps to secure and sustain U.S. competitiveness and economic growth. Similarly, NSF's strong support for science, technology, engineering, and mathematics (STEM) education at all levels provides the nation with a globally-competitive workforce.

SHOWCASE PARTICIPANTS

1366 Direct Wafer: Enabling Terawatt Photovoltaics ..... Booth 443

Craig Lund
clund@1366tech.com
www.1366tech.com

1366 Direct Wafer: Enabling Terawatt Photovoltaics

"Solar at the cost of coal" is the goal of 1366 Technologies. 1366's unique, innovative Direct Wafer process makes standard silicon wafers directly from the melt. The resulting high performance wafer is compatible with today's existing supply chain. Because the manufacturing innovation collapses four steps into one, 1366 has a sustainable cost advantage. Direct Wafer is a high quality product that delivers reduced manufacturing variation and lower processing cost for the solar cell and module makers. 1366 has had good success with customers, and cash flow from operations has been positive for the last two years.

ABB Inc..... AWARDEE Booth 439

V R Ramanan
varagur@nc.rr.com
www.abb.com

Superconducting Magnet Energy Storage System with Direct Power Electronics Interface

An advanced superconducting magnet energy storage system (SMES) will de developed that will store significantly more energy tha current SMES at a fration of the cost. The SMES will use an advanced second generation high temperature superconducting wire. A 2.5 MJ SMES with a modular, scalable power electronics converter will be demonstrated.

Abengoa Solar..... AWARDEE Booth 429

Ryan Webster
ryan.webster@solar.abengoa.com
www.abengoasolar.com

High Efficiency Solar-Electric Conversion Power Tower

The objective of this project is the development of a high efficiency solar-electric conversion power tower that utilizes novel system architecture to enable low cost, fully dispatchable or base load solar energy generation. Compared to a molten salt system the technology offers up to a 30% reduction in cost at the same performance.

ADMA Products, Inc. ..... AWARDEE **Booth 635**

Vladimir Duz
duz@admaproducts.com
www.admaproducts.com

High-Efficient, on-Line Membrane Air Dehumidifier Enabling Sensible Cooling for Warm and Humid Climates

This project is developing a novel membrane that only allows moisture to pass through while blocking air molecules. As hot humid air flows over such a membrane sheet surface, moisture molecules in the air are removed from the opposite side of the membrane sheet by a vacuum pump. The removed moisture can be recovered as liquid water or discarded into the environment. In this way, air is dehumidified without changing its temperature and pressure resulting in high energy efficiency. This process does not generate any solid wastes or air emissions and is a totally green process.

Agrivida

Agrivida ..... AWARDEE **Booth 517**

Michael Raab
michael.raab@agrivida.com
www.agrivida.com

Conditionally activated enzymes expressed in cellulosic energy crops

Agrivida is engineering biomass crops to improve performance in the production of fuels and chemicals, and as animal feed. We have developed cell wall degrading enzymes that are expressed at high concentration as inactive precursors in the cell wall. Their hydrolytic activity is dormant during plant growth and does not interfere with plant physiology. Upon harvest, the enzymes are activated using specific processing conditions and begin converting the plant cell walls into fermentable sugars. This technology helps relieve the challenges of making cheap cellulosic sugars and dramatically reduces external enzyme requirements.

ATK

Alliant Techsystems (ATK) ..... AWARDEE **Booth 717**

Bonifacio Calayag
Bonifacio.Calayag@ATK.com
www.atk.com

A High Efficiency Inertial CO2 Extraction System -ICES

Researchers at ATK and ACENT Laboratories are developing a device that relies on aerospace wind-tunnel technologies to turn CO2 into a condensed solid for collection and capture. ATK's design incorporates a special nozzle that converges and diverges to expand flue gas, thereby cooling it off and turning the CO2 into solid particles which are removed from the system by a separator. This technology is mechanically simple and scalable with no moving parts and generates no chemical waste, making it inexpensive to construct and operate, and delivering 50% savings compared to current technologies.

Alveo Energy ..... AWARDEE **Booth 940**

http://www.alveoenergy.com

Open Framework Batteries for Cost-Effective Energy Storage

Alveo Energy will develop a battery technology using Prussian Blue dye as the basis for the active material in both the cathode and anode. Prussian Blue is inexpensive, nontoxic, readily available, and most commonly known for its application in blueprint documents. Alveo will re-purpose this inexpensive dye for a new aqueous electrolyte, sodium-ion battery that can endure tens of thousands of rapid, deep discharge cycles without suffering internal damage, helping to facilitate the adoption and deployment of renewable energy technology.

Ambri ..... **Booth 812**

Kristin Brief

kbrief@ambri.com

www.ambri.com

Ambri's Liquid Metal Battery for Grid-Scale Electricity Storage

Ambri (formerly Liquid Metal Battery Corporation) is developing a low cost stationary electricity storage solution that will change the way electric grids are operated worldwide. Ambri will enable the more widespread use of renewable generation like wind and solar, reduce power prices and increase system reliability. Ambri's technology — the liquid metal battery — was invented in the lab of Professor Donald Sadoway at the Massachusetts Institute of Technology. Research on campus was funded in part by ARPA-E. Ambri was founded in 2010 with the goal of commercializing the technology. Ambri's investors include Khosla Ventures, Bill Gates and Total.

Ames National Laboratory ..... AWARDEE **Booth 228**

R. William McCallum

mccallum@ameslab.gov

www.ameslab.gov

Novel high energy permanent magnet without critical elements

The abundance of Ce is three times that of Nd- Neodymium and Pr- Praseodymium combined. Due to an excess of Ce- Cerium on the market, the development of a Ce–TM permanent magnet would facilitate an increase of the supply of high-energy rare-earth magnets by a factor of 2 to 3 without requiring additional mining or an increase in the amount of separated RE produced. The goal is to develop a Ce-TM based permanent magnet with a Tc > 300°C, Br > 10 kG, and Hci > 10 kOe. The project uses a combined theoretical and experimental effort.

Arcadia Biosciences ..... AWARDEE **Booth 1125**

Cassie Hilder
cassie.hilder@arcadiabio.com
www.arcadiabio.com

Vegetative Production of Oil from a C4 Crop

The Arcadia project is designed to produce vegetable oil in plant leaves and stems, turning plant parts that are not usually harvested for many crops into a source of concentrated energy. Vegetable oil is the most concentrated source of energy made by plants, but is usually made only in seeds. The development of plants that produce oil in leaves and stems, as well as in seed, will increase total energy production per acre and significantly decrease the carbon footprint of resulting biofuels. These crops will offer a new source of sustainable transportation fuel.

Architectural Applications.....**Booth 541**

John Breshears
jbreshears@architecturalapplications.com
www.architecturalapplications.com

Building-Integrated Heat & Moisture Recovery - Next Generation Air Conditioning Technology

Building-Integrated Heat & Moisture Exchange (BIHME) is a membrane-based, ventilation air heat and moisture exchanger integrated into the building wall to reduce building energy use. The technology 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 18-35% building energy savings with improved indoor air quality, enhanced control, and increased leasable floor area. The ARPA-E-funded technology is undergoing full-scale validation at Lawrence Berkeley National Laboratory.

Argonne National Laboratory ..... AWARDEE **Booth 713**

Richard Brotzman
rbrotzman@anl.gov
www.anl.gov

Nanocomposite Exchange-Spring Magnets for Motor and Generator Applications

Argonne will develop a cost-effective exchange-spring magnet to use in the electric motors of wind generators and EVs that uses no rare earth materials. This Argonne exchange-spring magnet combines a hard magnetic outer shell with a soft magnetic inner core—coupling these together increases the performance (energy density and operating temperature). The hard and soft magnet composite particles would be created at the molecular level, followed by consolidation in a magnetic field. This process allows the particles to be oriented to maximize the magnetic properties of low-cost and abundant metals, eliminating the need for expensive imported rare earths.

Arizona State University..... AWARDEE **Booth 411**

Dan Buttry
Dan.Buttry@asu.edu
http://chemistry.asu.edu/faculty/d_buttry.asp

Energy Efficient Electrochemical Capture and Release of Carbon Dioxide

We describe a new technology that allows energy and cost effective capture of carbon dioxide from fixed point emission sources, such as coal-fired power plants. A key strategy to mitigate increasing carbon dioxide concentration in the atmosphere is to cost effectively capture power plant carbon dioxide emissions. We are advancing a fundamentally new paradigm for carbon dioxide capture that uses an electrochemical process in which electrochemical reactions are used to capture and release carbon dioxide, thereby allowing its separation from flue gas. This process is scalable and can be implemented without much integration complexity in conventional fossil fuel power generation.

Arizona State University..... AWARDEE **Booth 312**

Willem Vermaas
wim@asu.edu
http://asu.edu/

Cyanobacteria Designed for Solar-Powered Highly Efficient Production of Biofuels

This transformative technology uses cyanobacteria as photosynthetic biocatalysts (mini factories) to convert solar energy and carbon dioxide into a biofuel feedstock, fatty acids. The fatty acids are excreted from the cells, harvested from the culture medium without major increases in biomass then converted to jet fuel via the CentiaTM process. This platform is also amenable to production of other commodity chemicals from metabolic precursors like isoprene, hydrogen, or bioplastics.

Arkansas Power Electronics International, Inc. ..... AWARDEE **Booth 1131**

www.apei.net

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

This project involves the design, development, and demonstration of a battery charger for plug-in hybrid electric vehicles. This on-board charger converts AC power to controllable DC power in order to charge the vehicle battery bank. The AC/DC rectification is accomplished using high-frequency, bridgeless power factor correction converter which offers high power factor and low distortion. A second DC/DC converter stage provides galvanic isolation and battery charging control. This high-frequency DC/DC converter utilizes a high-efficiency ZVS converter topology. In order to reduce size and weight while simultaneously increasing performance, this charger utilizes SiC power electronic semiconductor devices and advanced packaging techniques.

Astronautics Corporation ..... AWARDEE **Booth 642**

Steven Russek
s.russek@astronautics.com
www.astronautics.com

An Efficient, Green Compact Cooling System Using Magnetic Refrigeration

Astronautics Corporation, a world-leader in the development of magnetic refrigeration technology, is constructing a high-efficiency, magnetic air conditioning system. The system uses no greenhouse or ozone-depleting gases and will have energy consumption comparable to new, high-quality vapor compression systems. The system is also expected to offer enhanced reliability due to the absence of any gaseous constituents which frequently leak from vaopr compression systems.

ATFI ..... **Booth 814**

Paul Seidler
pseidler@atfinet.com
www.atfinet.com

ATFI's Cerablak® Antifouling Surface Treatment for Industrial Heat Exchangers

Cerablak® surface treatments are being developed for both compact and extended-surface heat exchangers across multiple end-use applications. The versatile surface treatment can be applied to hot and cold wall pipe interiors and exteriors, as well as corrugated plate and fin arrangements, microchannel designs, and more complex design geometries. Cerablak® ultra-thin, glassy films provide hermetic quality coverage to promote heat transfer efficiency, while providing superior protection from fouling, carburization, coking, and corrosion in harsh environments and temperatures up to 1,000°C.

AutoGrid, Inc ..... AWARDEE **Booth 1218**

Amit Narayan
amit@auto-grid.com
https://www.auto-grid.com

Highly Dispatchable and Distributed Demand Response for the Integration of Distributed Generation

AutoGrid Systems is organizing the world's energy data by bringing Internet scale cloud-computing to process and analyze the petabytes of energy data produced from an increasingly networked and automated grid. AutoGrid then employs big data analytics to generate real-time predictions that creates actionable data for electricity generators, providers, grid operators, and their customers to improve the utilization of the grid and manage the cost to serve.

Baldor Electric Company ..... AWARDEE **Booth 435**

Dr. Rich Schiferl
Rich.Schiferl@baldor.abb.com
http://www.baldor.com

Rare Earth-Free Traction Motor for Electric Vehicle Applications

Baldor will develop a new type of traction motor with the potential to efficiently power future generations of EVs. Unlike today's large, bulky EV motors which use expensive, imported rare-earth-based magnets, Baldor's motor could be light, compact, contain no rare earth materials, and have the potential to deliver more torque at a substantially lower cost. Key innovations in this project include the use of a unique motor design, incorporation of an improved cooling system, and the development of advanced materials manufacturing techniques. These innovations could significantly reduce the cost of an electric motor.

Battelle ..... AWARDEE **Booth 836**

James Saunders
jhs@battelle.org
www.battelle.org

Fault Sensing in Operating Batteries

Internal faults in batteries occur infrequently, but have major safety and reliability consequences. These faults are often local in behavior and difficult to detect with global measurements such as voltage, current and temperature. Battelle, together with the University of Akron, is developing a novel technique to monitor batteries continuously during operation. An optical sensor will detect changes in light propagating through each cell, well before local shorts occur, providing early warning to the battery management system.

Beacon Power, LLC ..... AWARDEE **Booth 440**

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

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

Beacon Power is developing the critical components and processes for a 100 kWh/100 kW hubless composite flywheel. This includes bonded magnetic materials for motor andmagnetic suspension, touchdown system for earthquake or suspension failure, and rapid in-situ cure process for the composite rim.

Bio Architecture Lab, Inc. ..... AWARDEE **Booth 637**
Yasuo Yoshikuni
yoshikuni@ba-lab.com
http://www.ba-lab.com

Macroalgae Butanol

Bio Architecture Lab (Bal) partnered with DuPont to demonstrate technical feasibility of producing butanol from seaweed (macroalgae). Bal and DuPont successfully demonstrated this proof-of-concept. In the current phase of the project, Bal, in partnership with Ocean Approved, is demonstrating high-yield farming of seaweed (Saccharina latissima) at nearly 1.5 hectare scale off the coast of Maine. Outside of this specific ARPA-E award, Bal has continued to develop its entire seaweed-to-products platform, including developing a Seaweed Biorefinery process that produces ultra-low-cost carbohydrates for conversion into a multitude of carbohydrate based end-products at low cost.

Brookhaven National Laboratory ..... AWARDEE **Booth 638**
Qiang Li
qiangli@bnl.gov
www.bnl.gov

Superconducting Wires for Direct-Drive Wind Generators

Development of a new generation of long length high temperature superconducting (HTS) wires to have critical current densities at least a factor of 4 times higher than that in the current state-of-the-art wires by combining the solid-tate "catalysis"-based synthesis approach (BNL) with a low-cost, long-length wire process (AMSC). The developed technology will enable motors and generators with significant performance and cost advantage over the permanent magnet technology, and reduce the use of rare-earth materials by over 1000 times and the overall system cost and complexity, increasing system reliability.

Brown University ..... AWARDEE **Booth 1236**

Caltech ..... AWARDEE **Booth 1224**
Steven Low
slow@caltech.edu
http://smart.caltech.edu

Scalable Real-time Decentralized Volt/VAR Control

We envision a future network with hundreds of millions of active endpoints, that are not merely passive loads but may generate, sense, compute, communicate, and actuate. They will create both a severe risk and a tremendous opportunity: a large network of DERs introducing rapid, large, and random fluctuations in power supply and demand, voltage and frequency, and our increased capability to coordinate and optimize their operation. We will develop foundational theories and practical algorithms for scalable real-time distributed control of such an active network. A specific application will be Volt/VAR control.

Case Western Reserve University ..... AWARDEE **Booth 539**

Robert F. Savinell
rfs2@case.edu
energy.case.edu

High Energy Storage Capacity Low Cost Iron Flow Battery

The topic of this research is an enhanced all iron flow battery, able to achieve $200/kW for dispersed/stationary grid and renewable energy applications, which is between 1/5 and 1/10 the cost today. The research proposed will improve the capability of the all iron flow battery by developing a novel architecture for the negative half-cell in order to remove iron from the cell stack and store it in external tanks. This electrode will thus decouple the power delivered from the battery from the battery's energy storage capacity.

SDLE
SOLAR DURABILITY AND LIFETIME EXTENSION CENTER

Case Western Reserve University .....**Booth 512**

Roger French
http://sdle.case.edu

Lifetime and Degradation Science of Advanced Energy Systems to Enable Secure Insertion of New Technologies

Our technology, Lifetime and Degradation Science, represents a new engineering paradigm, which combines Big Data Informatics and Analytics of technology populations to develop system models based on explicit knowledge of degradation and failure mechanisms/rates. Using methods to access data backwards in time, to accelerate mechanisms forwards in time, and to combine these with engineering science and statistics, L&DS provides the opportunity to rapidly bring managed technology development and insertion of new elements into long lived systems, while maintaining lifetime. Lifetime performance is thus validated in 2-5 years rather than 20, and new energy technologies last 20-50+ years rather than 5-10.

CPES

Center for Power Electronics Systems..... AWARDEE **Booth 419**

Fred C. Lee
fclee@vt.edu
www.cpes.vt.edu

Power Supplies on a Chips (PSOC)

This proposal aims to develop a proof-of-concept prototype power supply on chip (PSOC) using GaN devices operating at 5-10MHz. The target is to achieve a power density greater than 1000W/in3 with 88% efficiency. The proposed three-dimensional PSOC will be constructed using IR's GaN devices and Si gate driver IC's assembled on top of a 1 mm magnetic substrate. Such a level of integration has never been attempted with a current greater than 5A. The proposed prototypes will extend the current to 20 - 40A at 12V input voltage, targeting such applications as computer, mobile electronics, and telecommunication.

Ceramatec Inc. ..... AWARDEE **Booth 1039**

Dr. Dolly Chitta
dchitta@ceramatec.com

Direct Natural Gas to Chemicals

The objective of this research is to demonstrate the feasibility of a combined catalyst- hydrogen membrane to yield high single pass conversion to produce chemicals from natural gas. The innovation will combine nanocrystalline zeolite catalyst with a selective hydrogen ceramic membrane to address technical challenges, thereby dramatically improving the commercialization potential. Prior work by by the team has shown direct catalyst conversion to benzene and high flux and thermally stable membrane. Other Team members include the University of California at Berkeley and University of Utah.

Ceramatec Inc. ..... AWARDEE **Booth 1037**

Dr. S. Elangovan
elango@ceramatec.com

Medium Temperature Fuel Cell for Transportation Applications

Current fuel cells for transportation applications use polymer electrolytes that require platinum catalysts and operate below 80˚C due to water management issues. At elevated temperature, the electrolyte dries out and loses conductivity, and at low temperatures liquid water floods the electrode, which results in performance losses. Any carbon monoxide in the hydrogen fuel poisons the catalysts. The project will demonstrate a solid-state fuel cell stack operating in the intermediate temperature range (150 – 250 C°). This transformative fuel cell platform holds the promise of low cost, high durability, and fuel flexibility.

Ceres, Inc. ..... AWARDEE **Booth 1035**

Steve Bobzin
sbobzin@ceres-inc.com
http://www.ceres.net/

High-Biomass, Low Input Dedicated Energy Crops to Enable a Full-Scale Bioenergy Industry

Ceres develops & markets low-carbon, non-food grasses for advanced biofuels and biopower. Our energy crops can provide more fuel or electricity, new opportunities for growers and a cleaner environment for us all. ARPA-E's first open FOA funded our trait development project to increase biomass yields of switchgrass, sorghum, and miscanthus by as much as 40%, while simultaneously decreasing the use of inputs such as nitrogen fertilizers. Higher yields reduce the land area needed to support individual projects. Hardier, higher yielding seed varieties also sequester more carbon and expand the area where economic yields can be obtained – so-called marginal acres.

Chromatin, Inc. ..... AWARDEE **Booth 926**

www.chromatininc.com

Plant-Based Sesquiterpene Biofuels

Chromatin is engineering sweet sorghum to accumulate the fuel precursor farnesene, a molecule that can be blended into diesel fuel. Sweet sorghum is naturally drought tolerant and has readily available carbohydrates to redirect to the farnesene pathway. Chromatin's proprietary technology enables the introduction of a novel biosynthetic process into the plant to produce farnesene, targeting sorghum to accumulate up to 20% of its weight as fuel. The farnesene will accumulate in the sorghum plants—similar to the way in which it currently stores sugar—and can be extracted and converted into a type of diesel fuel using low-cost, conventional methods.

CIEE-UC Berkeley & Power Standards Lab ..... AWARDEE **Booth 742**

Alex McEachern

Alex@PowerStandards.com

http://PowerStandards.com/ARPA-E.php

Micro-synchrophasors in Distribution Sytems

This project will develop an instrument 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.

Clean Energy Research Center, University of South Florida ..... AWARDEE **Booth 446**

Prof. Yogi Goswami

goswami@usf.edu

http://cerc.eng.usf.edu

Low Cost Thermal Energy Storage System Using Phase Change Materials

We have encapsulated phase change materials for thermal energy storage in CSP plants in the temperature range of 250C to 900C. In a system the capsules would fill a storage tank such that a heat transfer fluid can flow around the capsules. Our development reduces the capital cost of a Thermal Energy Storage system to less than $15/kWhth.

CleanNG LLC ..... **Booth 412**

Aaron Laney

alaney@gocleanng.com

www.gocleanng.com

High-Pressure, Liner-less Fuel Storage Systems

Founded in 2010, CleanNG's liner-less fuel storage technology provides tank designs with higher capacity and less weight than its composite counterparts that use plastic or polymer liners.

Colorado State University..... AWARDEE **Booth 224**

June Medford
June.Medford@colostate.edu
http://wp.natsci.colostate.edu/medfordlab

Synthetic Gene Circuits to Enhance Production of Transgenic Bioenergy Crops

Our approach combines the emerging field of Synthetic Biology with Bioenergy Crop improvement. We will produce technology that will enable easy transformation of Bioenergy crops. We estimate that this innovation will not only enable simple and efficient transformation of Bioenergy crops, but it will also result in significant economic savings over the current technology. To demonstrate the power of our approach, we will integrate our Bioenergy transformation technology with the ability to amplify a key Bioenergy regulator. Our regulatory genetic circuits could also find application for biofuels, biomanufacturing and bioengineering, allowing the U.S. to retain technological lead in renewable energy.

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Columbia University..... AWARDEE **Booth 841**

Alan West
acw7@columbia.edu
http:/www.cheme.columbia.edu

Biofuels from CO2 Using Oxidizing Bacteria in a Reverse Microbial Fuel Cell

A process combining an electrochemical and biological reactor is used to convert water, CO2 and electricity into isobutanol (or other energy-rich compounds. The electrochemical reactor reduces iron ions , which are subsequently fed to the bioreactor containing an iron-oxidizing bacteria that has been genetically modified to produce isobutanol. The process is imminently scalable, and continues to be optimized. Furthermore, the design decouples operation of the biological and electrochemical processing, allowing for continuous operation of the biological reactor and intermittent operation of the electrochemical reactor. The decoupling of the two steps allows fore easier integration with renewable electricity generation.

COLUMBIA ENGINEERING

Columbia University..... AWARDEE **Booth 813**

Ah-Hyung Alissa Park
ap2622@columbia.edu
www.columbia.edu/~ap2622

Chemical and Biological Catalytic Enhancement of Weathering of Silicate Minerals as Novel Carbon Capture and Storage Technology

The key innovation of this technology is the development of chemical and biological catalysts to enhance weathering of silicate minerals to directly capture and store CO2 from flue gas as thermodynamically stable mineral carbonates in industrial scale. Compared to conventional CO2 capture technologies, our engineered mineral weathering process offers significant advantages including eliminated needs for energy-intensive solvent regeneration, CO2 compression and separate storage steps. Once converted, mineral carbonates can provide most safe method of carbon storage with great long term stability. Therefore, there will be no need for long-term monitoring and verification, while accounting of stored carbon will be straightforward.

Cool Angle LLC ..... **Booth 612**

Kirk Bailey
kirk@coolangle.com
www.coolangle.com

Cool Angle Technology for Asphalt Roofing Shingles with Dynamic Reflectivity

Cool Angle roofing shingles utilize directionally reflective technology to make asphalt roofing shingles more reflective toward the sun while maintaining traditional dark colors from normal viewing angles at street level. When the shingles are installed, viewers at the street level see a traditionally colored shingle, while a highly reflective coating is applied on to the back side of the granules that is hidden from view. This reflects thermal energy back into the atmosphere, rather than being absorbed into buildings and requiring increased cooling requirements and costs.

Cree, Inc. ..... AWARDEE **Booth 1144**

Dr. David Grider
david_grider@cree.com
http://www.cree.com/

15 kV SiC IGBT Power Modules for Grid Scale Power Conversion

This program is developing high voltage 15 kV SiC IGBT power electronics technology which will be used to demonstrate a 100 kVA Transformerless Intelligent Power Substation (TIPS) for grid-scale power conversion. This SiC IGBT technology offers critical advantages for grid-scale power conversion systems such as TIPS including higher efficiency power conversion up to 98%, replacement of heavy (8000 lb) 60 Hz transformer s with much smaller (100 lb) 50 kHz transformers, as well as over 50% reduction in power converter weight, size, and cooling requirements. This transformative SiC IGBT technology will enable a broad range of grid-scale power conversion systems.

CUNY Energy Institute ..... AWARDEE **Booth 432**

Eli S. Leland
esleland@che.ccny.cuny.edu
www.metacapacitors.com

Metacapacitors

We are developing next-generation electric power converters for solid state lighting and other applications. Our power converters have the potential to be smaller, cheaper, more efficient, and longer lasting than comparable switched mode power supplies. Our designs are built around switched capacitor circuit topologies and printed capacitors using a proprietary nanoparticle dielectric.

CUNY Energy Institute, City College ..... **Booth 431**

Sanjoy Banerjee
banerjee@che.ccny.cuny.edu
cuny.edu/energy

GRIDS Zn MnO2 Flow Cell

The CUNY Energy Institute team, led by Dr. Sanjoy Banerjee, is developing advanced zinc-manganese dioxide batteries for energy storage applications. Zinc (Zn) and manganese dioxide (MnO2) are used in traditional disposable batteries; they are non-toxic, abundant, and inexpensive, with good energy densities. At the CUNY Energy Institute, we are examining a 1.6kWh Zn anode module that has been tested through 5,000 cycles (and counting) and an MnO2 cell that can undergo 1,500 discharge cycles at $100/kWh.

Dais Analytic Corporation..... AWARDEE **Booth 344**

Jason Switzer
jason.switzer@daisanalytic.com
http://www.daisanalytic.com

Membrane Dehumidification Enabling Alternative Cooling Strategies in Humid Environments

Dais Analytic is applying the attributes of its Aqualyte™ family of nano-structured materials to develop a new generation of energy efficient, environmentally friendly Heating, Ventilation, and Air-Conditioning (HVAC) equipment. Commercially, ConsERV®, Dais's award winning high efficiency energy recovery ventilator, deployed in over 1,000 field installations, manages the attributes of the Aqualyte materials to save end-users energy, lower C02 emissions and provide improved Indoor Air Quality. This specific project manages the Aqualyte's attribute to create a selectively permeable membrane to adiabatically remove moisture from an air stream; enabling the use of alternative technologies, such as evaporative cooling, while cooling humid air.

Dartmouth College - Thayer School of Engineering..... AWARDEE **Booth 442**

Ian Baker
ian.baker@dartmouth.edu
http://engineering.dartmouth.edu/people/faculty/ian-baker/

Nanocrystalline τ-MnAl Permanent Magnets

We have produced bulk nanocrystalline τ-MnAl magnets by equal channel angular extrusion of mechanically-milled powders of the unstable, high-temperature ε-phase. The resulting material has a good coercivity of >4 kOe, and a saturation magnetization of >80 emu/g. The energy product obtained so far is still only half the theoretical value of 12.6 MGOe for binary τ-MnAl, indicating significant potential for further improvements. Even with our current energy product, τ-MnAl has both a better energy product per unit mass and lower cost per unit energy product that AlNiCo magnets, and a lower cost per unit energy product that rare earth magnets.

DELPHI

Delphi Automotive Systems ..... AWARDEE **Booth 636**

Greg Grant
greg.l.grant@delphi.com
delphi.com

Advanced Power Semiconductor and Packaging

This project will create a 600V Gallium-Nitride-on-Silicon power transistor that, when combined with sintered interconnects and dual-side cooling, will outperform existing IGBT power transistors by 3-5X and enable a roadmap to reduce cost, size and energy losses by at least 50% for automotive and other higher power applications within 5-7 years. The deliverable will be an electrically-stable packaged GaN-on-Si 600V depletion-mode HEMT power device with a second chip providing anti-parallel diode and normally-off behavior for the power transistor package.

Cornell University

Dept. of Computer Science, Cornell University ..... AWARDEE **Booth 1223**

Ken Birman
ken@cs.cornell.edu
http://www.cs.cornell.edu/Projects/gridcontrol/

GridCloud: A cloud-hosted platform for monitoring and controlling the smart grid.

Cloud computing offers tremendous cost and scalability benefits, but is too insecure and unpredictable for high-assurance tasks. Our effort seeks to demonstrate that such issues can be overcome. GridCloud is a new high-assurance platform for monitoring and controlling large (and often critical) physical infrastructures, including the smart power grid. Our work is funded under the ARPA-E GENI program.

Design Flux TECH energy management • simplified

Design Flux Technologies, LLC Partnering with NorTech ..... **Booth 504**

Kent Kristensen
www.designfluxtech.com

Intelligent Energy Exchange (IEE): Re-Configurable Energy Storage

Design Flux Technologies is developing the world's first Intelligent Energy Exchange (IEE) – a combined hardware & software turnkey solution for industries & businesses that store, deliver, and exchange electricity on-demand. The IEE solution re-configures battery packs in real time to meet the needs of their applications. The IEE completely eliminates the need for traditional chargers, charging stations, inverters, management systems, and load controllers. Applicable to all battery chemistries ranging from consumer electronics to grid storage, the IEE will enable new smart grid applications & infrastructure solutions to drive electrification of products in a revolutionary way.

Det Norske Veritas..... AWARDEE **Booth 643**

Davion M Hill, PhD
Davion.M.Hill@dnv.com
www.dnv.com

Sensor Enhanced and Model Validated Batteries for EnergyStorage

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

Dioxide Materials, Inc..... AWARDEE **Booth 720**

Megan Atchley
megan.atchley@dioxidematerials.com
http://www.dioxidematerials.com

Conversion Of Carbon Dioxide To Fuels and Chemicals

Dioxide Materials is developing a process to produce transportation fuels and industrial chemicals electrochemically using carbon dioxide emitted by power plants and renewable energy. Dioxide Materials' technology breakthrough improves energy efficiency by an order of magnitude (80% energy efficiency and 99% selectivity), which reduces the cost of conversion by a factor of three, cuts greenhouse gas emissions, and reduces U.S. dependence on foreign oil.

Donald Danforth Plant Science Center..... AWARDEE **Booth 544**

Jan Jaworski
jjaworski@danforthcenter.org

Center for Enhanced Camelina Oil (CECO)

The Center for Enhanced Camelina Oil (CECO) will engineer into elite camelina varieties mechanisms to i) capture more light, ii) fix more carbon in to biomass, iii) partition more carbon to oil, and iv) improve water/nitrogen use efficiencies. The transgenic work will make use of advanced technological platforms including a suite of in-house molecular tools such as binary vectors that are capable of stacking multiple gene cassettes.

Dynamo Micropower..... **Booth 543**

Jason Ethier
jason@dynamo-micropower.com
dynamo-micropower.com

Novel Microturbine for Distributed Applications

Dynamo Micropower is developing a 1-20kW gas generator (genset) that will significantly reduce the levelized cost of energy (LCOE) for the upstream oil and gas market. By implementing a novel ultra-microturbine architecture, we will displace conventional reciprocating engines with a solution that is fuel flexible, superior uptime, and superior emissions. While other microturbines with similar features exist, their high cost point has prevented mass adoption. Our novel architecture enables us to build an engine cost competitively with reciprocating engines to produce.

e Nova, Inc. ..... AWARDEE **Booth 1227**

EaglePicher™ Technologies, LLC An Exide Company

EaglePicher Technologies LLC ..... AWARDEE **Booth 735**

Dave Lucero
dave.lucero@eaglepicher.com
www.eaglepicher.com

Planar Na-Beta Batteries Development for Renewable Integration and Grid Applications

EaglePicher Technologies, Inc. has teamed with Pacific Northwest National Laboratory to develop the next-generation sodium β″-alumina batteries for the nation's large-scale energy storage needs. This project will have direct impact on establishing U.S. leadership in stationary storage, and will demonstrate a competitive path to cost effective electrical energy storage.

Eaton Corporation ..... AWARDEE **Booth 740**

Clark Fortune
gclarkfortune@eaton.com
www.eaton.com

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

Eaton Corporation and the University of Minnesota are developing a highly effecient, near isothermal liquid piston compressor for low cost at-home natural gas refueling. Targeting twice the flow at one tenth the cost of compressors of existing systems, the successful completion of this project could reduce the payback time of investing in a CNG vehicle from 9 years to 5 years. Durability of the technology is achieved through the use of established hydraulic components, developed for off highway and industrial markets.

Eaton Corporation ..... AWARDEE **Booth 738**

www.eaton.com

Predictive Battery Management System for Commercial HEVs

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.

Electron Energy Corporation ..... AWARDEE **Booth 325**

Peter Dent
pcd@electronenergy.com
www.electronenergy.com

Solid State Processing of Fully Dense Anisotropic Nanocomposite Magnets

We propose a new solid state processing technology which will transform how current high performance rare earth (RE) magnets are fabricated, resulting in increased magnetic performance while reducing cost and minimizing the criticality issue for these materials. We will develop and implement a new macro-scale synthesis and processing technology based on a concept validated at micro-scale, to produce cost-effective, highly textured, exchanged -coupled nanocomposite permanent magnets based on two phase Nd2Fe14B / Fe and SmCo / Fe systems, with up to 30% less rare earth content than the single phase magnet counterparts.

Ener-G-Rotors, Inc. ..... **Booth 418**

Michael Newell
mnewell@energrotors.com
www.energrotors.com

Efficient Heat to Power

Ener-G-Rotors, Inc. is commercializing a revolutionary appliance that economically converts low temperature heat to carbon free electricity for as little as 1.5 cents per kWh. The Ener-G-Rotors solution can help industrial customers recover some of the quadrillions of BTUs of low grade waste heat that they now throw away, often with paybacks as short as two years. Customers can lower energy costs, reduce their carbon footprint, and increase energy efficiency by using more of the energy they paid to make. Ener-G-Rotors' novel technology can also make large engines and combined heat and power plants more efficient, regardless of the fuel.

Energy & Enivornmental Research Center .... AWARDEE **Booth 942**

Christopher Martin
cmartin@undeerc.org
www.undeerc.org

Novel Dry Cooling Technology for Power Plants

The University of North Dakota's Energy & Environmental Research Center (EERC) is developing a market-oriented dry cooling technology that is intended to address the key shortcomings of conventional dry cooling technologies: high capital cost and degraded cooling performance during daytime temperature peaks. The technology will be applicable to all Rankine cycle-based power plants including conventional fossil and nuclear plants, and renewable options such as solar thermal or geothermal power systems.

Energy Storage Systems, Inc. ..... AWARDEE Booth 712

Craig Evans
craig.evans@energystoragesystems.com
www.EnergyStorageSystems.com

10kW 80kWh Energy Storage System based on All-iron Hybrid Flow Battery

The objective of this project is to research, design and construct a 10kW 80kWh cost effective energy storage system using an advanced battery design coupled with electrolyte materials composed of low cost iron. Subtasks of this project include battery design optimizations, materials' stability and degradation studies, system design and integration, and business and market development. The iron flow battery developed from this project will have a target storage cost of less than $100/kWh, which will enable full commercialization of grid-scale energy storage systems, allowing for increased deployment of renewable energy generation.

FastCAP Systems Corp. ..... AWARDEE Booth 619

Dr. Riccardo Signorelli
riccardo@fastcapsystems.com
www.fastcapsystems.com

Low Cost High Energy Density and Power Density Nanotube-Enhanced Ultracapacitor

Fueled by a multi-million dollar grant ARPA-E in 2010, FastCAP Systems seeks to transform the automotive and grid storage markets with its novel and enabling high-power, high-energy and low-cost ultracapacitor. FastCAP's proprietary carbon nanotube electrode technology has enabled breakthrough performance improvement in its cells when compared with commercially available ultracapacitors. FastCAP's cells have achieved over 100 kw/kg in third party validation tests, a 1000% improvement over ultracapacitors on the market today, and a leap forward that could create new markets for ultracapacitors, and lead to dramatic reductions in the cost of hybrid electric vehicles.

FloDesign Wind Turbine Corp. ..... AWARDEE Booth 640

http://www.fdwt.com

Next Generation Wind Turbine

FloDesign Wind Turbine is a wind turbine company that draws on proprietary technology developed for jet engines to target the lowest cost/kWh in the wind industry. FloDesign Wind Turbine surrounds its wind turbine blades with a patented mixer-ejector shroud system that directs and pumps more air through the rotor, providing over 3x the maximum efficiency of traditional turbines. This enables FloDesign's turbine to produce the same power with half the rotor diameter of traditional turbines.

Fluidic Inc. ..... AWARDEE **Booth 314**

www.fluidicenergy.com

High-power Zing-air Energy Wind Turbine

Our national electric grid has limited ability to store excess energy, so electricity must constantly be generated to perfectly match demand. Though wind and solar power are promising clean alternatives to fossil fuels, their natural unpredictability and intermittency present major challenges to delivery of the consistent power that is necessary to operate today's grid. The U.S. needs technologies that can store renewable energy for future grid-use at any location. Flexible, large-scale storage would create a stronger and more robust electric grid by enabling renewables to contribute to reliable power generation.

Ford Motor Company..... AWARDEE **Booth 837**

Mike Veenstra

mveenstr@ford.com

www.ford.com

Covalent and Metal-Organic Framework High-Capacity Natural Gas Adsorption *Storage Systems

This project will facilitate and accelerate the use of natural gas in vehicles by reducing the pressure of on-board tanks using a high-capacity framework material, while delivering the customer expected driving range. This technology will be achieved by adsorbent synthesis and characterization, impurity mitigation, enhanced processing and compaction, and system multi-objective optimization engineering.

Ford Motor Company..... AWARDEE **Booth 835**

Alvaro Masias

amasias@ford.com

www.ford.com

High Precision Tester for Automotive and Stationary Batteries

The purpose of this R&D project is to significantly reduce the time required to develop and validate batteries for automotive and stationary applications. We will accomplish this transformation of the battery development process by greatly improving the prognostication capability of the existing battery test equipment. To this end, our project will develop, build, calibrate and validate two high precision battery tester prototype machine designs.

Fraunhofer USA

Fraunhofer USA - Ubiquitous Energy.....Booth 811

Miles Barr & Bart Howe
info@ubiquitous-energy.com
www.ubiquitous-energy.com

Visibly Transparent Power-Producing Window Films

Ubiquitous Energy and Fraunhofer USA are collaborating to develop building-integrated energy harvesting based on Ubiquitous' ClearView PowerTM technology, which selectively converts incident ultraviolet and near-infrared light into electricity. This novel approach for invisible, high-performance photovoltaic coatings transforms common surfaces into energy resources while minimizing visual perception and maximizing design freedom. ClearView PowerTM utilizes proprietary device architectures that exploit the unique light-harvesting characteristics of molecular materials, offering a favorable combination of power conversion efficiency, color rendering, and visible light transmittance. By delivering cost-effective power at the point of utilization, ClearView PowerTM seamlessly enhances the functionality of portable electronics, buildings, and automobiles.

gti

Gas Technology Institute ..... AWARDEE Booth 620

Shiguang Li
Shiguang.Li@gastechnology.org
http://www.gastechnology.org

Nano-Valved Adsorbents for CH4 Storage

Gas Technology Institute in partnership with University of Louisville and University of South Carolina are developing a unique low-pressure natural gas storage method 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.

gti

Gas Technology Institute ..... AWARDEE Booth 618

www.gastechnology.org

Commercial Prototype Adsorbed Natural Gas (ANG) System for Light Duty Vehicles

The Gas Technology Institute (GTI) together with Northwestern University , Westport Fuel Systems, and NuMat Technologies will develop new computational models and synthesis routes, as well as characterize methane uptake capacities for new, high performance metal organic framework (MOF) materials for low pressure natural gas storage.

GTI

Gayle Technologies Inc. ..... AWARDEE Booth 529

Jimmy Gayle
Jimmygayle@gayletech.com
www.gayletech.com

The Summit

Developing an Acoustical Laser for NDT.

GE Global Research..... AWARDEE **Booth 1149**

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 reduces the cost of transmission infrastructure, improving grid reliability and facilitating renewable technology deployment.

GE Global Research..... AWARDEE **Booth 1149**

Francis Johnson
johnsonf@ge.com
www.geglobalresearch.com

Transformational Nanostructured Permanent Magnets

GE is using nanomaterials technology to develop advanced magnets that contain fewer rare earth materials than their predecessors. Nanomaterials technology involves manipulating matter at the atomic or molecular scale, which can represent a stumbling block for magnets because it is difficult to create a finely grained magnet at that scale. GE is developing bulk magnets with finely tuned structures using iron-based mixtures that contain 80% less rare earth materials than traditional magnets, which will reduce their overall cost. These magnets will enable further commercialization of HEVs, EVs, and wind turbine generators while enhancing U.S. competitiveness in industries.

GE Global Research..... AWARDEE **Booth 1149**

Robert Perry
perryr@research.ge.com
ge.geglobalresearch.com

CO2 Capture Process Using Phase-Changing Absorbents

An aminosilicone solvent undergoes a phase-change from liquid to solid on exposure to CO2 in an absorber unit. This solid is then transported to a high-temperature, high-pressure desorption chamber where the CO2 is released under pressure and the regenerated liquid solvent is returned to react with more CO2 inthe absorber. The solvent has a high CO2 capture capacity (17 wt%), is thermally robust, possesses a low vapor pressure, and does not require the presence of water. Plant and process models indicate that a 30% reduction in energy penalty, versus an MEA benchmark, can be achieved.

GE Global Research ..... AWARDEE **Booth 1149**

Ranjan Gupta
guptar@ge.com
ge.geglobalresearch.com

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

Present VSC HVDC converters require ultra-fast DC breaker technology for multi-terminal HVDC connection. The VSC HVDC converter station along with the DC breaker per offshore station, e.g. for multi-terminal DC grid for offshore wind, will require large offshore real estate and therefore higher capital investment. A new architecture using high voltage high frequency electronics is proposed which can decrease the cost and complexity of multi-terminal HVDC network by designing the power electronics in distributed renewable sources to have a direct HVDC-compatible output. This reduces the footprint and cost of HVDC station and potentially improves the overall efficiency.

GE Global Research ..... AWARDEE **Booth 1149**

http://ge.geglobalresearch.com/

Nanoclay reinforced Ethylene-Propylene-Rubber for low cost HVDC cabling

Dielectric materials for transmission cables are very costly. The key challenge leading to the high cost is the reliability of the insulation under HVDC. GE is embedding nanomaterials into specialty rubber, ethylene-propylene rubber, to develop a new formulation with an optimal combination of orientation, spatial distribution, and electrical properties, leading to highly reliable cabling for HVDC power transmission.

GE Power and Water ..... AWARDEE **Booth 1149**

Joyee Zhu
zhujo@ge.com
www.ge.com

Tensioned Fabric Wind Blades

This project will transform the way wind blades are designed, manufactured, and installed by employing tensioned fabric uniquely wrapped around a spaceframe blade structure. The main innovation of the tensioned fabric blade is to replace current clam shell of wind blades with selected glass fiber based fabrics, reducing the cost and weight of the blade skin. The net result of this technology is a lower cost of electricity by enabling cost effective larger wind blades that can capture more wind at lower wind speeds, helping the wind industry produce electricity as economically as fossil fuel energy based production.

GE Global Research ..... AWARDEE **Booth 1149**

Jalal Zia
jalal.zia@ge.com

http://ge.geglobalresearch.com/

Chilled NG for At-Home Refueling

Objective:

To develop an at-home refueling appliance for NGVs that has the capability of dispensing CNG at 250 bar, at a rate of greater than 1 GGE/hour, while meeting high safety, reliability standards at low mature cost.

Technology Description:

- The At-Home Refueling: A novel system design that eliminates compression stages and the issues and costs of traditional compressors.
- At-home refueling for NGVs that chills and transfers natural gas at high pressure.

GE Global Research ..... AWARDEE **Booth 1149**

http://ge.geglobalresearch.com/

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

GE, U-M, and Ford are developing a novel multimeasurand sensing system with supporting multi-physics models to increase cell lifetime and extend battery range for electric vehicle applications. Based on sensor technology, which can leverage high-volume, low-cost manufacturing, GE will develop an ultrathin sensor array capable of measuring strain and temperature across multiple cells within a pack. Combining strain and temperature measurements in optimally selected locations on a subset of cells across the pack, with a multi-physics model predicting the electrochemical, thermal, and strain behavior of cells, will result in novel on-board identification techniques for predicting the behavior of the system.

General Atomics ..... AWARDEE **Booth 917**

Aaron Sathrum
Aaron.Sathrum@ga.com

http://www.ga.com/

Soluble Lead Flow Battery Technology

General Atomics is developing a soluble lead flow battery that has only one electrolyte/reservoir that results in a safe, reliable, low cost energy storage solution. Using a similar chemistry as a traditional lead-acid battery but storing its energy outside of the cell allows for the use of very low cost materials. The goal is to develop a system that is far more durable than today's lead-acid batteries, that can be scaled to deliver megawatts of power, and lowers the cost of energy storage below $100 per kilowatt hour.

General Atomics ..... AWARDEE **Booth 919**

Joel Drake
joel.drake@ga.com
www.ga.com

Magnetically Pulsed Hybrid Breaker for High-Voltage Direct Current (HVDC) Power Distribution Protection

High voltage dc systems are currently being evaluated as a cost effective alternative to ac systems for long-haul power transmission to connect remote renewable energy sources, asynchronous grid interties, and long setback offshore power systems. Currently, however, dc grid development is constrained by the lack of a critical component for which there is no viable commercial example: the high voltage dc circuit breaker. This project will develop a low loss, high reliability 125kV/500A dc breaker that will interrupt system faults in less than ~¼ of a millisecond.

GeneSiC Semiconductor ..... AWARDEE **Booth 535**

Ranbir Singh
ranbir@ieee.org
www.genesicsemi.com

Silicon Carbide Anode Switched Thyristor for Medium-Voltage Power Conversion

GeneSiC is developing an advanced silicon-carbide (SiC)-based semiconductor called an anode-switched thyristor. This low-cost, compact SiC semiconductor conducts higher levels of electrical energy with better precision than traditional silicon semiconductors. This efficiency will enable a dramatic reduction in the size, weight, and volume of the power converters and electronic devices it's used in. GeneSiC is developing its SiC-based semiconductor for utility-scale power converters. Traditional silicon semiconductors can't process the high voltages that utility-scale power distribution requires, and they must be stacked in complicated circuits that require bulky insulation and cooling hardware.

Georgia Institute of Technology ..... AWARDEE **Booth 930**

Ari Glezer
ari.glezer@me.gatech.edu
www.SoV.gatech.edu

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

The Solar Vortex (SoV) is a transformative, low-cost, scalable, renewable electrical power generation approach for regions with high surface heating rates, using gravitational potential energy in the solar-heated ground air to deliberately form and anchor a "dust devil"-like columnar vortex. Each vortex entrains nearby ground-heated air through an array of stationary vertical vanes, converting the potential energy into a flow with significant rotational (azimuthal) and vertical (axial) kinetic energy, which drives a vertical-axis turbine. At utility scale, the cost-of-energy of SoV arrays is projected to be $0.07/kWh.

Georgia Tech Center for Organic Photonics and Electronics

Georgia Institute of Technology ..... AWARDEE **Booth 513**

Jason Martin
jason.martin@chemistry.gatech.edu
http://www.cope.gatech.edu

Completely Plastic Solar Cell

Researchers at the Georgia Tech Center for Organic Photonics and Electronics (COPE) has discovered a universal technique to reduce the work function of a conductor for organic electronics and has demonstrated the first completely plastic organic solar cell where all the parts are polymers. Using a polymer modifier containing simple aliphatic amine function groups to reduce the work function in a wide range of conductors, including noble metals such as Au and Ag, conducting polymers, metal oxides, or graphene, air-stable low-work function electrodes were created. These polymers are inexpensive, environmentally friendly and compatible with existing roll-to-roll mass production techniques.

Georgia Institute of Technology ..... AWARDEE **Booth 932**

Srinivas Garimella
sgarimella@gatech.edu
www.me.gatech.edu/STSL

Modular Thermal Hub for Building Cooling, Heating and Water Heating

A miniaturized, microchannel-based thermally activated cooling system is being developed at the Sustainable Thermal Systems Laboratory at Georgia Tech, in collaboration with Stone Mountain Technologies, Inc. The absorption cycle used here produces useful cooling from waste heat, the combustion of fuel, or other thermal inputs. Negligible electric input is needed, and the compressor found in vapor-compression systems is eliminated. All heat and mass exchangers of the absorption cycle are in self-contained integrated assemblies. The micro-scale geometries provide enhanced heat and mass transfer and high surface-to-volume ratios, and enable miniaturization to a scale not approached by existing systems.

Georgia Institute of Technology ..... **Booth 1242**

Chuanyi Ji
jic@ece.gatech.edu
http://users.ece.gatech.edu/~jic

Third Eye Technology for Power Grids in Disasters

We have developed novel software tools for real-time data analytics of large-scale power outages. The software tools adaptively learned failure rates, recovery time, and resilience of a network. The software tools can use data from individual provider networks without sharing. The software tools can also conduct assessment using publicly available power-outage data across multiple regional networks and multiple providers. The software tools can help utility providers to take proactive actions for planning, to expite recovery, to inform customers more accurately, to strenghen the network, and to assist decision making.

Advanced Computational Electricity System

Georgia Institute of Technology ..... AWARDEE **Booth 518**

Santiago Grijalva
sgrijalva@ece.gatech.edu
http://www.ece.gatech.edu/research/labs/aces/pages/home.html

Prosumer-Based Distributed Autonomous Cyber-Physical Architecture for Ultra-reliable Green Electricity Internetworks

This project proposes a comprehensive, backward compatible, incrementally deployable, and scalable control architecture based on distributed autonomous networked control and the emerging concept of electricity "prosumers"– economically motivated energy ecosystems that can consume, produce or store electricity. The architecture's distributed intelligence and innovative control design reduces communications requirements and decentralizes control functions. A "flat" electricity industry emerges wherein the actors expose various services related to individual and wide-area objectives, realizing an ultra-reliable internetwork for energy that will enable penetration of high levels of renewable energy and storage, numerous novel value propositions, and energy innovation.

Georgia Tech | MicroSensors & MicroActuators

Georgia Tech Research Corporation ..... AWARDEE **Booth 1130**

Mark G. Allen
mark.allen@ece.gatech.edu
http://mems.gatech.edu/msma

Highly-Laminated, High-Saturation-Flux-Density, Magnetic Cores for On-Chip Inductorsin Power Converter Applications

The magnetic components traditionally used to make adapters and bricks have reached their limits; they cannot be made any smaller without sacrificing performance. We are taking a cue from grid-scale power converters that use iron alloys as magnetic cores. These low-cost alloys can handle more power than other materials, but the iron must be stacked in insulated plates to maximize energy efficiency. In order to create compact, low-profile power adapters, these stacked iron plates must be extremely thin—only hundreds of nanometers in thickness. To make plates this thin, we use manufacturing tools used in microelectromechanics and other small-scale industries.

GINKGOBIOWORKS™

Ginkgo BioWorks..... AWARDEE **Booth 523**

Jason Kelly
jason@ginkgobioworks.com
http://ginkgobioworks.com

Engineering E. coli as an electrofuels chassis for isooctane production

Ginkgo Bioworks is bypassing photosynthesis and engineering E. coli to directly use carbon dioxide (CO_2) to produce biofuels. E. coli doesn't naturally metabolize CO_2, but Ginkgo Bioworks is manipulating and incorporating the genes responsible for CO_2 metabolism into the microorganism. By genetically modifying E. coli, Ginkgo Bioworks will enhance its rate of CO_2 consumption and liquid fuel production. Ginkgo Bioworks is delivering CO_2 to E. coli as formic acid, a simple industrial chemical that provides energy and CO_2 to the bacterial system.

Grid Logic, Inc ..... AWARDEE **Booth 739**

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

Low-Cost, High Temperature Superconducting Conductors

Grid Logic is developing a new class of high-temperature superconducting conductors with costs an order of magnitude lower than today's state-of-the-art HTS tapes. The technology will permit arbitrary conductor shapes with significant mechanical robustness and very low AC losses. Using a new manufacturing technique, Grid Logic will embed very fine HTS particles in a nanostructured metal matrix to create a Superconducting Nanocomposite. In this architecture, superconductivity is induced in the metal matrix. This new class of materials will overcome many of the barriers that limit the commercialization of high-power superconducting systems in energy generation, transmission and distribution applications.

Halotechnics, Inc..... AWARDEE **Booth 441**

Justin Raade
jraade@halotechnics.com
http://www.halotechnics.com/

Advanced Molten Glass for Heat Transfer and Thermal Energy Storage

Halotechnics is developing a thermal storage system utilizing a low melting point molten glass as the heat transfer and thermal storage material. An advanced glass promises a potential breakthrough in a low cost, earth abundant, and stable thermal storage material. Thermal storage at the target temperature can be integrated with existing high temperature gas turbines that significantly increase efficiency and lower cost versus today's steam turbine technology.

Harvard Medical School, Wyss Institute ..... AWARDEE **Booth 842**

Jeffrey Way
jeff.way@wyss.harvard.edu
http://www.openwetware.org/wiki/Silver_Lab#Research_Information

Engineering a Bacteria Reverse Fuel Cell

The goal of the Electrofuels program is to convert electricity into carbon-based liquid fuels. Electrons, as chemical reducing equivalents, will enter bacteria that will also fix carbon and synthesize biofuels. In our system, bacteria will sit on an electrode, take up electrons through direct contact, convert the electrons into NAD(P)H that is used to fix CO2, and synthesize medium-chain fuel molecules. We have engineered non-carbon fixing bacteria to perform reactions of CO2 fixation, and to synthesize C8- to C12-length biofuel molecules. We also engineered a bacterium to use the C1 sources formic acid and methanol to produce biofuel precursors.

Harvard University ..... AWARDEE Booth 941

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

Small Organic Molecule Based Flow Battery

In this new flow battery concept, electrical energy is stored chemically through the reversible electrochemical protonation of small organic molecules with high aqueous solubility, and returned to the grid through the reversal of these reactions. Harvard will leverage advantages this particular technology would have over other flow batteries, including high power density, inexpensive chemicals, energy storage in the form of safer liquids, and inexpensive components, to produce and evaluate devices based on three variants of the new chemistry. This project will yield 1-3 proof-of-concept devices that may be developed into commercially viable grid-scale electrical energy storage systems.

HexaTech Inc ..... AWARDEE Booth 911

Joe Grzyb
jgrzyb@hexatechinc.com
www.hexatechinc.com

Aluminum Nitride (AlN) Based Devices for High-Voltage, High Efficiency Power Conversion

High voltage 20kV Aluminum Nitride (AlN) based Schottky diodes are being developed to demonstrate the high-voltage, high efficiency power conversion capability using low dislocation AlN substrates. For power systems and grid-scale power conversion applications, high efficiency AlN based power devices will offer a significant reduction in size, weight, and cooling.

HRL Laboratories ..... AWARDEE Booth 1126

Karim S. Boutros
ksboutros@hrl.com
www.hrl.com

Gallium-Nitride Switch Technology for Bi-directional Battery-to-Grid Charger Applications

HRL Laboratories is using gallium nitride (GaN) semiconductors to create battery chargers for electric vehicles (EVs) that are more compact and efficient than traditional EV chargers. Reducing the size and weight of the battery charger is important because it would help improve the overall performance of the EV. GaN semiconductors process electricity faster than the silicon semiconductors used in most conventional EV battery chargers. These high-speed semiconductors can be paired with lighter-weight electrical circuit components, which helps decrease the overall weight of the EV battery charger.

Hybrid Electric Vehicle Technologies..... Booth 1244
Heidi Lubin
hevt.com

High-Performance, High-Efficiency, Affordable, Reliable Electric Motors

At HEVT, we share a vision around distributed and sustainable energy and mobility built upon core technology that begins with electric motors and power electronics - free of rare earth metals. Scientifically, we have addressed critical problems around noise, vibration and harshness for switched reluctance machines through the combination of innovative hardware and software. With lower initial and total cost of ownership, our motors make performance leaps with superior reliability, high efficiency over a wide speed range, and reduced cost and cost volatility due to the combination of innovative hardware and software design.

Ideal Power Converters ..... AWARDEE Booth 1032
Paul Bundschuh
paul.bundschuh@idealpowerconverters.com
www.idealpowerconverters.com

Bi-directional Silicon IGBTs Modules enables breakthrough Power Converter

Electronic power converters provide the infrastructure for the modern energy revolution. Ideal Power Converters has patented and commercialized its revolutionary electronic power converter technology which is shipping in the company's solar inverters, bi-directional battery and electric vehicle chargers based on its Universal Power Converter Platform™. IPC was awarded $2.5M ARPA-E award to develop and commercialize a bi-directional IGBT power switch that will further improve the cost, weight and efficiency of its products. IPC was also included in the "Cool Vendors in Solar Energy, 2012" report published by Gartner Inc, and won the 2012 Defense Energy Technology Challenge.

Infinia Corporation..... AWARDEE Booth 924
Dr. Songgang Qiu
sqiu@infiniacorp.com
www.infiniacorp.com

Stirling Air Conditioner (StAC) for Compact Cooling

Infinia Corporation is developing a Stirling Air Conditioner (StAC) that combines recent disparate technology advances to provide transformational improvement in compact cooling. StAC integrates the Stirling cycle with innovative heat transfer coupling to produce a highly efficient (COP>>4) system that produces no greenhouse gasses (GHG). In the past, Stirling systems have demonstrated high costs and low performance because of inefficient heat exchanger technology. But today, using chip cooling technology from the computer industry, Infinia is making improvements to the heat exchanger and enabling the cost-effective mass production of high-efficiency air conditioners that use no polluting refrigerants.

Intel.....**Booth 848**

Guy AlLee
guy.allee@intel.com

https://dl.dropbox.com/u/9314374/CP%20Demo.wmv

Data Center Demand-Response & Integration of Renewables

The Datacenter Demand-Response and Renewables Integration Project will revolutionize the Data Center while assisting the electric grid become more stable during peak load times. Intel has developed Cabezon Peak Technology to vary the amount of work a server does in response to an outside signal. This research investigates if the technology can scale up to Cloud Data Centers for Demand-Response programs as well as smooth the output of renewable energy sources with significantly fewer batteries to foster Integration of more Renewables.

Ionic Research Technologies..... AWARDEE **Booth 538**

Doug Morrison
dmorrison@ionicresearchtechnologies.com

www.nd.edu

Compact, Efficient Air Conditioning with Ionic Liquid Based Refrigerants

Notre Dame is developing an air-conditioning system with a new liquid salt and CO2 as the working fluid. Synthetic refrigerants used in air conditioning and refrigeration systems are potent greenhouse gases and can trap 1000 times more heat in the atmosphere than CO2 alone—making CO2 an attractive alternative for synthetic refrigerants in cooling systems. However, operating cooling systems with pure CO2 requires prohibitively high pressures and expensive hardware. Notre Dame is creating a new fluid made of CO2 and liquid salt that enables the use of CO2 at low pressures and requires minimal changes to existing hardware and production lines.

ITN Energy Systems, Inc..... AWARDEE **Booth 426**

Ashutosh Misra
amisra@itnes.com

www.itnes.com

2.5kW/10kWh Redox Flow Battery with Low-cost Membrane and Electrolyte Technologies

ITN's project objective is to dramatically improve Redox Flow Battery (RFB) technology and demonstrate a cost-effective, modular 2.5 kW, 10 kW.hr energy storage unit. ITN and partner University of Kentucky will accomplish this through further improvement/optimization of our low-cost chitosan membrane and development of low-cost electrolyte solutions for improved battery performance. The program includes iterative advancements in membrane and electrolyte chemistry, with subsequent improvements derived from analysis of each successive result. We will also design and fabricate balance of plant (BOP) components, with final integration into the demonstration unit, and also develop production cost models.

ITN Energy Systems, Inc. ..... AWARDEE **Booth 428**

Dr. Brian Berland
bberland@itnes.com
www.itnes.com

Low-Cost Electrochromic Film on Plastic for Net-Zero Energy Buildings

Buildings account for 40% of all energy used in the US, and windows are typically responsible for 25% of a building's energy consumption. Electrochromic windows reduce cooling in summer and heating in winter by applying electric current that changes the window's color, and thereby its heat transmission properties. ITN is reducing the currently high cost of electrochromic windows with a new roll-to-roll process for deposition onto flexible plastic surfaces. This innovative technique lowers processing temperatures and creates uniform film quality over larger surface areas than can be done with current techniques.

LanzaTech ..... **Booth 944**

Carl Wolf
carl.wolf@lanzatech.com
www.lanzatech.com

LanzaTech-A novel approach to capturing waste carbon for beneficial reuse.

LanzaTech, a leader in gas fermentation technology, provides novel and economic routes to fuels and high value chemicals from waste gas streams such as industrial flue gases from steel mills and processing plants; syngas generated from any biomass resource (e.g. MSW, organic industrial waste, agricultural waste); coal derived syngas and steam reformed methane.

LanzaTech's unique process provides a sustainable pathway to platform chemicals that serve as building blocks to products that have become indispensable in our lives such as rubber, plastics, synthetic fibers and fuels. LanzaTech's technology solutions mitigate carbon emissions from industry without impacting adversely food or land security.

Lawrence Berkeley National Lab ..... AWARDEE **Booth 1217**

Venkat Srinivasan
vsrnivasan@lbl.gov
http://www.lbl.gov

Hydrogen Bromine Flow Battery for Grid Scale Energy Storage

As renewable sources of energy generation start to penetrate the goal energy supply, storage of electricity become critical. While batteries offer a promising means of storing electricity, the cost tends to be prohibitive. We have developed a flow battery based on hydrogen and bromine that promises to store energy at low cost. We have demonstrated extreme high power operation in our device; with peak power in the range of 1.4 W/cm2 at room temperature.

Lawrence Berkeley National Lab/ Heliotrope Technologies ..... AWARDEE **Booth 1120**
Delia Milliron
dmilliron@lbl.gov
www.lbl.gov

Low cost solution processed universal smart window coatings

This project involves the development of dynamic window coatings based on the electrochromic effect by which the solar transmittance of building windows can be actively modulated under the application of a few volt potential. In this project, we will build on our recent discovery of dual-band visible-near infrared switching in nanocomposite electrochromic materials to develop a new, universally applicable smart window technology. Low cost, minimal power requirements, and a responsive user experience will drive broad deployment to make a significant impact on global energy consumption.

Lawrence Berkeley National Laboratory..... AWARDEE **Booth 1246**
www.lbl.gov

Lawrence Berkeley National Laboratory..... AWARDEE **Booth 1219**
Steven Singer
SWSinger@lbl.gov
www.lbl.gov

Development of an Integrated Microbial-ElectroCatalytic (MEC) System for Liquid Biofuel Production from CO2

LBNL is improving the natural ability of a common soil bacteria called Ralstonia eutropha to use hydrogen and carbon dioxide for biofuel production. First, LBNL is genetically modifying the bacteria to produce biofuel at higher concentrations. Then, LBNL is using renewable electricity obtained from solar, wind, or wave power to produce high amounts of hydrogen in the presence of the bacteria—increasing the organism's access to its energy source and improving the efficiency of the biofuel-creation process.

Lawrence Berkeley National Laboratory..... AWARDEE **Booth 1220**
Jarad Mason
masonj@berkeley.edu
http://www.lbl.gov/

High Throughput Discovery of Robust Metal-Organic Frameworks for CO2 Capture

New high-throughput synthesis and screening technology is developed and employed to generate robust metal-organic frameworks (MOFs) for the efficient capture of CO2 from flue gas. MOFs represent a new class of porous materials holding great promise as solid sorbents capable of selectively binding CO2 with a minimal energy penalty for regeneration. Key to the material development is high-throughput measurement equipment to screen large quantities of materials for their separation performance.

Lawrence Berkeley National Laboratory..... AWARDEE **Booth 1118**
Christer Jansson
cgjansson@lbl.gov
Folium - Developing Tobacco as A Platform for Foliar Synthesis of High-Density Liquid Fuels

Lawrence Livermore National Laboratory..... AWARDEE **Booth 918**
Roger Aines
aines1@llnl.gov
www.llnl.gov
Encapsulated Solvents for Carbon Dioxide Capture
Many chemical reactions can be improved by speeding up the reaction rate between a gas and solvent. We encapsulate the solvent in thin-walled polymer spheres, greatly increasing the surface area and reactivity. These permit new low-cost carbon capture systems with low energy penalty and reduce corrosion, and can be used as micro-reactors with catalysts, solids, and adjustably reactive walls.

LLNL and Yardney..... AWARDEE **Booth 1019**
Todd M. Bandhauer
bandhauer1@llnl.gov
www.llnl.gov
Battery Management System with Distributed Wireless Sensors
LLNL and Yardney are partnering to develop and demonstrate a battery management system that utilizes distributed addressable wireless sensors to directly measure several key operating parameters of lithium ion cells within large battery packs that can serve as early indicators of the onset of thermal runaway and be used to control their operation. The wireless sensor communication system will allow multiple sensors to be applied to each cell. The team will utilize its combined expertise in battery, sensor, and wireless communication technology to develop a system that improves safety and reduces cost.

Los Alamos National Laboratory..... Booth 1140
Pulak Nath
www.lanl.gov
'Magnetic' Algae
By genetically engineering a gene from magnetotactic bacteria into model algae systems, we have produced 'magnetic' algae that are capable of producing intracellular magnetic particles and are susceptible to permanent magnet based separation. This can have various transformational impacts on the energy sector. First, we can use permanent magnet based separation of inherently 'magnetic' algae to provide a low operating cost, highly scalable option for large scale algae harvesting. Second, biosynthesis of magnetic nanoparticles by the 'magnetic' algae can become an energy efficient and green technology for a wide range of nanotechnology applications.

Makani Power ..... AWARDEE **Booth 438**

Damon Vander Lind
damon@makanipower.com
www.makanipower.com

Airborne Wind Turbine

The Makani Airborne Wind Turbine is a tethered wing that generates power by flying in large circles where the wind is stronger and more consistent. It eliminates 90% of the material used in conventional wind turbines, and can access winds both at higher altitudes and above deep waters offshore — resources that are currently untapped. Fewer materials and better energy generation result in a levelized cost of energy competitive with fossil fuels, without subsidies. Our goal is the utility-scale deployment of airborne turbines in onshore and offshore wind farms.

Massachusetts Insittute of Technology ..... AWARDEE **Booth 1132**

Gary DesGroseilliers
gjd@mit.edu
http://www.rle.mit.edu/per/

PowerChip: Advanced Technologies for Integrated Power Electronics

This research will improve the size, integration and performance of power electronics enabling a reduction in electrical energy consumption. We focus on co-optimizing advanced GaN semiconductor devices, microfabricated magnetics, and high-frequency circuit architectures to improve the interface between electric grid sources and loads. This work will address power electronics bottlenecks in the application of high-efficiency solid-state lighting.

Massachusetts Institute of Technology ..... AWARDEE **Booth 1027**

http://web.mit.edu/nanoengineering/research/storage.shtml

Metallic composites phase-change materials for high-temperature thermal energy storage

Solar energy is an infinite and free source of light and heat which can be used and stored for our energy needs. A large amount of heat can be stored in the form of latent heat. Our goal is to design novel materials with a large latent heat, able to store up to 5 MJ/kg or more. Furthermore to be able to quickly extract this stored heat, the material needs to have a large thermal conductivity as well. For these reasons, we are considering metallic alloys instead of traditionally used salts, as the phase change material.

Massachusetts Institute of Technology ..... AWARDEE **Booth 1026**

http://www.rle.mit.edu/micronano

Scalable, Self-Powered Purification Technology for Brackish and Heavy Metal-Contaminated Water

Massachusetts Institute of Technology (MIT) will develop a new water purification technique to desalinate water with high-salt content. This approach would also remove other contaminants such as metals and microorganisms. MIT's device would require less power than competing technologies and has important applications for mining, oil and gas production, and water treatment for remote locations.

Massachusetts Institute of Technology ..... AWARDEE **Booth 912**

T. Alan Hatton
tahatton@mit.edu
http://web.mit.edu/hatton-group/

Electrochemical Methods for CO2 Capture

There is strong motivation to develop energy-efficient technologies for post-combustion CO2 capture that are easy to apply to existing industrial processes. We have developed three different electrochemically-mediated systems: a facilitated transport across a membrane, a flow system, and an electrochemically-mediated amine regeneration. These technologies are electrically-driven, isothermal, and continuous. The first two processes take advantage of electrochemically switchable sorbents that selectively and reversibly bind CO2. The third uses copper for competitive binding to amines as a way to regenerate amine sorbents without using steam.

Massachusetts Institute of Technology ..... AWARDEE **Booth 1025**

Jeffrey C. Grossman
jcg@mit.edu
http://zeppola.mit.edu

HybriSol Hybrid nanostructures for high-energy-density solar thermal fuels

The HybriSol solar thermal fuels utilize a number of highly cyclable, photoswitchable molecules in combination with specific nanostructures to capture and store solar energy by rearranging chemical bonds for release as heat on-demand, regenerating the original material for immediate reuse. This is achieved by templating the molecules into densely packed configurations at the nanoscale to form liquids or solids not observed in nature. Solar thermal fuels have the advantages of other liquid fuels in that they can be transported, handled and stored readily, yet they can be readily recharged tens of thousands of times simply by exposure to sunlight.

Massachusetts Institute of Technology ..... AWARDEE **Booth 1041**

Leslie Bromberg
brom@psfc.mit.edu
http://www.psfc.mit.edu

Small and Efficient Reformer for Converting Natural Gas to Liquid Fuels

The Massachusetts Institute of Technology (MIT) will develop a small and efficient conversion system or reformer for natural gas. This reformer produces synthesis gas, which is the first step in converting natural gas to liquid fuels. Unlike other systems that are too large to be deployed remotely, MIT's reformer could be used for small, remote sources of gas, and uses conventional mass produced systems to minimize cost.

Massachusetts Institute of Technology–Stephanopoulos Lab ..... AWARDEE Booth 525

Ben Woolston
woolston@mit.edu
bamel.scripts.mit.edu/gns/

Bioprocess and Microbe Engineering for Total Carbon Utilization in Biofuel Production

MIT is using carbon dioxide (CO2) and hydrogen generated from electricity to produce natural oils that can be upgraded to hydrocarbon fuels. MIT has designed a 2-stage biofuel production system. In the first stage, hydrogen and CO2 are fed to a microorganism capable of converting these feedstocks to a 2-carbon compound called acetate. In the second stage, acetate is delivered to a different microorganism that can use the acetate to grow and produce oil. The oil can be removed from the reactor tank and chemically converted to various hydrocarbons.

Materials & Systems Research, Inc. ..... AWARDEE Booth 420

Joonho Koh
jkoh@msrihome.com

Advanced sodium batteries with enhanced safety and low cost processing

The sodium battery using beta-alumina solid electrolyte is one of the most promising grid-scale electrical energy storage technologies. Despite many advantages, the sodium batteries have several barriers for successful commercialization, mainly related to safety issues and high capital investment for installation. Materials & Systems Research, Inc. is developing a novel cell design for advanced sodium batteries to overcome these issues. The proposed cell design ensures greatly enhanced safety by using high strength materials for structural integrity. Significant cost reduction is also expected by using a simple, low-cost processing method.

Medical University of South Carolina - Marine Biomedicine & Environmental Science Center ..... AWARDEE Booth 937

Harold D. May
mayhmusc@gmail.com
http://academicdepartments.musc.edu/mbes/

Electroalcoholgenesis: Bioelectrochemical Reduction of CO2 to Butanol

This ARPA-E Electrofuel project has resulted in the development of a microbial electrosynthesis process that is generating unprecedented quantities of H2, methane and acetic acid from just water, electricity and CO2. Fast paced, visible streams of gas are produced when generating H2 or methane, and acetic acid unceasingly accumulates with ever increasing rates of production. Some of these chemicals can serve as fuels or be used to synthesize polymers or liquid fuels. This patent pending technology may one day harness sustainable electricity with freely available CO2 to revolutionize the way in which fuels and chemicals are synthesized.

MICHIGAN STATE UNIVERSITY

Michigan State University..... AWARDEE **Booth 1136**

Norbert Mueller
mueller@egr.msu.edu
www.msu.edu

Wave Disk Engine

The wave disk engine, a new shock wave combustion engine with high energy efficiency potential, is compact, easily manufacturable, low-cost, light-weight. Reducing losses, it has only one rotating part: the wave disk where internally confined combustion, shock wave energy transfer, and turbomachinery power extraction is realized. Applications include primary power generator, serial hybrid vehicles, portable power, back-up power, distributed power.

MICHIGAN STATE UNIVERSITY

Michigan State University..... AWARDEE **Booth 920**

Fang Z Peng
fzpeng@egr.msu.edu
www.msu.edu

Transformer-less Unified Power Flow Controller for Wind and Solar Power Transmission

Michigan State University (MSU) is developing a power flow controller to improve the routing of electricity from renewable sources through existing power lines. The fast, innovative, and lightweight circuitry that MSU is incorporating into its controller will eliminate the need for a separate heavy and expensive transformer, as well as the construction of new transmission lines. MSU's power flow controller can be installed anywhere in the existing grid to optimize energy transmission and help reduce transmission congestion.

MicroLink Devices, Inc.

MicroLink Devices..... AWARDEE **Booth 743**

David McCallum
dmccallum@mldevices.com
www.mldevices.com

High Efficiency, Lattice-Matched Solar Cells Using Epitaxial Lift-Off

We will develop a novel, high-efficiency, all-lattice-matched solar cell with much higher power conversion efficiency than is possible with current concentrator photovoltaic technologies. This will be accomplished with a triple-junction InAlAsSb/ InGaAsP/ InGaAs cell lattice-matched to InP. With the inclusion of strain-balanced quantum well layers in the bottom subcell, this structure has a subcell bandgap combination with the potential to achieve power conversion efficiency >50% under 500x illumination. The novel wide band-gap, InAlAsSb top junction is the key enabling technology for this proposal. The cost of the InP substrate will be mitigated using MicroLink's epitaxial lift-off process.

MIT/UC-Berkeley/UT-Austin/Ford ..... AWARDEE **Booth 1029**

Evelyn N. Wang
enwang@mit.edu
http://drl.mit.edu/research.cgi?p=storage

Advanced Thermo-Adsorptive Battery Climate Control System (ATB)

We are developing an advanced adsorption-based thermal battery for effective climate control of electric vehicles which have high cooling and heating storage, fast charging time, and negligible thermal self-discharge. Using materials with relatively high adsorption capacities at low relative pressures, the thermal battery design enhances heat and mass transfer to provide fast adsorption rates. Collectively, the innovations will result in a light weight and compact solution with increased thermal storage capacity and rates, which will offer new methods to provide cooling and heating to electric vehicles as well as residential and commercial buildings.

MTPV Power Corporation ..... **Booth 511**

David Mather
www.mtpv.com

MTPV (Micron-gap ThermalPhotoVoltaics)

MTPV (Micron-gap ThermalPhotovoltaics) 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.

N12 Technologies ..... **Booth 913**

Jeffrey Sabados
jsabados@n12technologies.com

Lightweight Multifunctional Composites

N12 Technologies, Inc is commercializing research conducted at MIT that increases z-axis strength of a composite by 300% with added conductivity. Our new material product called Nanostitch™ will reduce cost and weight in future composites by as much as 25% and add conductivity for multifunctional applications including de-icing, lightning strike protection and structural health monitoring.

National Renewable Energy Laboratory..... AWARDEE **Booth 613**

Nikos Kopidakis
Nikos.Kopidakis@nrel.gov
www.nrel.gov

Negating Energy Losses in OPV Using Photonic Structures

· New paradigm for Organic Photovoltaics based on a photonic principles
· Polymer-based, solution-processible devices
· Integrating photonic elements to the device using a lamination method
· Utilizing commercial, optimized active materials

National Renewable Energy Laboratory..... AWARDEE **Booth 611**

David Ginley
david.ginley@nrel.gov
www.nrel.gov

High Temp High Efficiency Solar-Thermoelectric Generators (STEG)

•New thermoelectric materials have dramatically increased the efficiency of direct heat to electricity conversion.
•Combined with concentrated solar irradiation this is a dramatic new solar conversion technology.
•Low cost materials, simple processing and scalability point to low cost per watt and rapid deployment.
•STEG represents a new deployment-ready technology
•Capable of exceeding SunShot goals
•Direct conversion or in hybrid solar thermal systems.
•Establish US leadership in new solar field

NAVITASMAX..... AWARDEE **Booth 1127**

Kelly Herbst
kcherbst@msn.com

Novel Tuning of Critical Fluctuations for Advanced Thermal Energy Storage

NAVITASMAX is developing a novel thermal energy storage solution. This innovative technology is based on tuning the properties of simple and complex fluids to increase their ability to store more heat. In solar thermal storage systems, heat can be stored in NAVITASMAX's system during the day and released at night—when the sun is not shining—to drive a turbine and produce electricity. In nuclear storage systems, heat can be stored in NAVITASMAX's system at night and released to produce electricity during daytime peak-demand hours.

Nextek Power Systems ..... **Booth 914**

Jeff Daudert
jeff.daudert@nextekpower.com
www.nextekpower.com

DC Microgrids

Nextek Power Systems, Inc. is a pioneer in direct current (DC) power systems for buildings. The Nextek Direct Coupling® power distribution platform delivers superior efficiency, flexibility, and reliability to interior electrical circuits and on-site power generation.

- Lowers overall power consumption
- Boosts on-site power generation efficiency by 10% to 50%
- Improves use of on-site stored power by 20% to 30%
- Adapts to changing interiors at zero change over cost
- Renders electrical circuits uninterruptible at low cost

North Carolina State University ..... AWARDEE **Booth 546**

Hydrogen-Dependent Conversion of Carbon Dioxide to Liquid Electrofuels By Extremely Thermophilic Archae

North Carolina State University ..... AWARDEE **Booth 641**

Heike Sederoff
hwsedero@ncsu.edu
http://www.cals.ncsu.edu/plantbiology/Faculty/hwintersederoff/sederoff.html

Jet Fuel from Camelina Sativa: A Systems Approach

Camelina is an excellent oil crop for biofuel production because it grows with little water and fertilizer on marginal land. Yield increases in camelina will be achieved by increasing photosynthetic CO2-fixation rates via a novel, synthetic CO2 fixation cycle. The increased assimilated CO2 is used to increase seed and oil yield and accumulation of modified oils (short-chain, saturated) and terpenes in the seeds for thermocatalytic conversion to JP5 and other aviation fuels.

Northeastern University..... AWARDEE **Booth 617**

Joel Bresler
j.bresler@neu.edu
www.northeastern.edu/nanomagnetism/research/supermagnets.html

Multiscale Development of L10 Materials for Rare-Earth-Free Permanent Magnets

Ultrastrong permanent magnets are key to the operation of emerging clean energy technologies with a total projected market that exceeds $20 billion by 2020. A very promising yet very high-risk strategy for realization of rare-earth-free permanent magnets is synthesis of the FeNi compound with the tetragonal L10 crystal structure known as "tetrataenite". This material only exists naturally in meteorites subjected to extremely slow cooling rates occurring over one billion years. Tetrataenite will be developed on earth through engineering on the atomic (10-10 m), nano- (10-9 m) and micron (10-6 m) scales to realize optimal properties.

NovaTorque Inc ..... **Booth 1243**

Emily Liggett
eliggett@novatorque.com
www.novatorque.com

Affordable High-Efficiency Electric Motors

NovaTorque develops and produces cost-effective, high-efficiency electric motors. Based on a patented conical-shaped rotor and stator geometry, the NovaTorque ferrite (non-rare-earth) permanent magnet motor delivers superior performance at a cost comparable to premium induction motors. The technology is proven, the market is validated, customers are engaged and our premium value has been confirmed. Customers have tested our products and put them into field trials. They confirm that NovaTorque motors save >30% wasted energy, with payback < 1 year.

Oak Ridge National Laboratory ..... AWARDEE **Booth 430**

Sheng Dai
dais@ornl.gov
http://www.ornl.gov

High Performance CO2 Scrubbing Based on Hollow Fiber-Suported Designer Ionic liquid Sponges

Ionic liquids are defined as compounds consisting of a cation, typically organic, and an anion, typically inorganic. These compounds boast a wide range of favorable properties, such as high thermal stability, wide electrochemical windows, and negligible vapor pressures. A binary mixture of an imidazolium-based ionic liquid and an organic superbase has been shown to reversibly capture carbon dioxide (CO2) using a temperature swing. With the inherent modularity of ionic liquids, a wide range of desorption temperatures have been achieved (~70 C - 120 C), in addition to removing the necessity for use of water as a solvent (i.e. aqueous MEA).

Oak Ridge National Laboratory ..... AWARDEE **Booth 1226**

http://www.ornl.gov

Magnetic Amplifier for Power Flow Control

This project combines the concept of magnetic amplifier with power electronics technology to develop a prototype of a new type of controller for electric power flows. The controller can be thought of as magnetic valve for power lines in which a small dc current controlled by power electronics at low voltage level controls a much larger ac current in the power line at transmission level voltages. This combination of a proven concept with new technology in one device is simple, reliable, cost-effective, and easy to maintain. The expected device cost will allow for system-wide deployment and comprehensive power flow control.

Oak Ridge National Laboratory ..... AWARDEE **Booth 1225**

Hsin Wang
wangh2@ornl.gov
www.ornl.gov

Temperature Self-regulation for Large Format Li-ion Cells

The main obstacles for wide applications of Li-ion batteries can be traced back to lack of effective temperature control and high cost of thermal management as temperature. Today's large format Li-ion cells designs do not allow effective temperature control due to the fact that cell surfaces are used for cooling and heat is extracted along the thickness of the cell that has very poor thermal conductivity. Our project is focusing on a novel design modification of Li-ion cells that provides temperature control and heat extraction from the in-plane direction.

Ohio State University ..... AWARDEE **Booth 819**

Andrew Tong
tong.48@osu.edu
http://arpa-e.energy.gov/ProgramsProjects/OtherProjects/CarbonCapture/PilotScaleTestingofCarbonNegativeProductFl.aspx

Pilot Scale Testing of Carbon Negative, Product Flexible Syngas Chemical Looping

The syngas chemical looping (SCL) process can efficiently convert coal into electricity, hydrogen, and/or liquid fuel with zero CO2 emission. The SCL process has been successfully demonstrated at 2.5 kWth bench and 25 kWth sub-pilot scales with a combined operation of over 500 hours achieving >99.99% pure hydrogen generation with 100% carbon capture. The current work focuses on the design, construction, and demonstration of an integrated, pressurized 250 kWth pilot-scale unit to be constructed at the National Carbon Capture Center (NCCC). The project goal is to demonstrate the feasibility of this technology and address any technical barriers for its commercialization.

Ohio State University ..... AWARDEE **Booth 817**

Shang-Tian Yang
yang.15@osu.edu
http://microbiology.osu.edu/faculty/tabita-f-robert

Carbon Dioxide to Biofuels by Facultatively Autotrophic Hydrogen Bacteria

We have engineered hydrogen bacteria with improved CBB for CO2 fixation and expressing an exogenous butanol biosynthesis pathway to produce butanol from CO2 and H2 without light in a novel scalable biofilm reactor. The butanol produced in the fermentation can be recovered and purified by gas stripping and pervaporation with an energy input less than 20% of the conventional distillation process. This process is promising for producing butanol as an advanced biofuel from syngas and flue gas containing CO2, CO and H2. This technology is available for further commercial development and scale up.

OPX Biotechnologies, Inc. ..... AWARDEE **Booth 318**

Joanna Money
jmoney@opxbio.com
www.opxbio.com

Novel Biological conversion of Hydrogen and Carbon Dioxide into Diesel

OPX Biotechnologies is developing an industrially relevant microorganism and a bioprocess to produce a liquid fuel from hydrogen (H2) and carbon dioxide (CO2). The microorganism has the natural ability to consume H2 and CO2 as its sole sources of energy and carbon, respectively. OPXBIO is engineering the microorganism to divert energy and carbon away from central carbon metabolism and towards the production of liquid fuels in viable commercial quantities. The microorganism will produce a fuel precursor that is then chemically upgraded to green diesel or green jet fuel.

Oregon State University ..... AWARDEE **Booth 714**

Chris L Hagen
chris.hagen@oregonstate.edu
www.oregonstate.edu

Natural Gas Vehicle Self-Contained Home Filling Station

OSU is modifying a passenger vehicle to allow its internal combustion engine to be used to compress natural gas for storage on board the vehicle. Ordinarily, filling a CNG vehicle with natural gas would involve driving to a natural gas refueling station or buying an expensive stand-alone station for home use. OSU's design would allow natural gas compression to take place in a single cylinder of the engine itself, allowing the actual car to behave like a natural gas refueling station.

Otherlab ..... AWARDEE **Booth 737**

Tucker Gilman
tucker@otherlab.com
www.otherlab.com

Safe, Dense, Conformal, Gas Intestine Storage

To solve persistent volumetric and energy density issues associated with vehicular natural gas storage we propose a compressed gas storage tank modeled after the human intestine. In the design of a cylindrical tank the ratio of the tank mass to the mass of the contained gas is not dependent on tank geometry. The mass of the material used, and thus the bulk material cost is constant for a given pressure and material yield stress. With no penalty paid (in material cost or packing density) for moving to small diameter tubes we gain significant freedom in fitting into arbitrary shapes.

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Pacific Northwest National Laboratory ..... AWARDEE Booth 1112

Praveen Thallapally
praveen.thallapally@pnnl.gov

Electric-Powered Adsorption Heat Pump for Electric Vehicles

The thermodynamic cycle for adsorption cooling uses heat to desorb refrigerant, which is then condensed and pumped through a conventional evaporator to provide cooling load. Over the past few years, we at PNNL have been engaged in developing a new class of sorbents called metal organic frameworks for heating and cooling applications. The objective of this proof-of-concept project is to develop and demonstrate a new class of metal-organic frameworks (MOFs) that can be regenerated electrically (conducting MOFs, con-MOFs), thus providing a new electric power driven thermodynamic cycle upon which a heat pump for electric vehicles can be developed.

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Pacific Northwest National Laboratory ..... AWARDEE Booth 1211

Ewa Ronnebro
ewa.ronnebro@pnnl.gov
www.pnnl.gov

Reversible Metal Hydride Thermal Storage for High Temperature Power Generation Systems

PNNL is developing a thermal energy storage system based on a Reversible Metal Hydride Thermochemical (RMHT) system, which uses metal hydride as a heat storage material. In solar thermal storage systems, heat can be stored in these materials during the day and released at night to produce electricity. PNNL's metal hydride material can reversibly store large amounts of heat of 200kWh/m3 as hydrogen cycles in and out of the material, operating at 650°C under ambient pressures. The low-cost material and simplicity of PNNL's thermal energy storage system is expected to keep costs down.

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Pacific Northwest National Laboratory ..... AWARDEE Booth 1114

Jun Cui
jun.cui@pnnl.gov
www.pnnl.gov

Manganese-Based Permanent Magnet with 40 MGOe at 200 °C

Manganese-Bismuth-IronCobalt (MnBi-FeCo) is a novel magnet promising 40 MGOe at 200°C. It represents 2X improvement compared to the state of the art NdDyFeB magnet at high temperature. The superior performance is achieved by combining two low-cost materials, MnBi and FeCo at nano-scale. PNNL has assembled a team with complementary skills in combinatorial materials development, modeling, physics of magnetic materials, magnet manufacturing, and design of wind-turbine generator to answer the challenges of materials synthesis and bulk magnet fabrication development, as well as to evaluate the economical and technical impact of the new magnet technology.

PARC, a Xerox company ..... AWARDEE **Booth 818**

Sean Garner
sean.garner@parc.com
http://www.parc.com

Printed Integral Batteries

PARC has developed a process that uses co-extrusion printing to simultaneously lower the cost of production and improve the resulting performance of batteries. Co-extrusion is a low-cost manufacturing process that prints different materials together but keeps them from mixing. This fundamentally new process optimizes battery performance; batteries with co-extruded structured electrodes have shown increased energy densities of 20%. PARC will extend its research for co-extrusion printing to all three functional layers of a battery at one time to create a Printed Integral Battery. The technology will be a powerful driver for increased battery adoption.

PARC, a Xerox company ..... AWARDEE **Booth 820**

Ajay Raghavan
ajay.raghavan@parc.com
http://www.parc.com/services/focus-area/adaptive-energy/

SENSOR: Smart Embedded Network of Sensors with Optical Readout

PARC and LG Chem Power (LGCPI) are developing an optically-based, smart monitoring system prototype for electric vehicle (EV) batteries. The system will use PARC's compact wavelength-shift detection technology and machine learning/sensor network expertise to enable effective, real-time performance management and optimized battery design. Significantly improving performance and reducing costs of next-generation energy storage technologies, capabilities will range from inferring state and health information to predicting remaining life. The resulting commercial EV-grade battery module with embedded optical sensors and readout will undergo industry-standard validation at LGCPI's facilities.

Penn State & U. Kentucky..... AWARDEE **Booth 1210**

Wayne R. Curtis
wrc2@psu.edu
http://www.curtislab.org/research-projects/arpa-electrofuels

The Development of Rhodobacter as a Versatile Platform for Fuels Production

C30 hydrocarbon synthesis has been engineered into Rhodobacter. Optimization of expression ongoing. Multiplexed small scale bioreactors are being used for screening autotrophic productivity performance. Evaluations of kinetics to perform economic analysis including autotrophic chemostats for growth yield and maintenance. Pilot scale bioreactor for high gas transfer at minimum power input is undergoing testing.

Penn State Applied Research Lab ..... AWARDEE Booth 1123

Matthew Poese, Ph. D.
poese@psu.edu
http://www.arl.psu.edu/

Trillium: A Helium-Based Sonic Chiller - Tons of Freezing with 0 GWP Refrigerants

A leader in the development and commercialization of thermoacoustic technology, the team at Penn State's Applied Research Lab is prototyping a new design for a thermoacoustic freezer called Trillium that has improved efficiency and significantly reduced Total Environmental Warming Impact (TEWI) compared to the state-of-the-shelf. The goal of the project is to work with potential sub-system manufacturers to establish processes and competence so that an integrator will be ready to build Trillium-based machines by the end of the project.

Plant Sensory Systems..... AWARDEE Booth 1129

Frank Turano
fturano@plant-ss.com
www.plantsensorysystems.com

Development of High-Output, Low-Input Energy Beets

Plant Sensory Systems is developing an enhanced energy (sugar) beet, optimized for biofuel production. The newly engineered beets will contain a gene construct that is expected to produce larger beets that use fertilizer and water more efficiently and that produce higher levels of fermentable sugars compared to current feedstocks. The new beet crop will have lower production costs and increased yield for biofuels without competing against food-grade sugar. Other benefits include decreased energy requirements and pollution emissions. The proposed technology could easily be transferred into other feedstocks (sweet sorghum, sugar cane) with expected similar results.

PolyPlus Battery Company..... AWARDEE Booth 537

Steven J. Visco
svisco@polyplus.com
www.polyplus.com

Development of Ultra-High Specific Energy Rechargeable Lithium-Air Batteries Based On Protected Lithium Metal Electrodes

PolyPlus is developing the world's first commercially available rechargeable Li-air battery. Li-air batteries, which store nearly 700% as much energy as traditional Li-ion batteries used in most EVs today, employ atmospheric air as an active material, greatly decreasing weight. A lighter battery would improve the range of EVs dramatically. PolyPlus has made a critical breakthrough: the first manufacturable protective membrane between its lithium–based negative electrode and the oxygen (from air) reaction chamber. Until now, engineers had been unable to create the complex packaging and air-breathing components required to turn Li-air batteries into rechargeable systems.

Porifera ..... AWARDEE **Booth 423**

Jeffrey Mendelssohn
jeffrey.m@poriferanano.com
www.poriferanano.com

Advanced Membrane Technology for Water Treatment, Desalination, and Re-Use

Porifera is a startup company developing advanced membranes with a commercial focus on water treatment, desalination and re-use. Porifera's first product is a high performance forward osmosis membrane. Porifera is also engaged in the development of carbon nanotube membranes with a commercial focus on ultrafiltration applications. Porifera's membranes are unique in that their performance is up to an order of magnitude better--in terms of flux, rejection, and propensity to foul than conventional membranes resulting in significant energy savings. Porifera is currently engaged in leveraging its new membranes in the development of portable, energy efficient desalination and water reuse systems.

Power Partners, Inc. ..... AWARDEE **Booth 1213**

Praveen Thallapally
praveen.thallapally@pnnl.gov
www.eco-maxchillers.com

High Efficiency Adsorption Chilling Using Novel Metal Organic Heat Carriers

Adsorption cooling technology is an established alternative to mechanical vapor compression refrigeration systems. Adsorption-based refrigeration systems have several advantages including few moving parts, reducing vibration and lubrication requirements, and scalability to refrigeration load from a few watts to several kilowatts. Key disadvantages include large thermal mass, bulkiness, complex controls, and low COP (0.2-0.5). These disadvantages arise mostly from thermophysical property limitations of adsorbent-refrigerant combinations presently available.

Pratt & Whitney Rocketdyne

Pratt & Whitney Rocketdyne..... AWARDEE **Booth 338**

http://www.pw.utc.com/Power_Propulsion_and_Optimization

Continuous Detonation Engine Combustor for Natural Gas Turbine

Continuous detonation combustion has several theoretical advantages over the constant pressure combustion used in gas turbine engines:

1. Continuous detonation is a more efficient combustion process,

2. Continuous detonation produces a pressure rise during combustion, and

3.The extremely short combustion time potentially limits NOx emissions.

PWR will design and build continuous detonation combustors and test them in a simulated gas turbine environment to establish the feasibility of incorporating the technology into natural gas-fueled gas turbine electric power generators. Continuous detonation technology is expected to save commercial-scale power plants $5 million annually in operating expenses per turbine.

Pratt & Whitney Rocketdyne

Pratt & Whitney Rocketdyne ..... AWARDEE **Booth 340**

http://www.pw.utc.com/Power_Propulsion_and_Optimization

Ultra High-Temperature Gas Turbine Cycle

Pratt & Whitney Rocketdyne will develop a high efficiency gas turbine by using pure oxygen, instead of air, to burn fuel, creating ultra-high temperatures. To prevent melting, Pratt & Whitney Rocketdyne will apply their expertise in liquid rocket engines to develop advanced cooling technology. This cycle has the potential to reduce the fuel used to power natural gas turbines by as much as 50%.

Pratt & Whitney Rocketdyne

Pratt & Whitney Rocketdyne ..... AWARDEE **Booth 336**

http://www.pw.utc.com/Power_Propulsion_and_Optimization

Turbo-POx For Ultra Low-Cost Gasoline

Pratt & Whitney Rocketdyne will develop a system to improve the conversion of natural gas to liquid fuels. 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, generating electricity in the process.

Protean Electric ..... **Booth 329**

Ken Stewart

ken.stewart@proteanelectric.com

www.proteanelectric.com

Protean Electric

Protean Electric is an award-winning global supplier of in-wheel electric drive technology that will enable the wide-spread transformation of the global auto industry from the petroleum era to the hybrid/electric era. Protean's system can provide more power, better fuel economy, easier integration, and lower cost to new and existing vehicles. Protean Drive™ offers advantages to front-, rear- or four-wheel drive vehicles that run on gas, diesel or gaseous fuels such as CNG. The Protean system can even become a common system used for hybrid, plug-in hybrid and electric vehicle applications across a wide range of light-duty vehicles.

Proton OnSite ..... AWARDEE **Booth 1023**

Dr. Katherine Ayers

kayers@protononsite.com

www.protononsite.com

Novel Regenerative Fuel Cells based on Anion Exchange Membranes for Affordable Renewable Energy Storage

Proton OnSite manufactures membrane-based electrolyzers which can take water and excess renewable energy to generate hydrogen and oxygen, which can then be stored and used in a fuel cell to generate power during periods of low renewable input. This technology is highly scalable from scales of watts to hundreds of kilowatts. The hydrogen and oxygen are separated by an ion exchange membrane which acts as the electrolyte, enabling pure water as the circulating fluid. Acidic membrane systems are well established commercially, but require expensive catalysts. In this project, Proton is developing basic membrane-based systems, which enable low cost materials.

QM POWER

QM Power ..... AWARDEE **Booth 1212**

PJ Piper
pjpiper@qmpower.com
www.qmpower.com

Advanced Electric Vehicle Motors with Low or No Rare Earth Content

QM Power is commercializing proprietary and patented new advances in high performance electric motor, generator and actuator technologies. QM Power's breakthrough QSync™, Parallel Path Magnetic Technology™ (PPMT™) and QSR™ technologies use novel yet simple and efficient magnetic and controller designs to substantially reduce cost and improve performance for today's Commercial Refrigeration, HVAC, Industrial, Electric and Hybrid Electric Vehicle, Robotics, Renewable and Non-Renewable Power Generation and Military applications. QM Power products are more reliable, lighter, smaller, competitively priced, do not require rare earth magnets and operate far more efficiently over a wider range of operating conditions.

REL

REL, Inc...... AWARDEE **Booth 527**

www.relinc.net

Fully and Intricately Conformable, Single-Piece, Mass-Manufacturable High-Pressure Gas Storage Tanks

REL is developing a low-cost, conformable natural gas tank for light-duty vehicles that contains an internal structural cellular core. Traditional natural gas storage tanks are cylindrical and rigid. REL is exploring various materials that could be used to design a gas tank's internal structure that could allow the tank to be any shape. The REL team is exploring various methods of manufacturing the interconnected core structure and the tank skin to identify which combination best meets their target pressure-containment objectives. REL's conformable internal core would enable higher storage capacity than current carbon fiber-based tanks at 70% less cost.

BOSCH
Invented for life

Research and Technology Center, Robert Bosch LLC ..... AWARDEE **Booth 1043**

Nalin Chaturvedi
Nalin.Chaturvedi@us.bosch.com
http://www.bosch.us/content/language1/html/rtc.htm

Advanced Battery Management System

We aim to develop a novel battery management system (BMS) to achieve a cost reduction of 25% and charge rate that is twice that of state-of-the art charging. Rather than relying upon conventional current, voltage, and temperature measurements, our approach uses estimations of immeasurable internal states to impose more appropriate constraints on battery operation, thus pushing the envelope on charging rates and battery utilization while maintaining battery safety and longevity. We use model-based techniques to design an adaptive BMS that allows fuller utilization of batteries and safer operation in less expensive designs by increasing the usable capacity of the battery.

turning knowledge into practice

RTI International ..... AWARDEE **Booth 425**

Luke Coleman
lcoleman@rti.org

http://www.rti.org/page.cfm/Energy_Research

Novel Non-Aqueous CO2 Solvent-based Capture Process with Substanially Reduced Energy Penalties

RTI and BASF are developing a novel non-aqueous solvent CO2 capture process as a means of reducing the cost associated with removing CO2 from power plant exhaust gas by reducing the amount of energy consumed and the building and operating the plant. The proposed non-aqueous solvent CO2 capture process has the potential to reduce the energy penalty to < 2 GJ/tonne CO2, a 40% reduction compared to conventional, aqueous amine-based solvent processes. Furthermore, this novel CO2 capture technology has the potential to reduce the ICOE to < 50% with a cost of CO2 avoided ≤ $45/tonne.

RTI International ..... AWARDEE **Booth 427**

David C. Dayton
ddayton@rti.org

http://www.rti.org/page.cfm/Biomass_and_Biofuels

Catalytic Bio-crude Production in a Novel, Short Residence Time Reactor

This transformational R&D project is focused on developing a novel single-step catalytic biomass pyrolysis process with high carbon conversion efficiency to produce stable bio-crude with low oxygen content (<20%). A synergistic effort in both catalyst development and process development has identified a highly active and selective catalyst. Laboratory engineering data from proof-of-concept R&D has supported the development of a 1 ton/day catalytic biomass pyrolysis system. Optimal process integration should yield a hydrocarbon intermediate that can be easily upgraded to fuels using conventional petroleum refining technology providing an economically attractive option for advanced biofuels production.

S-RAM Dynamics ..... **Booth 711**

Lee Jestings
lee@S-Ram.com

www.S-RAM.com

S-RAM variable capacity CO2 regenerative expander/compressor for heat pump and waste heat applications

The S-RAM Regenerative expander/compressor will have a transformational impact on the CO2 HVAC-R and waste heat-to-power markets. The S-RAM Regenerative expander/compressor can simultaneously adjust compression and expansion ratios while maintaining a fixed clearance, independent of speed, not possible with other devices. The S-RAM CO2 regenerative heat pump will improve system efficiencies by at 30% to 50% resulting in substantial energy savings and accelerated adoption of natural refrigerants (CO2). This device will have immediate market applications in commercial and industrial HVAC-R applications. The S-RAM heat engine will outperform current Organic Rankine systems.

Sandia National Laboratories ..... AWARDEE **Booth 1216**

http://energy.sandia.gov

Improved Power System Operations Using Advanced Stochastic Optimization

Sea Engineering, Inc. ..... AWARDEE **Booth 232**

Craig Jones

cjones@seaengineering.com

http://www.seaengineering.com

Cost Effective Real Time Wave Assessment Tool

Wave energy is the most abundant form of hydrokinetic energy; however, there is a critical need to obtain site-specific wave conditions to implement successful wave energy converter (WEC) facilities. Sea Engineering, Inc. will develop an ocean wave buoy that will measure and wirelessly relay real-time wave data at a fraction of the cost of current off-the-shelf technologies. This device will more effectively assess the optimal locations and designs for WEC systems and could be used to optimize the performance of WEC systems in real time. If successful, this system will enable more efficient and cost-effective ocean energy systems.

Sheetak Inc. ..... AWARDEE **Booth 1013**

www.sheetak.com

Thermoelectric Reactors for Efficient Automotive Thermal Storage (TREATS)

Sheetak has developed a low cost, high efficiency thermoelectric heat pump utilizing thin film semiconductor manufacturing technology. Sheetak's nanostructured TE products are meant to address the macro scale applications such as home and automotive HVAC systems as well as efficient energy generators. Furthermore, Sheetak has developed a breakthrough system technology that utilizes its novel thermoelectrics products to create extremely efficient engines to address the heat pumps, refrigeration and modular energy generation. These products can achieve performance higher than traditional mechanical engines and compressors and contain no moving parts.

Sheetak Inc. ..... AWARDEE **Booth 1011**

Himanshu Pokharna

pokharna@sheetak.com

www.sheetak.com

Efficient Solid State Energy Converters

Sheetak has developed a low cost, high efficiency thermoelectric heat pump utilizing thin film semiconductor manufacturing technology. Sheetak's nanostructured TE products are meant to address the macro scale applications such as home and automotive HVAC systems as well as efficient energy generators. Furthermore, Sheetak has developed a breakthrough system technology that utilizes its novel thermoelectrics products to create extremely efficient engines to address the heat pumps, refrigeration and modular energy generation. These products can achieve performance higher than traditional mechanical engines and compressors and contain no moving parts.

Silicon Power Corporation ..... AWARDEE **Booth 928**

David Syracuse
david_syracuse@siliconpower.com
www.siliconpower.com

Optically-Switched, 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.

Simbol Materials ..... **Booth 843**

Paul Gutwald
pgutwald@simbolinc.com
http://www.simbolmaterials.com/

Using Geothermal Energy to Produce Specialty Materials

Simbol Materials is changing the way our world is made with sustainable, high quality specialty materials for longer-lasting batteries, stronger, lighter steels and improved agricultural yields, all produced by leveraging renewable energy.

SLAC National Accelerator Laboratory ..... **Booth 514**

Mark Hartney
mhartney@slac.stanford.edu
http://slac.stanford.edu/

SLAC National Laboratory - Battery Diagnostics with X-ray Microscopy

Our x-ray microscopy technology allows monitoring lithium batteries during operation to observe chemical and structural changes over charge discharge cycles. Additional techinques follow structural changes, phase transformation, and side reaction products. These techniques are useful for understanding new battery chemistry, reliability, and as a verification of battery management programs which often rely on model assumptions and electrical measurements to understand life cycle, state of charging and safety margins for operation. The techniques have been applied to Li-S and Li-air batteries in addition to conventional Li ion cells.

Smart Wire Grid, Inc. ..... AWARDEE **Booth 1024**

Jerry Melcher
Jerry.Melcher@smartwiregrid.com
www.smartwiregrid.com

Distributed Power Flows Using Smart Wires for Energy Routin

Smart Wire Grid's devices offer utilities cost effective power flow control for the grid, simple and reliable alternative to conventional technologies and traditional FACTS devices. Smart Wires converts the existing transmission system to a "Smart Asset" that can bring extensive monitoring capability, regulate power flow and effectively shift excess power to under-utilized portions of the network. Using the technology, standard transmission lines will be augmented with a number of Distributed Series Reactors (DSRs) that are directly fixed onto the conductor. Each DSR on a line is designed to be autonomously switched on at a particular current level.

SolarBridge Technologies, Inc. ..... AWARDEE **Booth 646**

Patrick Chapman
p.chapman@solarbridgetech.com
http://www.solarbridgetech.com

Scalable Submodule Power Conversion Methods for Power Density, Efficiency, Performance, and Protection Leaps in Utility-scale Photovoltaics

SolarBridge is developing a new technology, known as differential power processing (DPP), for increasing energy harvest from large-scale solar arrays. The proprietary DPP technique, jointly developed with the University of Illinois, involves submodule power conversion. In effect, the DPP power converter corrects for mismatches between PV modules. It differs from prior technology in that the power converter can be rated only for the mismatch power, rather than the power of the entire module. As such, the approach is more cost effective. Prototypes have been developed and are now testing.

Soraa, Inc. ..... AWARDEE **Booth 519**

Mark P. D'Evelyn
mdevelyn@soraa.com
www.soraa.com

Ammonothermal Bulk GaN Crystal Growth for Energy Efficient Lighting

A new, scalable method has been developed for cost-effective manufacturing of bulk gallium nitride (GaN) substrates. We have demonstrated 2-inch crack-free GaN crystals and 100x lower defect densities than conventional bulk GaN substrates. The new substrates, once commercialized, will enable significant cost reductions in GaN-on-GaN™ light-emitting diodes (LEDs) plus new generations of laser diodes for full-color displays and of high performance electronics. These applications represent markets of more than $50 billion per year and have the potential to reduce electricity consumption in the United States by 30% or more.

Southwest Research Institute ..... AWARDEE **Booth 531**

Jeff Xu
jeff.xu@swri.org
www.swri.org

Novel SOC and SOH Estimation through Sensor Technology

The technology is to identify an innovative and online sensing technology to be able to detect the lithium-ion battery state of charge (SOC) and the state of health (SOH) through strain-gauge-based model and control algorithms. Mathematical formulations that can accurately define the correlation between strain versus SOC/SOH will be transferred into a representation appropriate for in-vehicle control system development.

Space Coast Energy Consortium, Inc.....Booth 417

Michael Aller
michael.aller@spacecoastenergy.org
www.spacecoastenergy.org

Aerospace-Derived Collapsible Truss for Portable Solar Power Generation

Space Coast Energy Consortium is helping foster a new "innovation ecosystem" in Florida focused on energy-related products and services. SCEC is assisting companies including CPI Technologies to adapt Florida's aerospace-related engineering capabilities to the energy sector. CPI Technologies' Aptus retractable solar arrays are a transportable system derived from the US Space program. Based on a unique retractable truss, Aptus is a modular, plug-n-play photovoltaic system ideal for military and civilian rapid deployment applications, including remote micro-grids, disaster relief, humanitarian aid and utility-scale solar farms. Aptus' design gives it an edge over similar systems, enabling dual-use for on-grid and off-grid applications.

SRI International

SRI International..... AWARDEE Booth 719

Marc Hornbostel
marc.hornbostel@sri.com
www.sri.com

Containerless Natural Gas Storage

SRI International is developing a conformable, low-pressure and "containerless" natural gas storage system for vehicular applications. Using carbon sorbent developed by ATMI Inc., SRI's adsorbed natural gas storage tanks can be cast into various shapes and have enough structural strength to eliminate the need for an external tank. The solid sorbent has a high surface area and no dead space, resulting in low-pressure storage at high energy densities. Coolant can be placed in direct contact with the high thermal conductivity sorbent, providing enhanced thermal management and enabling rapid charge/discharge. This project leverages research to develop cost-effective carbon capture technology.

Stanford | Energy Behavior Initiative

Stanford University..... AWARDEE Booth 943

June Flora
jflora@stanford.edu
http://peec.stanford.edu

Large-Scale Energy Reductions through Sensors, Feedback, & Information Technology

Stanford University's energy behavior initiative aims for widespread energy savings by leveraging sensors, like smart meters, with behavioral approaches. Our approach draws from fields of behavioral sciences, computer sciences, engineering and product design to take advantage of internet technology and increasingly pervasive low-cost sensors. Over twenty research projects are being conducted to create a transformative system that enables highly personalized energy-saving recommendations via games, Facebook apps, appliance calculators and community programs like Girl Scout troops. Interventions are underpinned by an energy services platform, smart meter data algorithms, high resolution data sets allowing appliance disaggregration algorithms and energy behavior data.

Sun Catalytix Corporation ..... AWARDEE **Booth 614**

Thomas Jarvi
tjarvi@suncatalytix.com
http://www.suncatalytix.com/

Affordable Energy from Water and Sunlight

Sun Catalytix Corporation has been developing solar energy capture, conversion and storage technology with support from ARPA-E. Early work within its ARPA-E program focused on solar powered water electrolysis as a means of converting and storing solar energy. More recent work has further integrated solar capture materials and directly coupled catalysts with light-absorbing semiconductors to achieve coincident capture and conversion processes. This ARPA-E supported work has also inspired the development of new electrical energy storage systems based on advanced inorganic electrochemical couples. Sun Catalytix will discuss the results of its ARPA-E program and the related technologies under development.

Sustainable Energy Solutions..... AWARDEE **Booth 1138**

Larry Baker
larrybaker@sustainablees.com
www.sustainablees.com

Cryogenic Carbon Capture

Cryogenci Carbon Capture separates CO2 from light gases such as flue gases and pressurizes them to pipeline conditions with much higher energy efficiency and at lower cost than the leading alternatives. This bolt-on technology requires essentially no modification to the existing facility. The process also removes many pollutants, including SOx and Hg, and consumes far less water. The process enables highly efficient and rapidly responding energy storage at rates of 15-25% of the boiler capacity. The process has been through external review and laboratory and bench-scale testing and is now in skid-scale development. This presentation summarizes its current status.

TCA Team ..... AWARDEE **Booth 1234**

Pablo A. Ruiz
paruiz@ieee.org
n/a

Transmission Topology Control for Infrastructure Resilience to the Integration of Renewable Generation

The CRA team is developing control technology to help grid operators more actively manage power flows and integrate renewables by optimally turning on and off power lines in coordination with traditional control of generation and load resources. The control technology being developed would provide grid operators with tools to help manage transmission congestion by identifying the facilities whose on/off status must change to lower generation costs, increase utilization of renewable resources and improve system reliability. The technology is based on fast optimization algorithms for the near to real-time change in the on/off status of transmission facilities and their software implementation.

Teknatool USA Incorporated ..... Booth 1045

Colin Leonard

www.dvr-motor.com

DVR Motors provide intelligent and energy efficient transformational technologies to industry

Teknatool USA Inc is based in Florida, making highly energy efficient and intelligent motor and generator technologies. This proprietary intelligent motor technology is produced under the DVR brand. These DVR motors ('digital variable reluctance') are a 'next generation' computerized, green motor (also can be used as a generator) These motors can be supplied as OEM - designed and built into equipment, or can be supplied as a standard frame 'package drive' - that can be bolted onto existing equipment. This transformational technology is expanding motor application and control functionality well beyond what has been traditionally available to industry.

Teledyne Scientific & Imaging, LLC ..... AWARDEE Booth 1128

SUNG-YONG PARK

spark@teledyne-si.com

http://www.teledyne-si.com/

Optofluidic Solar Concentrators

Teledyne is developing a liquid prism panel that tracks the sun's position to help efficiently concentrate onto a solar cell to produce power. Typically, solar tracking devices have bulky and expensive mechanical moving parts that require lots of power and are often unreliable. Teledyne's liquid prism panel has no bulky and heavy supporting parts. Instead it is implemented by electrowetting that adaptively tunes the prism apex angle to steer incident sunlight and focus onto the CPV cell. This process uses very little power and requires no expensive mechanical moving parts, enabling efficient and quiet residential or building rooftop operation.

Texas A&M Engineering Experiment Station ..... AWARDEE Booth 1232

http://smartgridcenter.tamu.edu/ratc/

Robust Adaptive Topology Control (RATC)

RATC uses active topology control as a mechanism to improve system operations and manage disruptions within the electric grid and to manage intermittent renewable sources. 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 will help prevent future power outages, which account for roughly $80 billion in losses for businesses and consumers each year.

Texas A&M Engineering Experiment Station (TEES) ..... AWARDEE **Booth 1142**

Matt Koch
mattkoch@tees.tamus.edu

N/A

Electricity Generation from Waste Heat using a Metal Hydride Cycle

Texas A&M Engineering Experiment Station (TEES) in San Antonio, TX will develop and demonstrate a system to generate electricity from low-temperature waste heat. The system would cycle 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. The technology at the core of the system is being developed by TEES' partner ERRA/Ergenics in Ringwood, NJ.

Texas A&M University ..... AWARDEE **Booth 424**

Trevor Makal
tmakal@chem.tamu.edu

http://www.chem.tamu.edu/rgroup/zhou/

System Development for Vehicular Natural Gas Storage Using Advanced Porous Materials

The project is a multi-organization and multi-disciplinary effort aimed at developing and demonstrating vehicular on-board storage of natural gas (NG) using improved porous sorbents guided by computational studies. In particular, metal-organic frameworks (MOFs) and porous polymer networks (PPNs) will be investigated for their applicability as sorbents for methane storage, due to exceptionally high surface areas and gas sorptive properties. During the densification process, binders, fillers, and other aspects of the process will be analyzed along with the porous materials to study the heat transfer properties and initiate studies involving thermal management systems to be included in ANG fuel tank technologies.

Texas A&M University & framergy.....**Booth 413**

Hongcai Zhou

http://www.framergy.com/

Stimuli-Responsive Metal-Organic Frameworks for Energy-Efficient Post-Combustion Carbon Dioxide Capture (ARRA)

The goal of our work is to develop innovative metal-organic framework (MOF) based molecular sieves whose adsorption/desorption properties can be finely tuned by controlling their mesh size for energy-efficient post-combustion CO2 capture thus reducing CCS costs. We are developing materials that significantly reduce capture costs by: 1) improving the CO2/N2 selectivity with high CO2 loading, 2) achieving one-pot separation of CO2 from other components of flue gases (N2, H2O, SO2) in an unprecedented manner, 3) lowering the regeneration cost by their unique temperature-responsive molecular sieving properties, and 4) introducing stimuli-responsive properties, such as sorbent regeneration by exposure to sunlight.

Texas A&M University/
Texas Agrilife Research ..... AWARDEE **Booth 1238**

Joshua S. Yuan
syuan@tamu.edu
http://people.tamu.edu/~syuan

Synthetic Crop for Direct Biofuel Production through Re-routing the Photosynthesis Intermediates and Engineering Terpenoid Pathways

The project aims to develop synthetic biofuel feedstock with high yields of terpene hydrocarbon through the unique combination of novel carbon channeling pathways, storage strategy design, and feedstock development. Within a short time-frame, we have developed several potentially transformative technologies including re-channeling waste carbon into hydrocarbon biofuel, unique intracellular organelle to store the fuel products, and engineering strategy for Arundo donax as novel biofuel feedstock. These technologies are enabling the novel and commercially viable synthetic crop for direct production of high level of hydrocarbon biofuel and bioproducts.

The University of Texas at Austin ..... AWARDEE **Booth 342**

Dan Sellan
dan.sellan@utexas.edu
http://arpa-e.energy.gov/?q=arpa-e-projects/thermal-batteries-electric-vehicles

Thermal Batteries for Electric Vehicles

This project is focused on the demonstration of modular, high-energy density, low-cost thermal storage systems that provide cabin heating and cooling for electric vehicles (EVs). A specific goal for the thermal batteries is to achieve a comparable energy density at a quarter of the cost of electric batteries. They can be charged with off-peak electric power together with the electric batteries. Compared to existing heating, ventilation, and air conditioning (HVAC) systems powered by electric batteries in EVs, the overall objective of these thermal batteries is to decrease the manufacturing cost and increase the driving range of next-generation EVs.

The University of Utah ..... AWARDEE **Booth 645**

Z. Zak Fang
zak.fang@utah.edu
http:/powder.metallurgy.utah.edu

A New Generation of High Density Thermal Battery Based On Advanced Metal Hydrides

The project aims to develop a "thermal battery" that can be used for air-conditioning and heating of electrical vehicles, thus reserving electrical battery power for longer driving range. The thermal energy storage is accomplished by advanced metal hydride with high energy densities. The exothermic and endothermic reactions during hydrogenation and dehydrogenation are sources of heating and cooling effect. A cell-level prototype has been fabricated and successfully demonstrated. The same approach can also be used for space heating and cooling, and waste heat recovery.

Thermal Conservation Technologies.....Booth 226
Alan Feinerman
AFeinerman@tensileVIP.com
www.tensileVIP.com

R40 Vacuum Insulation Panels in Stainless Steel Envelope

Thermal Conservation Technologies can manufacture vacuum insulation panels (VIPs) of any size or shape within a puncture resistant stainless steel envelope. The versatility of this technology allows any building's R value to be increased by 40 by placing an inch thick VIP on a building's envelope and then covering it with any siding. Our VIPs can be incorporated into other settings such as insulation for new buildings, refrigerators, ovens and any temperature controlled enclosure.

Transphorm Inc..... AWARDEE Booth 1030
Dr Primit Parikh
pparikh@transphormusa.com
http://www.transphormusa.com/

Four quadrant GaN switch enabled three phase grid-tied microinverters

Transphorm is developing power switches for new types of inverters that improve the efficiency and reliability of converting energy from solar panels into electricity for the grid. Semiconductor switches control the flow of current in inverters, enabling DC to be converted to AC. Transphorm's technology will enable a single semiconductor device to switch electrical currents in both directions at high voltage and frequencies. This enables low-loss, compact and reliable solar inverter technologies. Transphorm is using Gallium Nitride (GaN) as the semiconductor material in its switches instead of silicon, because GaN switches have lower loss at higher voltages and switching frequencies.

Transphorm Inc..... AWARDEE Booth 1028
Dr Primit Parikh
pparikh@transphormusa.com
www.transphormusa.com

High Performance GaN HEMT Modules for Agile Power Electronics

Transphorm is developing transistors using gallium nitride (GaN) that could be used to make cost-effective, high-performance power converters for a variety of applications, including motor drives. A transistor acts like a switch, controlling electrical energy that flows in a circuit. Most transistors used today are built using silicon. But silicon transistors don't operate efficiently at high frequency and high voltage. Transphorm's GaN power transistors perform better at higher voltages and frequencies. These enable compact, efficient power electronics. The project demonstrates energy savings between 2-8% can be got using GaN transistor based smart motor drives compared to those using silicon transistors.

TreadStone Technologies, Inc. ..... Booth 327

Gerald DeCuollo
gdecuollo@Treadstone-Technologies.com
www.TreadStone-Technologies.com

Low Cost Corrosion Resistant Metal Plates, Enhancing Commercialization of Flow Batteries and Electrolyzer Energy Storage Systems

TreadStone proposes to demonstrate a low cost enabling technology that enhances the commercialization of flow batteries and electrolyzers for Grid-Scale Energy Storage. This technology is preferred because of its low cost thereby reducing the overall capital cost required for commercialization. Flow battery and electrolyzer technologies are promising technologies utilizing off peak electricity current electricity generation systems, wind and solar power sources. The success of this project will enhance the use of flow batteries and electrolyzers and provide an energy efficient, environmentally friendly and safe process for electricity supply.

TYRC ..... AWARDEE Booth 414

Cr. Christopher M. Rey
cmrey@tai-yang.com
www.tai-yang.com

Superconducting Magnetic Energy Storage for Miltary Applications and the Electric Grid

TYRC has developed a unique proprietary technology involving High Temperature Superconducting (HTS) cables that has the ability to improve Superconducting Magnetic Energy Storage (SMES) 2-3X. HTS SMES can deliver extremely high power densities, with round trip energy efficiencies of > 95 % and can be charged and discharged extremely rapidly without degradation or loss of system life, nearly an infinite number of times. The time delay during charge and discharge is extremely short and typically faster than that of even ultra-capacitors.

UCLA/JPL ..... AWARDEE Booth 839

Richard E. Wirz
wirz@ucla.edu
www.wirz.seas.ucla.edu

Thermal Energy Storage With Supercritical Fluids

UCLA and JPL are creating cost-effective solar thermal energy storage systems using new materials and designs. Cost-effective thermal storage technology is necessary for the widespread use of solar thermal energy. State-of-the-art molten salt systems cost well in excess of DOE's $20/kWh thermal energy storage cost goal, which is required for long-term investment viability. UCLA and JPL are developing a supercritical fluid-based thermal energy storage system that employs low-cost fluids that can meet DOE's cost goal. The team's design also uses a novel modular tank design that is more reliable and scalable for a large range of thermal storage applications.

UCLA and Easel Biotechnologies, LLC..... AWARDEE Booth 838

James C. Liao
liaoj@seas.ucla.edu.
http://www.seas.ucla.edu/~liaoj/

Electro-Autotrophic Synthesis of Higher Alcohols

UCLA and Easel Biotechnologies are utilizing renewable electricity to power direct liquid fuel production in genetically engineered Ralstonia eutropha bacteria. The team is using renewable electricity to convert carbon dioxide into formic acid, a liquid soluble compound that delivers both carbon and energy to the bacteria. The bacteria are genetically engineered to convert the formic acid into liquid fuel—in this case alcohols such as butanol. The electricity required for the process can be generated from sunlight, wind, or other renewable energy sources. In fact, this electricity-to-fuel system could be a more efficient way to utilize these renewable energy sources.

United Technologies Research Center..... AWARDEE Booth 324

William Veronesi
veronewa@utrc.utc.com
www.utrc.utc.com

Additive Manufacturing of Optimized Ultra-High Efficiency Electric Machines

United Technologies Research Center (UTRC), the central research organization of United Technologies Corporation (UTC), together with The Pennsylvania State University-Applied Research Lab (PSU-ARL), Connecticut Center of Advanced Technologies (CCAT), and Ricardo Inc. proposes a new approach for designing and producing ultra-high efficiency, power dense electric machines. The team is targeting the production of a high power density induction motor that matches the performance of current automotive permanent magnet (PM) motors.

United Technologies Research Center..... AWARDEE Booth 330

Hayden Reeve
reevehm@utrc.utc.com
www.utrc.utc.com

Liquid Desiccant in Air Conditioners

UTRC is developing an air conditioning system for use in warm and humid climates. UTRC's system integrates a liquid desiccant and a traditional vapor compression system found in 90% of air conditioners. The desiccant reduces the humidity in the air before it is cooled, using less energy. The technology uses a membrane as a barrier between the air and the liquid salt stream allowing only water vapor to pass through. This solves an inherent problem with traditional liquid desiccant systems—carryover of the liquid drying agent into the conditioned air stream—which eliminates corrosion and health issues.

United Technologies Research Center ..... AWARDEE Booth 332

www.utrc.utc.com

Transformational Flow Battery System

UTRC is developing a flow-battery system with a unique cell design that provides substantially more power density than conventional flow-battery cells. A flow battery is a cross between a traditional battery and a fuel cell. Flow batteries store their energy in external tanks instead of inside the cell itself. Flow batteries have traditionally been expensive because the custom-built cell stacks are costly. In this project, UTRC has developed and demonstrated a new stack design that utilizes conventional cell materials, but significantly reduces the size and cost of the stack as a result of UTRC's high power-density cell technology.

United Technologies Research Center ..... AWARDEE Booth 328

Bart van Hassel
vanHasBA@utrc.utc.com
www.utrc.utc.com

Thermal Storage Using Hybrid Vapor Compression Adsorption System

UTRC is developing a new climate-control system for EVs that uses a hybrid vapor compression adsorption system with thermal energy storage. The closed system will use energy during battery-charging to recharge the thermal storage, and it will use minimal power to provide cooling or heating to the cabin during a drive cycle. This approach absorbs a refrigerant on a metal salt, creating a lightweight, high-energy-density thermal storage system. The project will deliver a hot-and-cold battery that provides comfort to the passengers using minimal power, substantially extending the driving range of EVs.

United Technologies Research Center ..... AWARDEE Booth 326

Alison Gotkin
gotkinae@utrc.utc.com
http://www.utrc.utc.com/pages/our_company.html

Low Cost Hybrid Materials and Manufacturing for Conformable CNG Tanks

A non-cylindrical conformable modular tank concept based on topology optimized hybrid material structures that addressed the challenges associated with CNG pressurized gas storage tanks for vehicular applications. The concept adopts a 'unit cell' approach that enables modular designs to suit vehicular needs. The objective of this program is to develop a 140 L modular CNG tank based on this unit cell concept that can be assembled to form any parallelepiped shape, uses existing manufacturing techniques, and achieves a conformability > 90%, energy density > 12MJ/kg at a tank cost < $1500.

University of Alabama ..... AWARDEE **Booth 444**

Rare-Earth-Free Permanent Magnets for Electrical Vehicle Motors and Wind Turbine Generators: Hexagonal Symmetry Based Materials Systems Mn-Bi and M-type Hexaferrite

UCLA

University of California, Los Angeles..... AWARDEE **Booth 840**

http://www.seas.ucla.edu/~liaoj/

Energy Plant: High Efficiency Photosynthetic Organisms

The project involves a complete redesign of carbon fixation in photosynthetic organisms by implementing an alternative carbon fixation cycle that is not dependent on RuBisCo. The work is being performed in two model organisms: cyanobacteria and Arabidopsis. Once optimized in the model organisms, the successful pathway can be implemented in a number of biofuel producing organisms or crop plants.

University of Colorado..... AWARDEE **Booth 1229**

Staci Van Norman

staci.vannorman@colorado.edu

Low Cost Microtubeular ALD-based Reactor Systems for Catalytic Reforming

Low cost alternative to the current complex and expensive microchannel reactor technologies for specific application in GTL technologies. A lab scale microtubular catalytic reactor with activity and selectivity to liquid fuels from the Fischer Tropsch Synthesis reaction which meet or exceed those of current state-of-the-art at a reduced cost of fabrication. Fabrication of the proposed microtubular reactor involves a novel and innovative approach by design of a catalytic reactor via precise atomic level controlled deposition.

University of Colorado **Boulder**

University of Colorado Boulder ..... AWARDEE **Booth 1017**

Richard D. Noble

Nobler@colorado.edu

http://www.colorado.edu/che/faculty/noble.html

Achieving a 10,000 GPU permeance for Post-Combustion Carbon Capture with Gelled Ionic Liquid-Based membranes

The Gin and Noble group at the University of Colorado Boulder have developed materials potentially capable of a 10,000 GPU permeance for post-combustion carbon capture. Assuming an electricity cost of $0.425/kwh, a permeance of 10,000 GPU would meet the DOE's 2020 target. In order to achieve this permeance, defect-free, ultrathin (0.1 micron) membranes would need to be fabricated. 3M and Los Alamos National Laboratory have partnered with CU Boulder on the project and have the facilities and expertise to prepare ultrathin membranes on the commercial scale.

University of Colorado **Boulder**

University of Colorado Boulder ..... AWARDEE **Booth 1235**

Dragan Maksimovic
maksimov@colorado.edu
http://ecee.colorado.edu/~maksimov/submic

Wafer-Level Sub-Module Integrated DC/DC Converter

In photovoltaic (PV) power systems, submodule integrated DC/DC converters (SubMIC) improve the system efficiency by performing distributed maximum power point tracking, while processing only a relatively small mismatch fraction of system power. The SubMIC technology, based on conventional switched-mode DC/DC power converter circuits or based on innovative wafer-level GHz DC/DC converters, results in significantly improved energy capture at very low incremental cost in residential, commercial, or utility-scale PV systems. The wafer-level GHz DC/DC converters further offer unprecedented integration and co-packaging opportunities in all types of PV modules.

University of Delaware ..... AWARDEE **Booth 936**

Yushan Yan
yanys@udel.edu
http://www.che.udel.edu/yan

High-Voltage Flow Batteries for Stationary Energy 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 Delaware ..... AWARDEE **Booth 935**

Yushan Yan
yanys@udel.edu
http://www.che.udel.edu/yan

Quaternary Phosphonium Based Hydroxide Exchange Membranes

The University of Delaware is developing a new fuel cell membrane for vehicles that relies on cheaper materials than those used in current fuel cells. Conventional fuel cells are very acidic, so they require acid-resistant metals like platinum to generate electricity. The University of Delaware is developing an alkaline fuel cell membrane that can operate in a non-acidic environment where cheaper materials like nickel and silver, instead of platinum, can be used. In addition to enabling the use of cheaper metals, the University of Delaware's membrane is 500 times less expensive than other polymer membranes used in conventional fuel cells.

University of Delaware ..... AWARDEE **Booth 323**

George C. Hadjipanayis
hadji@udel.edu
www.udel.edu/

High Energy Permanent Magnets for Hybrid Vehicles and Alternative Energy

The main objective of this contract is to develop/discover permanent magnet materials with magnetic properties significantly better than those of Nd-Fe-B. This would allow us to synthesize the next generation high energy permanent magnets with energy products, (BH)max ,significantly higher than those of the best available Nd-Fe-B magnets ((BH)max =59 MGOe), with the potential to obtain values exceeding 100 MGOe, as predicted theoretically! We will undertake an intense concerted effort to develop such a material using three different routes. The first route will be aimed at discovering new materials with high anisotropy (K>107erg/cc) and high saturation magnetization.

University of Florida ..... AWARDEE **Booth 540**

Saeed Moghaddam
saeedmog@ufl.edu
http://www.mae.ufl.edu/saeedmog/

Nanoengineered Membrane Based Absorption Cooling for Buildings Using Unconcentrated Solar and Waste Heat

Thermally driven absorption heat pumps—which transfer heat energy from one location to another in a cooling and heating system—offer independence from electricity because these technologies can be powered from the combustion of natural gas and solar and waste heat. They could play a larger role in the future cooling market if compact, inexpensive, high performance, and robust systems are developed. In this work, nanoengineered membranes are implemented to greatly enhance the transport processes involved within the system and reduce the HXs size and cost.

University of Florida ..... AWARDEE **Booth 331**

Kevin Bowles
kbowles@hesiodcorp.com
www.solarfuelcorporation.com

Solar Thermochemical Fuel Production via a Novel Low Pressure, Magnetically Stabilized, Non-volatile Iron Oxide Looping Process

Solar Fuel's proprietary technology converts solar energy to syngas, which is then converted to "drop in" fuel (diesel, gasoline or hydrogen). The Solar Fuel patented process uses concentrated solar energy, carbon dioxide and water, and involves low pressure and a patented reactor. The output of the Solar Fuel process is fuel that can be used in cars, trucks, and other fuel-powered machinery. The production requires no rare-earth minerals and can be scaled according to demand. Available synthetic fuels achieve a conversion efficiency of 3 to 7 percent, while Solar Fuel has a target of 10 to 25 percent conversion efficiency.

University of Florida ..... AWARDEE Booth 542

Gary Peter
gfpeter@ufl.edu
http://sfrc.ufl.edu/forestgenomics/

Commercial Production of Terpene Biofuels in Pine

Southern pines naturally synthesize and accumulate terpenes in the wood as a defense against insect predation and fungal infection. Pine terpenes are currently recovered at commercial scales from live trees by tapping, during processing into pulp and paper, and from stumps. We are testing 3 complementary and synergistic biological strategies to engineer loblolly pine trees to produce 5 fold more terpene than average wood accumulates. Pines with high terpene wood are projected to yield over 160 GJ/h/y of biofuel. Terpenes can be recovered using current and new methods, and the lignocellulose onverted to bioenergy, biofuel and biomaterials.

University of Houston ..... AWARDEE Booth 437

T.J. Wainerdi
twainerdi@uh.edu
http://www2.egr.uh.edu/~vselvama/

High Performance, Low Cost Superconducting Wires and Coils for High Power Wind Generators

Superconducting generators are a viable alternative to permanent-magnet-based generators for direct-drive, high-power wind turbines especially because of their potential low operating cost, reduced weight, and near elimination of rare-earth materials. The University of Houston along with SuperPower Incorporated, and Tai-Yang Research Company have teamed up to develop transformative technologies to improve wire performance by a factor of four in the operating condition of superconducting wind generators (30 K, 2.5 T) being developed by our partner TECO-Westinghouse Motor Company. This improved wire performance will lead to significant cost and weight savings required to improve the commercial viability of offshore wind.

University of Illinois at Urbana-Champaign (UIUC) ..... AWARDEE Booth 346

Lisa Emerson
lemerson@illinois.edu

Engineering Hydrocarbon Biosynthesis and Storage Together with Increased Photosynthetic Efficiency into the Saccharinae

UIUC, along with the project's partner institutions, is working to convert sugarcane and sorghum—already 2 of the most productive crops in the world—into dedicated bio-oil crop systems. Three components will be engineered to produce new crops that have a 50% higher yield, produce easily extractable oils, and have a wider growing range across the U.S. This will be achieved by modifying the crop canopy to better distribute sunlight and increase its cold tolerance. By directly producing oil in the shoots of these plants, these biofuels could be easily extracted with the conventional crushing techniques used today to extract sugar.

University of Kentucky Center for Applied Energy Research ..... AWARDEE **Booth 938**

Qiying Jiang
qiying.jiang@uky.edu

www.caer.uky.edu

A Solvent/Membrane Hybrid Post-Combustion CO2 Capture Process for Existing Coal-Fired Power Plants

Our research team is developing a solvent-based membrane for the post-combustion CO2 capture. Relative to the conventional CO2 scrubbing process, the developing membrane-based hybrid process will provide a compact stripper and balance of plant with significant energy savings and is expected to be a breakthrough for the future CO2 capture sector.

University of Maryland ..... AWARDEE **Booth 1124**

Ichiro Takeuchi
takeuchi@umd.edu

http://arpa-e.energy.gov/Portals/0/Documents/FundedProjects/BEETIT%20Slicksheets/BEETIT_University%20of%20Maryland_Final.pdf

Thermoelastic Cooling

We demonstrate a novel cooling technology based on thermoelastic effect. The technology utilizes the latent heat absorbed and released during the solid-to-solid martensitic phase transformation to pump heat. Thermoelastic cooling has high efficiency because of the high density of the refrigerant allowing for storage of large amount of thermal energy in a given volume. The theoretical coefficient of performance of a thermoelastic cooling system can be as high as 11.8. Thermoelastic cooling is friendly to environment. It completely eliminates the need for refrigerants with high global-warming potential such as CFC, HFC and HCFC.

University of Massachusetts Amherst ..... AWARDEE **Booth 718**

Danny Schnell
dschnell@biochem.umass.edu

http://www.cns.umass.edu/timbr/research/grants/dedicated-high-value-biofuels-crop

Development of a Dedicated, High-Value Biofuels Crop

This project addresses the major limitations to sustainable, commercially viable biofuels production:

1) DEVELOP A DEDICATED NON-FOOD BIOFUEL/BIOPRODUCTS CROP that can be cultivated in a broad geographic range,

2) INCREASE CROP YIELDS by genetic engineering of plant chloroplasts to optimize photosynthesis, and

3) INCREASE THE PRODUCTION OF SEED OIL AND CHEMICALS, to increase overall yields and suitability for production.

University of Massachusetts ..... AWARDEE **Booth 741**

Derek Lovley
dlovley@microbio.umass.edu
www.electrofuels.org

Electrofuels via Direct Electron Transfer from Electrodes to Microbes

Microbial electrosynthesis is an artificial form of photosynthesis in which microorganisms convert carbon dioxide and water to transportation fuels, or other desirable organic commodities, with electricity as the energy source. Microbial electrosynthesis is much more efficient, and results in significantly less environmental degradation, that biomass-based energy strategies.

University of Minnesota ..... AWARDEE **Booth 939**

Wojciech Lipinski
lipinski@umn.edu
http://www.me.umn.edu/labs/solar/index.shtml

Solar Fuels via Partial Redox Cycles With Heat Recovery

A solar thermochemical reactor technology is developed that will efficiently produce fuel from sunlight, water and carbon dioxide, using solar thermal energy to break chemical bonds. Fuel production is envisioned by using partial redox cycles and ceria-based reactive materials. The team will achieve unprecedented solar-to-fuel conversion efficiencies of at least 10%.

University of Notre Dame ..... AWARDEE **Booth 536**

energy.nd.edu

CO2 Capture with Ionic Liquids Involving Phase Change

We propose a new concept for CO2 capture that uses phase change ionic liquids to remove CO2 from flue gas. We have discovered solid ionic materials with high CO2 uptake. They form a liquid upon reacting with CO2. In the regeneration step, the heat of fusion of the salt would supply part of the heat needed to desorb the CO2 from the absorbent. This novel innovation has the potential to cut the heat of regeneration in half. Process modeling suggests this could reduce the energy loss of post-combustion CO2 capture to <19%, with a potential reduction of up to 14%.

University of Pittsburgh ..... AWARDEE **Booth 1031**

Tom McDermott
tem42@pitt.edu

Nanocomposite Magnet Technology for High Frequency MW Scale Power Converters

A new nanoscale magnetic material has been developed at CMU to reduce the size, weight, and cost of utility-scale PV solar power conversion systems that connect directly to the grid. LANL has developed a new inverter design leveraging this material, while Spang Magnetics has prepared to manufacture it at scale. University of Pittsburgh has developed the technology-to-market plan, and has researched other material applications for transformers and rotating machines.

University of Pittsburgh ..... **Booth 1228**

University of Southern California ..... AWARDEE **Booth 746**

Sri Narayan
sri.narayan@usc.edu
www.usc.edu

A Robust and Inexpensive Iron-Air Rechargeable Battery for Grid-Scale Energy Storage

The ARPA-E project on advancing iron-air batteries is specifically aimed at addressing the dire need for a transformational solution for inexpensive and robust large-scale electrical energy storage systems. The iron-air rechargeable battery is particularly attractive because iron and air are plentiful and inexpensive. The specific objective of the iron-air battery project is to overcome the key technical limitations of energy efficiency and durability.

University of Texas at Dallas ..... AWARDEE **Booth 520**

Babak Fahimi
www.utdallas.edu/research/REVT

Double-Stator Switched Reluctance Motor (DSSRM) Technology

Double stator switched reluctance motor drive is an innovative solution in which an optimal magnetic configuration will force magnetic flux lines to generate substantial motional forces while minimizing the radial forces. These radial forces are responsible for generation of acoustic noise and unwanted vibration of the stator frame. Furthermore DSSRM will benefit from employment of full pitch winding which renders a better cooling arrangement. As a result, DSSRM drive will provide high power density, lower acoustic noise, and possibility of using higher current density without the use of rare-earth metals.

University of Washington - University of Michigan ..... AWARDEE **Booth 1222**

Hrvoje Pandzic
hpandzic@uw.edu
http://www.ee.washington.edu/research/real/ep.html

Energy Positioning: Control and Economics

This project will develop the control technologies needed to establish an "energy positioning" operating paradigm: Excess production from renewable energy sources is either consumed directly by flexible loads or directed to the storage facilities where it is best pre-positioned for later use. Following a contingency, control on a faster timescale reallocates the distributed stored energy and the flexible demands to alleviate overloads and stabilize the system. The results of this project will:

- Increase the utilization factor of the transmission grid
- Reduce the need for building new transmission line
- Reduce the proportion of spilled renewable energy
- Reduce the power system operating cost

Utah State University ..... AWARDEE **Booth 736**

Dr. Regan Zane
regan.zane@usu.edu
http://power.usu.edu/

Robust cell-level modeling and control of large battery packs

We are developing a cell-control system that is robust to cell manufacturing and runtime variability and brings all cells to a homogeneous end-of-life. This allows significant reduction in required battery pack size for the same performance and end-of-life and also increases the battery pack value for second use applications. The approach applies adaptive electrochemical model-predictive and prognostic-coupled cell-level control algorithms to safely drive cells to non-conservative physical limits, and realizes control objectives using integrated power converters in a flexible, modular, cost-effective system architecture for coordinated cell-level dynamic control.

Varentec ..... AWARDEE **Booth 1231**

Dr. Deepak Divan
ecowell@varentec.com
www.varentec.com

Compact Dynamic Phase Angle Regulators for Power Routing

The Compact Dynamic Phase Angle Regulator (CD-PAR) is a low-cost dynamic power flow controller that is scalable from use in distribution to transmission networks. Using fractionally rated converters in tandem with small rated transformers, the proposed controller can dispatch real and reactive power along specified paths. This device can selectively be installed in key locations in a power network to provide improved asset utilizations, congestion management, and open up new energy market through delivery of differentiated energy. Further, the proposed controller offers a 'fail-normal' mode of operation, restoring the grid to its 'normal' condition if the converter should ever fail.

Virginia Commonwealth University ..... AWARDEE **Booth 1214**

Everett Carpenter
ecarpenter2@vcu.edu
http://www.people.vcu.edu/~ecarpenter2/10.htm

Discovery and Design of Novel Permanent Magnets using Non-strategic Elements having Secure Supply Chains

Here, we report a ferromagnetic material based upon nanoscale cobalt carbide particles that provide a rare-earth-free alternative to high performance permanent magnets. The cobalt carbide-based magnets described herein are processed by chemical polyol reduction of metal salts. The precipitate of the reaction need only be rinsed and dried prior to packaging. Packaging may be in the form of isotropic or anisotropic high density compacts, bonded magnets, particle suspensions, etc. The impact of this innovation may be far reaching in that it does not rely upon rare earth elements and their precarious supply chain.

Virginia Tech ..... AWARDEE **Booth 320**

Jess Calata
jcalata@vt.edu
www.cpes.vt.edu

High-Density Front-End Converters with Low-Loss Magnetics and Switches

Technologies are under development for a front-end ac-dc converter rated at 3 kW, 390 V output; 97% efficiency; 1 MHz switching frequency; and 150-W/in3 power density.

Magnetic powder with low hysteresis loss will be developed and coated with insulating polymer to suppress eddy-current loss to achieve low core loss overall.

Gallium nitride transistors are needed to switch high voltage at 1 MHz. While high-voltage GaN transistors are current-bidirectional, gate drivers with accurate timings are needed to ensure high efficiency over a wide voltage range. Such gate drivers will be implemented on power ICs co-packaged with the transistors.

Vorbeck Materials Corp ..... AWARDEE **Booth 436**

Christy Martin
christy.martin@vorbeck.com
www.vorbeck.com

Low-Cost, Fast-Charging Batteries for Hybrid Vehicles

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 increase the efficiency of hybrid vehicles by up to 20% while also reducing cost and emissions.

Washington University ..... AWARDEE **Booth 744**

www.maple.eece.wustl.edu

Optimal Operation and Management of Batteries based on Real Time Predictive Modeling and Adaptive Battery Management Techniques

- 2D thermal-electrochemical coupled models with capacity fade mechanisms integrated into Battery Management System (BMS)
- BMS based on fastest and most detailed physics based models
- Demonstrate improvements in safety, charging rate and useful capacity, and battery lifetime

Wilson Solarpower Corporation ..... Booth 644

Bruce Anderson
Bruce.Anderson@WilsonSolarpower.com

Baseload, Modular Concentrated Solar Power Under 6 cents/kWh

Innovative clean energy technologies such as PV and wind typically supply power intermittently. Wilson's distributed, modular CSP system will overcome this problem by generating power 24/7, year round, regardless of the weather or time of day and at prices competitive with conventional power. Its modular nature offers power generation at all scales: individual buildings (CCHP); multiple buildings; and utility scale. With DOE funding support to develop this system, Wilson has shown that it can achieve the above at electricity prices that are competitive with conventional power, initially in the 12-15 cents per kilowatt-hour range and ultimately under 6 cents.

Wyss Institute for Biologically Inspired Engineering at Harvard University and Harvard School of Engineering and Applied Sciences ..... AWARDEE Booth 639

Robert Cunningham
robert.cunningham@wyss.harvard.edu
www.wyss.harvard.edu

Slippery Coatings as a New Platform Technology for Energy-Saving Applications

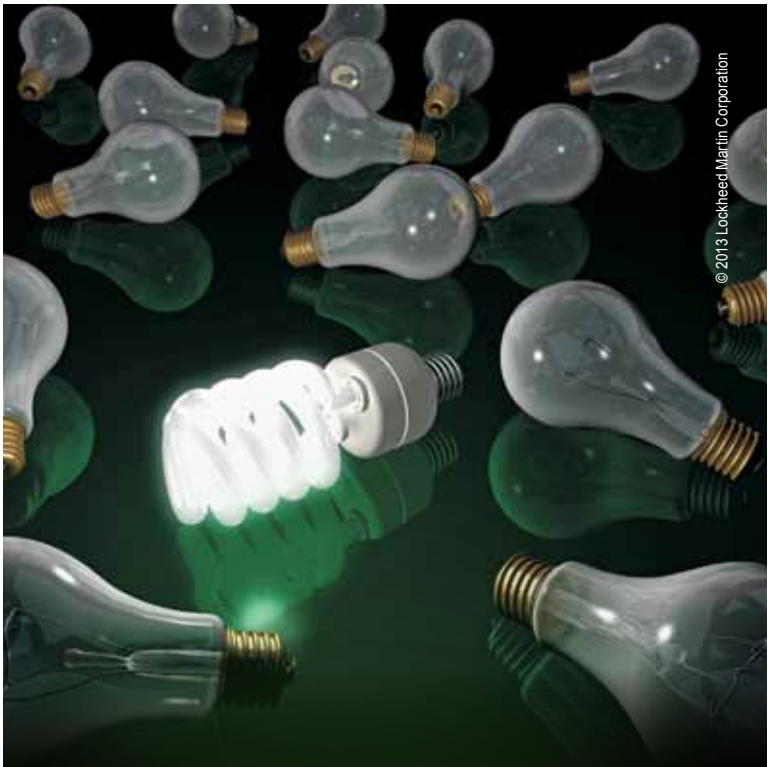
Harvard University will develop a new generation of self-repairing, anti-fouling coatings for energy-intensive applications, such as waste water treatment, refrigeration and fluid transport. Reduced friction and bio-fouling have the potential to reduce energy use by up to 50%. Anti-icing coatings have applications in wind turbines and electrical transmission lines. Transparent omni-repellant films may improve the efficiency and lower maintenance costs of photovoltaic panels.

Yale University - Department of Chemical & Environmental Engineering..... AWARDEE Booth 1230

http://www.yale.edu/env/elimelech/bio.htm

Power Generation from Waste Heat with Closed-Loop Membrane-Based System

Yale is developing membrane-based technology to convert low-grade heat that is otherwise unutilized to useful energy.



LOST IN THE COMPLEXITIES OF ENERGY MANAGEMENT AND

LOOKING FOR A WAY OUT?

Whether the question is implementing the latest smart grid technology, conserving energy or protecting your networks, one thing is certain. Energy management is complex. Lockheed Martin can help. Not only do we have experience working with utility, commercial, and government customers on energy efficiency, security, and information technology. We thrive on it. Lockheed Martin. Solving today's and tomorrow's complex problems with the right mix of systems integration and engineering.

www.lockheedmartin.com/energysolutions

LOCKHEED MARTIN

100 YEARS OF ACCELERATING TOMORROW

Showcase Notes

Showcase Index by Type

ASSOCIATIONS

AWARDEES

Showcase Index by Type

Showcase Index by Type

Showcase Index by Type

GOVERNMENT AGENCY PARTICIPANTS

★ U.S. Department of Defense Agencies ★

★ U.S. Department of Energy Agencies ★

★ Other U.S. Federal Agencies ★

Showcase Index by Type

PARTNERS

SHOWCASE PARTICIPANTS

Showcase Index by Technology Order

ADVANCED FUELS

BUILDING EFFICIENCY

CARBON CAPTURE & UTILIZATION

CONTROL SYSTEMS

Showcase Index by Technology Order

ELECTRICITY TRANSMISSION & DISTRIBUTION

ENERGY STORAGE, PORTABLE

Showcase Index by Technology Order

ENERGY STORAGE, STATIONARY

INDUSTRIAL EFFICIENCY

RENEWABLE POWER GENERATION

THERMAL ENERGY UTILIZATION

Showcase Index by Technology Order

VEHICLE TECHNOLOGIES

WATER

Showcase Floorplan

MEETING ROOMS

#1 DuPont
#2 General Atomics
#3 Asahi Kasei America
#4 Chevron Technology Ventures
#5 Constellation New Energy
#6 Goodwin Procter
#7 Lockheed Martin
#8 Massachusetts Clean Energy Center
#9 Siemens
#10 The Pew Charitable Trusts
#11 United Technologies Research Center
#12 General Electric
#13 Bright Capital
#14 BASF
#15
#16 ARPA-E PD Room
#17 ARPA-E PD Room
#18 ARPA-E PD Room
#19 ARPA-E PD Room

Showcase Hours & Special Events

Showcase Hours of Operation

TUESDAY

Lunch	10:50 a.m. - 1:10 p.m.
Reception	5:00 p.m. – 8:00 p.m.

WEDNESDAY

Continental Breakfast	7:30 a.m. – 8:45 a.m.
Lunch and Closing	11:45 a.m. – 1:45 p.m.

Demonstrations in the Technology Showcase

Technology Showcase participants can sign-up at the exhibitor service desk during showcase hours to give live technology demonstrations on stage in the exhibit hall. Availability is on a first-come, first-served basis and Show Management will announce when the demonstrations are taking place.

Women in the Energy Sector

WEDNESDAY 7:30-8:30 a.m.

Join ARPA-E Deputy Director Cheryl Martin at the ARPA-E booth for a special networking event for women in the energy sector.

About MassCEC

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.

Our Mission

Cultivating a clean energy ecosystem.

Our Goals

Create jobs, drive innovation, and build a clean energy future.

www.masscec.com @MassCEC