TEC2013

Transactive Energy

Implementing the Future of the Electrical System

The First International Conference & Workshop:

May 23-24, 2013, World Trade Center, Portland, OR

The GridWise® Architecture Council, with support from PNNL, BPA, Smart Grid Oregon and Portland General Electric, is pleased to convene the First International Conference and Workshop on Transactive Energy in Portland, Oregon, on May 23-24, 2013.

The Transactive Energy Conference and Workshop 2013 is organized by the GridWise® Architecture Council as part of its mission to further the advanced thinking about the guiding principles, or architecture, of a highly intelligent and interactive electric system.

The Conference is part of the continuing work of the GridWise® Architecture Council in defining Transactive Energy and developing a framework for the industry to move forward under.

The goal of the conference and workshop is to bring together organizations and researchers that have been researching, developing and deploying Transactive Energy techniques and business models.

This forum is intended to facilitate development of a Transactive Energy Framework design initiated by the GridWise Architecture Council to enable accelerated adoption of Transactive Energy policy and technologies policy worldwide.

This first of its kind conference offers industry participants an opportunity to demonstrate leadership, both in products and in industry evolution. There will be multiple sponsorship, exhibits and endorsement opportunities.

The conference structure is an adaptation of the GWAC Stack to the lay out theory (Architecture) and practice (Implementation) tracks for Transactive Energy.

These start at the upper layers (Business and Policy); and moving through the middle layer (Control Architecture) to the lower layers of the GWAC Stack (Cyber-Physical) and finally to cross-cutting issues such as probabilistic planning decisions, algorithms and analytics. Two of the workshop sessions will specifically address the relationship between buildings / facilities and the grid and the application of transactive approaches within buildings / facilities.

Each of the 4 tracks will include two serial sessions to engage the experts and interested stakeholders and in combination will span a three-hour discussion of the topic with attention to both theory and practice.

Between sessions will be break periods with time for networking and talking with attendees, presenters, and sponsors while enjoying refreshments. A free reception is planned for the first evening for all participants to discuss the conference topics and enjoy food and drinks.

About the GridWise Architecture Council

The GridWise® Architecture Council was convened in 2004 by the Department of Energy with support from the Pacific Northwest National Laboratory. As a volunteer council, the GWAC includes practitioners and leaders with broad-based knowledge and expertise in power, information technology, telecommunications, financial systems and other fields who are working together toward a coordinated GridWise vision - the transformation of the nation's energy system into a rich, collaborative network filled with decision-making information exchange and market-based opportunities.

About Smart Grid Oregon

The Mission of Smart Grid Oregon is to enable, promote and grow the smart grid industry and infrastructure in Oregon and the Northwest. Organized as a trade association, Smart Grid Oregon has two major goals:

Advocacy/public policy: Smart Grid Oregon will work with smart grid stakeholders to craft and advocate for effective public policies that promote and grow Oregon's smart grid industry and infrastructure.

Business promotion/networking: Through informational events, conferences, and other forums, Smart Grid Oregon will be a catalyst for smart grid entrepreneurs and leaders to meet, interact, compare notes, and work together to grow and promote the industry in Oregon and the Pacific Northwest.

http://pointview.com/s/131

Message from the GridWise® Architecture Council

The GridWise® Architecture Council is pleased to welcome you to this 1st International Conference and Workshop on Transactive Energy. Since the Council's inception, the members have worked on identifying and framing solutions to key challenges to enabling a future power system that realizes the benefits of information interconnection and takes advantage of new information enabled sensors, devices and technology. The earlier work of the Council was focused on interoperability and resulted in a number of reference documents the most notable of which is the "Interoperability Context Setting Framework" - the source of the well-known GWAC Stack.

For the past two years the Council has been facilitating discussion of efforts to integrate the economic and engineering approaches to managing and optimizing the electric power system including how to address critical requirements such as reliability. The Council hosted a small workshop on this subject, which has come to be labeled "Transactive Energy" in May 2011 and a slightly larger second workshop in March 2012. The participants in these workshops have joined with the Council in making the broader community aware of these efforts through organization of and participation in panels and several meetings or conferences such as Grid-Interop 2011 and 2012 and the IEEE Innovative Smart Grid Technology Conference in 2012 and 2013.

Recently the Council has decided to undertake creation of a sister document to the Interoperability Context Setting Framework which will be focused on the topic of transactive energy. This Transactive Energy Framework document is intended to build on the interoperability framework applying it to considering the broad dimensions of transactive approaches to managing, coordinating and/or controlling grid elements. While that scope sounds grid-centric, in fact the intent is to include those systems connected to the grid - in others words buildings, facilities, vehicles and so forth. The changing nature of the grid - ever increasing variable generation resources at large scale on the bulk power side, the introduction of new, intelligent devices and technology in the control elements of the grid, and the increasing use of intelligent devices and technologies in energy devices on the consumption side – require end-to-end consideration of all active or potentially active elements of the electric power energy system.

The objective of the Council in creating the Transactive Energy Framework is to provide a frame of reference for the community of policy makers, researchers, vendors, utilities, and asset owner operators in the electric power system and building controls communities to define and discuss the various approaches that may be labeled as "Transactive Energy". The Council believes that such a document will help form and build this community, promote discussion within the community, and is a necessary element of enabling the combined electric power and buildings technology industries to work together in developing interoperable new technologies which apply these techniques.

At this conference and workshop we will be both sharing information about the current state of transactive energy efforts and engaging you, the attendees, in workshops where we ask you to help us in the early stages of drafting the Transactive Energy Framework document. Each workshop will have a brief panel session to provide background on a small number of key questions. The panel presentations will be followed by discussion of the questions. Through these workshops the Council will gain valuable insight into the broader industry views, both positive and negative, of the dimensions of transactive energy.

Thank you for joining us in Portland. Thanks also to Smart Grid Oregon for helping organize this meeting, to Portland General Electric for graciously making the meeting facility available to us and to those who have joined with the Council to help organize this meeting.

Mark Knight, Chairman
GridWise® Architecture Council

Ron Melton, Administrator
GridWise® Architecture Council

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Conference Information

Thursday, May 23		
Time	**Session**	**Room**
7:00am	Arrival and check-in	Auditorium Lobby
8:00am	Welcome Comments	Auditorium
8:30am	DOE Interests in Transactive Energy	Auditorium
9:15am	Break – refreshments; sponsorship information tables	Auditorium Lobby
9:30am	Plenary - Elements of a Transactive Energy Framework	Auditorium
11:30am	Break – refreshments; sponsorship information tables	Auditorium Lobby
12:00pm	Lunch Keynote - State Regulator's View of Transactive Energy	Mezzanine 2, 3, 4
1:30pm	Workshop 1A - Policy and Market Design	Skybridge A & B
	Workshop 2A - Transactive Energy Management Architecture	Mezzanine 5
3:00pm	Break – refreshments; sponsorship information tables	Auditorium Lobby
3:20pm	Workshop 1B - Business Models and Value Realization	Skybridge A & B
	Workshop 2B - Transactive Energy Functional Requirements	Mezzanine 5
4:45pm	Closing Comments - Progress Towards a Framework	Auditorium
5:00pm	Evening Reception	Skybridge Terrace

Friday, May 24		
Time	**Session**	**Room**
7:00am	Arrival and check-in	Auditorium Lobby
8:00am	Keynote: Our Changing Grid	Auditorium
8:55am	Plenary - Implementing Transactive Energy: Lessons Learned and Case Studies	Auditorium
9:40am	Break – refreshments; sponsorship information tables	Auditorium Lobby
9:55am	Workshop 3A - Enabling Cyber-Physical Infrastructure (Theory-Grid Integration)	Mezzanine 5
	Workshop 4A - Transactive Energy End-to-End with Emphasis on Facility to Grid	Skybridge A & B
11:30am	Lunch Plenary - Implementing Transactive Energy	Mezzanine 2, 3, 4
1:00pm	Workshop 3B - Enabling Cyber-Physical Infrastructure (practice-Implementation Elements, M&V)	Mezzanine 5
	Workshop 4B - Transactive Energy Applied to Buildings / Facilities Energy Management	Skybridge A & B
2:30pm	Break – refreshments; sponsorship information tables	Auditorium Lobby
3:00pm	Framework progress reports and summary: next steps	Auditorium
4:00pm	Adjourn	Auditorium Lobby

Thursday May 23, 2013

Morning Plenary	
7:00am to 8:00am	**Arrival and Check-in** Attendees arrive and check-in. A continental style breakfast is available.
8:00am to 8:30am	**Welcome Comments** **Welcome and opening comments** **Call to action for Transactive Energy** **Mark Knight, CGI, Speaker** **Ron Melton, Battelle / Pacific Northwest National Laboratory, Speaker**
8:30am to 9:15am	**DOE Interests in Transactive Energy** **William Parks, DOE Office of Electricity Delivery and Energy Reliability, Speaker** **Ronald Risser, Department of Energy, Speaker** The Keynote provides a framework for the conference discussions – overview of Transactive Energy, current implementation efforts, framework, industry needs, Call to Action
9:15am to 9:30am	**Break - Exhibits Open**
9:30am to 11:30am	**Plenary - Elements of a Transactive Energy Framework** **Ron Melton, Battelle / Pacific Northwest National Laboratory, Moderator** **Ron Ambrosio, IBM T.J. Watson Research Center, Speaker** **Paul De Martini, Newport Consulting Group LLC, Speaker** **Terry Oliver, Bonneville Power Administration, Speaker** **Jeffrey Taft, Cisco, Speaker**
11:30am to 12:00am	**Break - Exhibits Open**
Keynote Speaker **Luncheon**	
12:00pm to 1:30PM	**State Regulator's View on Transactive Energy** **Carl Imhoff, Pacific Northwest National Laboratory, Moderator** **Philip Jones, President, NARUC, Speaker** Lunch Keynote: State Regulator's View of Transactive Energy. Implementing Transactive Energy. Philip Jones, Chairman WUTC and President of NARUC, will discuss the issues of regulation and the deployment of Transactive Energy applications within the electric power system.
1:30pm to 3:00pm	**Workshops**

Workshop 1A	**Policy and Market Design** **Jeff Gooding, Southern California Edison (SCE), Moderator** **Ed Cazalet', TeMIX Inc., Speaker** **Ali Ipakchi, OATI (Open Access Technology International, Inc.), Speaker** **Tom Sloan, Kansas House of Representatives, Speaker** This workshop session shall explore the Policy and Market design considerations of emerging transactive energy implementations. Specifically, a panel of industry thought leaders shall discuss policy objectives, transactive energy markets' potential to contribute to sustainable energy goals, higher reliability expectations, integration of new energy technologies and requirements for new market-based mechanisms for managing an electric grid that integrates new energy technologies and expands the traditional energy supply chain. This session will also examine potential constraints and market mechanisms that enable value realization across customer categories and requirements to maintain fair access to reliable and affordable power. This workshop shall address policy and market design theory and practice including but not limited to such topics as balancing leading edge customer expectations with trailing customers while maintaining utility operational requirements; impacts to customer costs and requirements to ensure transparency in the market; and lessons from the telecomm and other technology sectors that can be leveraged by utilities to evolve and integrate new energy technologies and meet customer demands. **Discussion Questions:** 1. How do we balance leading edge customer expectations with trailing customers while maintaining utility operational requirements? 2. What is the TE impact to customer costs and how do we ensure transparency in the market? 3. What does a TE roadmap look like?
Workshop 2A	**Transactive Energy Management Architecture** **Ron Ambrosio, IBM T.J. Watson Research Center, Moderator** **Jeffrey Taft, Cisco, Speaker** **Donald Hammerstrom, Pacific Northwest National Laboratory, Speaker** This audience-interactive session will focus on architectural considerations and frameworks for both Transactive Energy electrical and information flows for achieving the direct and indirect value realization discussed in the Business and Policy sessions. It will explore transaction and control architectural issues from local to ultra-large scales and how they relate to various domains such as markets, grid management systems, renewable and distributed generation, building and premises interactions, micro grids, and vehicles while enabling stable, coordinated Transactive Energy operations and planning. Our purpose is to create the basis for a more in depth discussion leading to an architecture. **Discussion Questions:** 1. What are the characteristics of a market / transaction participating entity to be able to participate in transactions? a. What differences in characteristics would exist at the macro and micro levels? b. At a micro or energy asset or microgrid level, might traditional central

	controls be replaced with more distributed control using transactive interactions? 2. How can economic value be represented and incorporated into business and operational objectives and constraints – how can we monetize operational and business objectives and constraints, without exposing participants' strategies and policies? **Background Materials:** • A Foundation for Transactive Energy in a Smart Grid World • Standardization of a Hierarchical Transactive Control System • Ultra Large-Scale Power System Control Architecture • Transactive Device Architecture and Opportunities • Understanding Microgrids as the Essential Architecture of Smart Energy • Grid 2020: Towards a Policy of Renewable and Distributed Energy Resources • Energy Interoperation Version 1.0 • Green Button
3:00pm to 3:20pm	**Break - Exhibits Open**
3:20 to 4:45pm	**Workshops**
Workshop 1B	**Business Models and Value Realization** **Paul De Martini, Newport Consulting Group LLC, Moderator** **Gregg Ander, Energy Foundation, Speaker** **Dian Grueneich, Dian Grueneich Consulting, LLC, Speaker** **Steve Widergren, Pacific Northwest National Laboratory (PNNL), Speaker** Transactive energy is at its core about the identification, communication and monetization of economic value related to customer participation in the power system. This session will bring a strategic perspective and discussion related to advancing development of transactive products, valuation techniques and monetization methods that align power system needs and customer benefits to enable current and emergent business models. Key questions posed by eminent thought leaders will be discussed by all participants in the session as input into the Transactive Energy Framework under development. Objective: Identify business and policy considerations and input for Transactive Energy Framework related to business models and value realization for customers and service providers. The principle are of focus are: Identification of TE related products and services Economic-FinancialCCcC c Engineering value indexc Not determined Valuation Techniques Economic-Financial Engineering value index

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	Not determined yet Methods of Realization Value signaling Quality of Service Availability Firmness M&V Value Transparency Value access Customer equity Markets Organized (e.g., ISOs) Regulated (REPs) Unregulated (e.g., TX private use networks) Discussion Themes: Affordability-Reliability-Sustainability: Related to Products/Valuation/Realization methods Business Model summaries and key takeaways Pathway/Evolution from today to future Questions for Session Discussion (draft) Evolution of TE products and services from current state to future needs? Structural business and market issues & barriers to full TE value realization? Reconcile TE pricing with existing LMP, other while services and retail tariffs? **Background Materials:** • Caltech Resnick Institute Grid2020 Discussion Series • California DR Use for Renewable Integration • Potential Role of Demand Response Resources in Maintaining Grid Stability and Integrating Variable Renewable Energy • Advanced Grid Planning & Operations • Bain & Co. Distributed Energy Business Models • Renewable and Distributed Power in California • LBNL CERTS Distributed Resource Integration Website • Pacific Northwest Demonstration Project Website • AEP Demonstration Project Website • Virtual Power Plants in Real Applications in EU • Virtual Power Plants, Real Power • Balancing Energy in German Market Design • Integrated DER Pricing & Control • GWAC TE Workshop Proceedings • New utility business models: Experts predict the 3 stages of our evolution • Electric Utility Business Models of the Future

	• German energy consumers transform into local energy providers • Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide • Southern California Edison's Approach to Evaluating Energy Storage • Pricing & Controls
Workshop 2B	**Transactive Energy Functional Requirements** **Jeffrey Taft, Cisco, Moderator** **Ed Cazalet, TeMIX Inc., Speaker** **Ron Melton, Battelle / Pacific Northwest National Laboratory, Speaker** This session will focus on exploration of the high level requirements for Transactive Energy implementations, building on the plenary presentations, architectural considerations from Session 2A and the pre-workshop draft Transactive Energy Framework document. The session will be interactive, with participation by attendees greatly encouraged. Discussion Questions: 1. Requirements a. What are the market forward and spot transaction requirements? b. What are the requirements for regulatory oversight of transactions and market structure? c. Do we need clock sync for transactions? d. Do we need synchronous transactions, asynchronous transactions, or both? e. What are the electronic communication requirements for market participants? f. What is the essential relationship between electrical and information flows for TE? i. How closely should these topologies correlate? ii. How is information about current and desired future electrical flows expressed and communicated? 2. Challenges and opportunities related to implementation a. What are the key constraints? b. How should we incorporate requirements for stability, observability, controllability, scalability, federation, disaggregation, constraint fusion, coordination? c. What theories, tools, and other available starting points exist now? d. What are the open issues? **Background Materials:** • A Foundation for Transactive Energy in a Smart Grid World • Standardization of a Hierarchical Transactive Control System

	• Ultra Large-Scale Power System Control Architecture • Transactive Device Architecture and Opportunities • Understanding Microgrids as the Essential Architecture of Smart Energy • Grid 2020: Towards a Policy of Renewable and Distributed Energy Resources • Energy Interoperation Version 1.0 • Green Button
4:45pm to 5:00pm	**Closing Comments - Progress Towards a Framework** **Ron Melton, Battelle / Pacific Northwest National Laboratory, Speaker** **Mark Knight, CGI, Speaker**
5:00pm to 6:30pm	**Evening Reception**

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Friday May 24, 2013

Morning Plenary	
7:00am to 8:00am	**Arrival and Check-in**
Keynote Speaker	
8:00am to 8:55am	**Our Changing Grid** **Jon Wellinghoff, Federal Energy Regulatory Commission (FERC), Speaker** FERC Chairman Jon Wellinghoff will provide a view of challenges that transactive energy or other approaches must address in the power system of the future.
Plenary	
8:55am to 9:40am	**Implementing Transactive Energy: Lessons Learned and case studies** **Terry Oliver, Bonneville Power Administration, Moderator** This panel will review progress in several project implementing transactive energy techniques.
9:40am to 9:55am	**Break - Exhibits Open:**
9:55am to 11:30am	**Enabling Cyber-Physical Infrastructure**
Workshop 3A	**Enabling Cyber-Physical Infrastructure (Theory-Grid Integration)** **Erich Gunther, EnerNex, Moderator** **Gordon Matthews, Bonneville Power Administration, Speaker** **Ali Ipakchi, Open Access Technology International, Inc. (OATI), Speaker** **Paul De Martini, Newport Consulting Group LLC, Speaker** In its simplest form, the overall architecture of the grid can be seen in three easy steps or domains – Make, Move, and Use. In a transactive energy ecosystem, there are numerous components that must work together to achieve the overall objectives of such a system. These components include numerous grid components – centralized and distributed energy sources, transformers, transmission and distribution lines and support structures, switching equipment, sensors, control systems, protective relays, energy storage devices, residential/commercial/industrial consumer distribution systems, energy consuming devices, energy management systems and more. The architecture includes two cyber-physical networks – the electrically connected network and the communications networks necessary to monitor and control it. When the grid was first instantiated, there was no communications network of any kind so the grid was architected to perform its primary function with highly optimized local control to protect equipment and support safe operation of the grid. As the grid has evolved, an increasingly pervasive communications network has emerged to support the ever increasing demands on grid infrastructure and ensure the continued safe, reliable operation of the grid as a system of systems. As we evolve the grid further to support the concepts and goals of transactive energy, we must transform the cyber-physical elements of the grid. New sensors, actuators, distributed and centralized control elements not necessary for the traditional operation of the grid must

	now be deployed. Existing systems (a.k.a. legacy) must be pressed into service to support applications they were not originally designed to support. These devices and systems must support information gathering and automation in a manner that is much more flexible than has been needed for operating the traditional grid. Specifically, key architectural principals of asynchronous information exchange, disengaged data, staged data filtering and pruning, layered and loosely decoupled system interactions are key to achieving that flexibility. **Discussion Questions:** 1. NIST developed a reference model for interoperable information exchange to support grid modernization related applications. Is this model flexible enough to accommodate the concepts in play for the ultimate transactive energy vision? 2. Although we have several early implementations of transactive energy like systems the infrastructure being used is generally repurposed from other traditional power system and information technology applications. Are there specific requirements for the ultimate implementation of transactive energy that require new infrastructure elements not available today? 3. Transactive Energy is a highly distributed application involving local decision making but broad information sharing and market participation. What actors (organization entities, systems, devices) are responsible for ensuring that the cyber-physical infrastructure is managed, monitored, secured, and maintained to ensure that the system as a whole operates and supports its evolving needs?
Workshop 4A	**Transactive Energy End-to-End with Emphasis on Facility to Grid** **Mark Knight, CGI, Moderator** **David Holmberg, NIST, Speaker** **Farrokh Rahimi, Open Access Technology International, Inc., Speaker** This session focuses on End-to-End elements of the TE framework. It specifically focuses on Facility to Grid scenarios but does this by looking at various end to end elements across different components of the traditional energy system from consumers/prosumers to distribution to bulk power operation and markets. The term facility covers a broad range of potential entities from a residential household to a smart commercial building to a campus with many buildings. The common attributes that any facility has in this context is that it has multiple intelligent components/agents that are responsible for managing energy either directly, or indirectly through management and analysis of energy data, including consumption levels, prices, etc. As such these components form part of a control system for the facility that in turn interacts with external transactive energy elements across distribution and/or transmission systems. These interactions are influenced by a number of factors that represent a classification of issues that cut across all layers of the of the Transactive Energy Framework that need to be focused on (Technical, Informational, Organizational) in order to understand the constraints and enablers of TE. The end-to-end perspective provides a high-level view of the TE landscape. As we now look to the future and focus on the impacts of Transactive Energy, where a mature transactive grid, comprises optimization and control that is coordinated and distributed but largely decentralized and is associated with the parties, devices and systems that use and comprise the grid and where transactions can be designated as either financial or physical, it is time to take a closer look at the cross-cutting issues, from the perspective of how they impact Facility to Grid transactions. **Discussion Questions:**

	1. What does the grid need from buildings? • From the point of view of the bulk power system (generation and transmission)? • From the point of view of distribution systems? • From the point of view of other buildings - what do they need from each other relative to their interaction with the grid? Possible dimensions of the answers: • Responsiveness - how fast?, Automated?, Magnitude? • Storage - what type?, what size?, what charge / discharge rate? • Generation? 2. For the needs, what is the value to the grid if the need is met? Dimensions include: • At what point do these become valuable if not financial? • What are the non-monetary benefits or benefits yet to be monetized such as security, resiliency, reliability, etc.? • Relationship to facilitating integration of renewable generation / acceptance at large scale? Background Materials: • Transaction-based Techniques for Bulk Power Operation Will Be Useful in Distribution
11:30 to 1:00pm	**Lunch Plenary - Implementing Transactive Energy** **Terry Oliver, Bonneville Power Administration, Moderator** **Steve Wright, Stephen Wright LLC, Speaker** Lunch Keynote: Steve Wright, former CEO and Administrator of the Bonneville Power Administration, will talk about the need to clearly establish the business case and to organize research around the topic of deploying transactive energy approaches within the electric power system.
1:00 to 2:30pm	**Workshops**
Workshop 3B	**Enabling Cyber-Physical Infrastructure (practice-Implementation Elements, M&V)** **Aaron Snyder, EnerNex, Moderator** **Chris Knudsen, AutoGrid Systems Inc, Speaker** **Gordon Matthews, Bonneville Power Administration, Speaker** **Shawn Chandler, Portland General Electric, Speaker** In its simplest form, the overall architecture of the grid can be seen in three easy steps or domains – Make, Move, and Use. In a transactive energy ecosystem, there are numerous components that must work together to achieve the overall objectives of such a system. These components include numerous grid components – centralized and distributed energy sources, transformers, transmission and distribution lines and support structures, switching equipment, sensors, control systems, protective relays, energy storage devices,

	residential/commercial/industrial consumer distribution systems, energy consuming devices, energy management systems and more. There are a significant number of elements necessary to achieve interoperability among all of the grid components and actually implement the application set that defines transactive energy. Key among these Cyber Physical Implementation Elements are enterprise management system components including enterprise networks, databases, data warehouses, application servers, network management systems, cyber security appliances, and more. These devices and systems must interact with the grid communications network, grid equipment and systems at well-defined points of interoperability. In the cyber physical context, these well-defined points of interoperability involve selecting, documenting and standardizing the technologies used to implement the basic connectivity (e.g. Wi-Fi, 100BaseT, RS-232), network (e.g. TCP, IPv6, SSL) and syntactic (e.g. HTML, XML, SOAP) interoperability levels of the GWAC stack. The use of widely adopted, standardized technologies in these layers is critical to achieving seamless interoperability at the lower levels of the GWAC stack which permits achieving seamless interoperability and application "workability" (it just works) at the higher levels of the stack. A disciplined requirements discovery process is required to select which standards should be used for various application contexts.
Workshop 4B	**Transactive Energy Applied to Buildings / Facilities Energy Management** **Tony Giroti, 1Efficiency, Inc., Moderator** **Kenneth Wacks, Home & Utility Systems, Moderator** **George Hernandez, Pacific Northwest National Laboratory, Speaker** **Ron Ambrosio, IBM T.J. Watson Research Center, Speaker** This session focuses primarily on the application of Transactive Energy techniques and capabilities within buildings / facilities. These buildings can benefit from Transactive Energy, both as stand- alone structures, and as part of a collective such as a campus or neighborhood and additional revenue from the grid. This session sets the stage by first discussing the value to the building community of interoperability and the application of the GWAC stack. This will be followed by real examples of Transactive Energy scenarios where equipment within a building, such as an updated HVAC and chiller, can interoperate with other building devices including a building automation system and onsite generation(such as PV, backup generation, CHP, etc.) and storage (such as thermal or electric) using transactive techniques to improve overall cost effectiveness. A building with this capability might participate in responsive demand (peak demand and generation following) and dynamic grid services (e.g., volt/VAr support, frequency) to generate a significant savings and potentially new revenues compared to day-ahead DR. Buildings can be aggregated via transactive systems to balance loads on the rooftop units resulting in overall savings and reduced costs. This session will include three stages of discussion. First the panelists will summarize current and future activities related to the application of transactive techniques in buildings / facilities. These presentations will describe a future class of building technology. Then, a panel of vendors will be asked to explain briefly how their products and services might support such a future vision. Finally, the entire audience will be invited to discuss the application of Transactive Energy techniques as an integral part of building technology. **Background Materials:** • The Smart Greenset Grid,' IEEE Spectrum, May 2013, pp. 43-47
2:30 to 3:00pm	**Break - Exhibits Open**

3:00 to 4:00pm	**Framework progress reports and summary: next steps** **Ron Melton, Battelle / Pacific Northwest National Laboratory, Moderator** **Paul De Martini, Newport Consulting Group LLC, Speaker** **Knight, Mark CGI, Speaker**
4:00pm	**Adjourn**

Background Materials

Resnick Institute Report, Grid 2020 Towards a Policy of Renewable and Distributed Energy Resources

http://www.gridwiseac.org/pdfs/grid_2020_resnick_report.pdf

Cisco Paper, Ultra Large-Scale Power System Control Architecture

http://www.gridwiseac.org/pdfs/cisco_control_architecture_white_paper.pdf

Organizers

The Conference and Workshop is organized by the GridWise® Architecture Council as part of its mission to further the advanced thinking about the guiding principles, or architecture, of a highly intelligent and interactive electric system.

Steering Committee
Ron Melton, PNNL, GWAC Administrator
James Mater, QualityLogic, GWAC Member
Ron Ambrosio, IBM Research, GWAC Past Chairperson Emeritus
Paul De Martini, Newport Consulting, GWAC member
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