Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

GWAC members:

David Forfia, Director, Enterprise Architecture & IT Transformation, Electric Reliability Council of Texas (ERCOT)

Ron Ambrosio, Chief Scientist, Utopus Insights

Ron Bernstein, President, RBCG, LLC

Doug Houseman, Grid Modernization Lead, Burns & McDonnell

Tom, Sloan, State Rep., State of Kansas

Online Participants

Tanya Barham, Director of Operations, PECI

Gerald R. Gray, Technical Executive at the Electric Power Research Institute (EPRI)

Stephen Knapp, Vice President of Quality Assurance & Energy Markets

Farrokh Rahimi, Senior Vice President, Open Access Technology International, Inc. (OATI)

Heather Sanders, Special Advisor, CA PUC

GWAC Associates:

Gordon Matthews, Technology Innovation, BPA

Jeff Morris, Principal, Energy Horizon Corp.

Chris Villarreal, President, Plugged in Strategies

Online Participant
Leonard Tillman, Partner, Balch & Bingham, LLP of Birmingham

Members Not Present

Paul De Martini, Managing Director, Newport Consulting Group, LLC

James Mater, Co-Founder and Director, QualityLogic, Inc.

Lorenzo Kristov, Principal, Market & Infrastructure Policy, California ISO

Guests

Mike Beehler, Burns & McDonnell
Aaron Snyder, EnerNex

Joseph Paladino, US DOE

John Caldwell, EEI

Natelle Dietrich, MPSC

Marcus Hawkins, OMS (online)

Matthew Klucher Arkansas PUC

Online

Dave LaVee, PwrCast

David Wollman, NIST

David Katz, Smart Energy & Sustainable Business Consulting, Toronto

Chris Underwood, Burns & McDonnell

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

PNNL Support:

Ron Melton, outgoing GWAC Administrator
Mark Knight, incoming GWAC Administrator
Susie McGuire, GWAC Coordinator

GWAC Emeritus Council Members:

Ken Wacks, Home, Building & Utility

Announcements

David Forfia, Chair, opened the meeting

Ron Melton reviewed upcoming meetings.

Chris Underwood with Burns & McDonnell gave the opening remarks and safety tip for visitors.

Ron Melton, who has announced that he is stepping down as the GWAC Administrator, gave a brief overview of the history of the GWAC, which began in 2004 with Steve Widergren as the Coordinator. He then graciously introduced Mark Knight as the new GWAC Administrator.

Mark Knight thanked Ron for his many years of leadership of the Council, and presented him with a "high precision optics device" to help him spot problems from at least three months out.

Mark noted that his meeting presentation is out on the GWAC SharePoint site and encouraged everyone to use the site for GWAC meeting documents.

Mark presented slides to show what national labs are involved in the DOE GMLC projects and he noted that he does have presentations on all the projects on the list. These can be accessed from SharePoint.

Ron Bernstein also sent the group the DOE GMLC link via email as another source of this information.

Mark Knight went on to review the new Cordova project which will focus on the microgrid located in Cordova, Alaska.

Next, Mark reviewed Interoperability progress. Recent efforts include two workshops, a paper on roadmap methodology IMM, the most current steps toward model procurement language and the vision paper.

He asked that any GWAC participants who are interested help him to create a summary statement that captures the objectives of the Vision Document which is over 100 pages in length.

Mark noted that the Interop project will hold a workshop on the vision document soon.

The IMM effort is working to integrate the IMM with the GMLC interoperability roadmap, to shorten the roadmap, and to simplify interoperability criteria and determine the timing of the criteria within the roadmap. Each criteria should represent 1 concept.

Gordon Matthews asked about simplifying the Interop criteria, and asked if cyber security "baked" into the criteria. He suggested starting at a minimum with a cumbersome structure that would still provide a level of cyber resilience in the foundation of Interoperability. But to keep it simple at the start and become more complex as the project progresses.

Mark rephrased this by saying that cyber security should be designed in from the beginning. He referred to an example of a project that he worked on in the past. If you build it in at the beginning you have it from the ground up..

Mark Knight led a discussion on Interoperability Procurement language. He noted that use of a specific set of terms and language could help us improve interoperability adoption by the industry. The main goal is to facilitate interfaces between applications. He also noted that SEPA has two committees also working on this topic.

Ken Wacks asked about utilities, he had a concern that if the language was too prescriptive that vendors might be held back from innovating. He asked if this would still allow customization.

Doug Houseman asked if the language would support multiple customization options. Mark Knight noted that the intent is to create opportunities to innovate and also to have standards at the same time.

Doug Houseman noted there could be issues with reclosers and controllers.

Tanya Barham said that a motivated vendor will follow the wishes and desires of their customers. She feels it's important to drive standardization from the top down. Doug Houseman agreed with Tanya.

Ken Wacks noted that we need flexibility and room for API.

David Forfia noted that publishing something, even though not yet complete, gives you a stake in the sand.

Doug Houseman said what is needed is a "how-to" on creating an application in a specific protocol for various projects. Specifically, if a standard includes optional components, the project should offer guidance on how to deal with these situations.

Ron Bernstein noted that the model has been instructional and verifiable as well as providing the why. This would give vendors guidance. It would get all teams on board with some background.

Break

GMLC Interoperability Project Collaboration

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

<u>David Wollman, NIST Framework update</u>

The NIST SmartGrid framework, most current Version 3 was published a couple years ago. NIST is planning to refresh the Framework as Version 4 and this will be led by Avi Gopstein. They are right now identifying where changes for release 4 are needed. Economic operations and cyber security are considered very important. Internet of Things, IoT, and physical systems are also noted as a key focus.

The framework is meant to be an analysis methodology in the area of smart grid. Changes in the distribution system are one methodology. Resiliency, and community resilience activities will be addressed.

Tanya Barham noted that as a regulatory person she would now would like to be included in the offline conversation with Mark, Tom and Chris.

Ron Melton talked about the vision paper history. A fully functional interface is the goal. The vision would paint a picture of what our objective is and what type of the integration result. Doug Houseman asked about test cases being included.

TE Roadmap Finalization

Ron Melton noted that there were some fabricated scenarios in the first work. He confirmed that they are applying this in terms of the roadmap and IMM.

Action: Ron Melton would like to have a committee to help get this done in the remainder of this calendar year. Steve Widergren, Aditya Khandekar and Ron, Melton are working on it now. So they are hoping to have a document to circulate to those interested in the next four weeks as a review committee. Ron Ambrosio, Ron Bernstein, Doug Houseman, Ken Wacks, Gordon Matthews and also Mark Patterson, Tanya Barham, Steven Knapp, David Forfia and Chris Villarreal all volunteered to be on this committee. Ron Melton and Mark Paterson will talk about this at the VPS2 meeting next month.

Ken Wacks asked what will motivate companies to add value. Ron referenced a document that tries to note the positive cost – it's related to this and he will send it out. **Action: Ron Melton to send out a document.**

Ron Bernstein and Doug Houseman noted the need for providing definitions and other educational tips for a more broad audience. Ron Bernstein suggested an appendix or glossary of terms.

Mark Knight noted that there is a glossary in the document but some terms and acronyms are not in so it needs to be expanded. Ron Ambrosio suggested keeping a shared document where contributors can continuously add terms in real time. Ron Bernstein suggested that the document should include hyperlinks for technical terms to make it easy for people to check the definition quickly. Gordon Matthews suggested capitalizing those terms to indicate that the word is in the glossary. Mark Knight said he will updated the references and amend one core concept.

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

Chris Villarreal commented that the assumptions about aggregators in the TE Roadmap are affected by the assumptions. Possibly need a stage 0. He noted that DSO's – are there assumptions as to what is a DSO and what does it look like? He also noted that with DSOs that there is a risk of conflating the two (functions and the platform) so need to be sure they are considered and how they roll in. He also noted the need to explain the role of regulators. He also noted that bulk refers to wholesale regulatory markets.

Mark Patterson said he would try to get back to Mark on the TE Roadmap. He had to sign off.

Action: Mark Knight said that he would send Mark Patterson a copy of the document.

Farrokh Rahimi asked about the definition of an aggregator and does it mean everything must go through an aggregator? The word in the context of Transactive Energy should maybe say distributed energy resource.Mark Knight said that perhaps they would exchange the word aggregator with DER.

Doug Houseman noted that the NARUC definition is different. He and Chris Villarreal had discussed the existence of two definitions, and these vary by state. Mark Knight would like to have this document out on the GWAC website by the end of next week.

Action Mark: put the Roadmap document on the GWAC website

Mike Beehler, Burns & McDonnell

Mike opened with a recognition of safety in the energy industry and the importance of safety at this company. B&M is in the top 1% of safety. The company is owned by the employees. 50% of the company is millennials. Stock is bought back when employees leave. The company today has 5,800 employees.

Mr. Beehler commented that he is interested in supporting innovation. He gave the example of 3-D and noted the early resistance due to cost, and difficulty with early applications but now a decade or so later it is the norm. Likewise with 3 D printing.

Mr. Beehler cited many innovations from the company and its support for innovation and cooperation with major utilities.

Mr. Beehler and Doug Houseman took a moment to enhance descriptions of new innovations regarding transmission poles. Many are addressing the fires such as those recently in California. These innovations could notify operators when there is trouble and a pole is near falling so that power could be shut off. Also ways to prevent two wires from touching in the case of a structural failure.

He noted the need for fuel diversity and shared some insights from a meeting that he recently attended, and he gave some examples of new projects that the company is involved in.

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

Mr. Beehler noted that at the recent Grid of the Future meeting, cyber security came up as a key issue in the next five to ten years. Burns and McDonnell will want to be ready help their clients with this and other emerging issues.

The issue of Puerto Rico and Hurricane Harvey came up. Burns & McDonnell has people working now in these areas to restore power. He mentioned a book called "One Second After" which is a novel about the effects of a major power outage, and he went on to note the beneficial uses of drones in the assessment and repair of utilities in these affected areas. The company obtained permission to use them to expedite the process.

Mr. Beehler also briefly discussed current progress toward smart cities and the popularity of this idea to connect the basic infrastructure in various communities. There have been many grants given for this development with the idea that the innovations will continue on after the grants. Today's consumers are seeking a sustainable lifestyle. He noted that electric utilities have a great opportunity to lead these efforts. ATT and Verizon are wanting to build more 5G networks to support smart cities and Burns & McDonnell are planning to be a part of this effort.

Mr. Beehler ended by asking what the GWAC is expecting to see in the grid of the future. He also spoke about international efforts such as China and Japan. He commented about the need for potable water and for sewers for residential waste in many countries and the benefit that could be made for humanity as cities and communities become better developed. He thanked the group for their service to the community.

Regulatory Panel

Matthew Klucher with Arkansas Public Service Commission

Matthew gave an overview of investor owned utilities in Arkansas. There are 17 operations in Arkansas that have implemented AMI and they serve 499,000 residential customers. He noted the benefits of AMI such as remote meter reading, disconnections and reconnections, outage diagnostics, energy eff, rates and prepay options. He explained that their largest vendor serves about 50% of the state.

OG&E Residential rates offered include standard, demand, time of use, variable peak pricing. Customers receive texts regarding rate reduction opportunities. All have the same customer charge and seasonally differentiated rates.

Pre-pay programs can be offered with AMI. Customers can purchase energy in advance. Mr. Klucher gave a presentation of a customer bill and how it shows variable rates. The bill shows how the rate plan works. He noted that the commission has an active docket to address net-metering.

Doug asked about how the commissions views privacy in relation to major standards. Mr. Klucher said he could not comment on this because the law is pending. He said this could take a year for the

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

commission to decide. He gave an example of the process by explaining their approach to net-metering. He said they would reach out to stakeholders for their input.

Ron Bernstein asked about the use of renewable energy in Arkansas. Mr. Klucher said that solar is coming on but wind is not as viable in their area.

Natelle Dietrich, MPSC regulatory panel.

Ms. Dietrich reviewed regulatory findings by the commission in that while there are some issues there was currently no strong impetus to make any radical changes. She went over other decisions about rate setting modifications. The commission had requested a toolbox regarding AMI. Ms. Dietrich noted that the system has been modified somewhat but no sweeping changes.

She noted that Gov. Brighten of Missouri made a move to remove any unnecessary regulatory burdens. The group is taking input and comments on co-generation and net metering rules. Also, security practices including cyber and physical security are currently being implemented. Ms. Dietrich ended by saying that the commission continues to monitor and explore these issues. Those interested can send her their comments.

Marcus Hawkins, Organization of MISO States (OMS)

OMS covers 15 states, the city of New Orleans as wells as Manitoba Canada. Many of the groups are in different states of implementation. Mr. Hawkins noted that regarding DER, the organization recognizes that MISO doesn't have jurisdiction in the area of DER. If a state has an interesting docket related to DER they present that to the board.

They are hosting a training in January with NARUC and GMLC as well as with IEEE regarding new standards. They are focused on the transmission and distribution interface, and they are in the early stages of opening a dialogue in this area. In August, the OMF held a workshop on DER with stakeholders and members that they represent. From that a committee formed under the name "DERT." They (Distributed Energy Resources Team) will monitor activities at the MISO level regarding state policies and actions taken. He noted current activities in Minnesota and Michigan. He also said they are trying to monitor other states actions in the DER area.

Chris Villarreal noted that the Midwest region is represented by a OMS and that that only a few utilities in this area have AMI although discussions are underway regarding potential expansion. They are limited by concern as to the revenue earning potential and how regulators might deal with issues related to growth.

Mr. Hawkins noted that Lawrence Goldman from LBNL will visit next week and plan to discuss a future utilities model and are very interested from an OMF perspective. Ron Bernstein asked the panel for feedback on the GWAC.

Natelle Dietrich encouraged the GWAC to provide information to the commission in the form of documents.

Matthew Hawkins also said his commission wants to provide their customers with information about how to do more with less. Any information that GWAC could provide would be helpful.

Ron Melton asked if discussions on reliability and resilience are going on in light of recent hurricanes. Natelle said Dietrich said they work with FEMA closely and experienced a large event about 5 years ago in the form of a tornado which hit Joplin MO particularly hard. In the last year they hired a critical infrastructure engineer to address response and resiliency. They are taking steps to acknowledge this type of issue. They have changes proposed in the area of natural gas and water.

Matthew Klucher and Marcus Hawkins both noted similar activities at their organizations.

Doug Houseman noted that utilities have not been supporting research and development for decades. The sentiment was kind of a feeling that there was nothing new to learn. Matthew Klucher agreed and said there is lots of room for improvement.

Natelle Dietrich noted that her utilities have supported some solar and wind projects that are now starting to come on line in Missouri. They are members of SPP which is an RTO besides MISO.

Doug Houseman mentioned that there are interest free loans available for development if utilities can tap into it.

Chris Villarreal asked Marcus Hawkins about the Transmission planning function as a system becomes more distributed. Mr. Hawkins replied that on the Transmission planning side, the important thing is identifying the load forecast and where resources are coming from to help the RTO to make sure there is no double counting.

Gordon Matthews answered a question of Tanya Barham by saying that in the Midwest the level of penetration is still fairly small so centralized versus decentralized is not as much of an issue.

Natelle also replied that Missouri has an incentive act to drive growth in renewables but these are still being implemented slowly, and she said that in Missouri there are large industrials that would like to be fully sustainable in the near future, provided there were special rates for manufacturing and other industrial customers, it might spur development.

GMLC Interoperability Project Collaboration

David Wollman, NIST Framework update

NIST SmartGrid framework, most current is version 3 published a couple years ago. They are planning to refresh the framework and this will be led by Avi Gopstein. They are right now identifying where

changes for release 4 are needed. Economic ops and cyber sec are considered very important. IoT and physical systems are also noted as a key focus.

The framework is an analysis methodology in the area of smart grid. Changes in the distribution system are one methodology. Resiliency, and community resilience activities will be addressed.

Dr. Wollman and his colleagues are trying to educate NIST stakeholders in the aftermath of the recent gulf hurricanes. He referred the group to their website (link needed).

Dr. Wollman answered a question from Farrokh Rahimi by saying that if you look at the community planning guide there are some worksheets to use as a guide to establishing metrics in the area of smart cities. On monetizing value, such as Interoperability, that is being addressed but David doesn't have any documents to refer the group to at this time.

NIST has identified four key areas of trustworthiness. He also mentioned the upcoming NIST team challenge.

Farrokh Rahimi asked about blockchain. Mr. Wolman replied that from the smart grid side it's been looked at with support from a small grant and how regulators might look at blockchain. NIST is monitoring it but he doesn't have a lot to say on it as yet.

David answered Ron Melton on quantum computing and Googles activities in that area. He said this is being addressed at NIST as quantum techniques become available and it will affect the strength of crypto methods. He will try to find a link to some of this activity and send it to Ron.

Mark Knight thanked David and noted that he has some additional info that he will send to him on measuring and monetizing resilience. He also noted that the DOE GMLC is pursuing this and it would be a good topic for future GWAC events.

David Wolman noted that in the latest revision the metrics of resilience has come up and that there have been some interesting conversations on this topic.

Planning for TESC 18

Ron Melton led a discussion on the TESC 18. He gave a brief update on the administrative challenges to GWAC hosting this event.

Ron noted the support that SmartGrid Northwest and Portland General Electric have provided regarding fiduciary responsibility, venue and hospitality.

The venue should be able to accommodate about 200 attendees with at least 2 breakout session of 75 people. He also noted that last year the conference did a bit better than breaking even.

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

We are still working on the location, theme, partners and the call for papers. He reviewed potential partners one of which it was recently discovered did not work out. Others may be Portland and SGNW, Southern, Duke/EPRI, MIT, UT or UM. Another new opportunity might be Minneapolis, which Chris Villarreal and Ron have been discussing.

Ron noted that last year we had more industrial participants and the hope is to continue that trend. Some sponsors in that area could help increase the interest level of industry.

Our Canadian online participant David Katz asked if Canada could host. Ron said possibly in a future year. Aaron Snyder noted that most utilities cannot get permission to travel to Canada on business and Gordon Matthews agreed.

Doug Houseman suggested topics such as TE and blockchain, or IoT and IO might attract more industry. He said this would make Intel and others be more excited about the conference.

Ron Ambrosio suggested TE and IoT or TE and Technology.

David Katz said that Minneapolis would be a good location for him.

Farrokh Rahimi asked if we would stay with the June timeframe and Ron affirmed this.

Aaron Snyder suggested Indianapolis.

Thanksgiving was set as a target for having decisions made about TESC 18.

An organizing/planningcommittee was formed.

DAY 2, OCT 26

Meeting start time 8:40am

Mark Knight began the meeting with a review of the TE Framework and reminded everyone that the last update of the TE Framework was in 2014. He asked for volunteers to assist with editing the document.

Tom Sloan, Chris Villarreal, Jeff Morris are interested in working on sections 1 and 2.

Doug Houseman volunteered to work on any of them needed

Gordon Matthews volunteered for 2 and 4

Ken Wacks volunteered for Conceptual and Cyber Physical

Ron Bernstein volunteered for Conceptual and Cyber Physical

Farrokh Rahimi will work on the business model.

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

Mark Knight then referred the group to the **TE Framework** document located on both the GWAC website and the GWAC SharePoint. The group looked at 4.4.2, the TE Transaction train.

Action: Mark asked the TE Framework volunteers and others interested to make notes as they work on the TE Framework document about --how to create more clarity. If you have an idea for a graphic send it to Mark Knight.

Ken suggested that the frameworks standard. The standard includes graphics. Ken thinks that the frame work would fit into the standard. Ron Melton said that we are not trying to design the solution, and we want to refer to standards in the document but we want to use caution because this is not a design.

Ken Wacks agreed, he said this is a framework.

Ron Melton noted that there is some material that Steve Widergren has led at PNNL that designs the basic characteristics of a TE agent that we believe are necessary with any TE transaction. Mark Knight told the group that this is commonly referred to as the scenarios paper*.* He noted that a TE working group to build a conceptual model and to publish a paper through SGIP, would fit in. But he doesn't think we'd have a chance to complete the conceptual paper in time. He did think that John Caldwell's work on the TE Challenge as well as the TE Framework will help people to understand the document. **Mark Knight took the action to a note and follow up on that.**

4.3 Conceptual Architecture Guidelines

Ron Melton commented that this where Steve's work fits in, and Jeff Taft's. Ron Bernstein said this is where cyber and physical fits in without calling them out by name. Doug Houseman also said this is also similar to some documents from IEEE on decomposition.

Ron Melton said as we get more detailed, a diagram would help people see the logical and physical aspects. On page 26 the diagram, Figure 8, generated a lot of conversation. Ron Bernstein asked to take this conversation offline with a note to improve the diagram offline.

Ron Melton commented that if a diagram that applied the GWAC stack were to show the relationship between the four areas it could be used as a "you are here" indicator to help people to understand at a glance what is being discussed. It would be compressed to show the four chapters with a quick view of how what they are looking at relates to the rest of the document.

Tom Sloan asked who the audience is, meaning technical or more broad? Could we put in some simple explanations so that a less technical person could get some of the concepts? Gordon Matthews urged caution against going too far in that direction.

Doug Houseman asked if there are some lessons that we have learned. Can we insert a "Chapter 5," such as one on case studies and we could include what came out of them? We don't want to give a bias to anyone. We could provide some third party analysis for readers to review and draw conclusions

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

from. Ron Melton said that the appendix has two case studies currently but Doug asserted that this should be expanded and included as Chapter 5.

Jeff Morris said that there are no actual examples but if people are looking at the document as to how to put a document together we need to include some of the regulatory issues. David LeVee: The document lacks the conceptual overview, what are we trying to accomplish? Here are the incentives. We don't see programs being implemented because considerations of different decisions.

Ron Melton said that Chapter 4.1 and 4.2 are the policy and regulatory chapters. There has been a lot of work done on valuation since this document was published and so it doesn't reflect this. The utility of the approach to an economic based decision.

Jeff Morris said the REV model of New York has been looked at by a lot of regulators. And he said in 4.1 – there is an architectural and conceptual model, but that you lose people when you read the doc, if you are not going to be doing it in an interstate environment. Ron M said we can certainly include that kind of thinking in this document, and asked if he means where you are in the world and how to regulations affect you? Jeff Morris agreed, that yes, the regulatory market that you are building in.

Ron Melton said that since we have these subchapters that address this, maybe we need something so that as you have gone through these discussions there would be a "tying it all together discussion". Jeff Morris agreed with this.

Chris Villarreal said that this isn't a prescriptive document, and because of all the various structures in this country, we can only address 1 or 2. He also said that many markets, such as those that he works with do not follow the California or New York market structure so those constructs would be irrelevant to them. Some are vertically integrated and some are horizontally integrated.

David Forfia said we should also have a tool to say "if you are here and you want to go here' and maps out a path based on the readers objective.

Doug Houseman said that maybe we could create basic buckets where each state fits into a bucket. This would allow regulators to see how the construct works for their bucket. A pointer tool that could help the reader to find the place in the appendix that directs them to the appropriate construct quickly would be helpful.

Ron Melton also mentioned the Decision Makers Checklist. He believes that we need a tool that helps people to understand how the three documents work together and how to use them. Mark Knight reflected that by using the roadmap to illustrate something it would help people to use it. Gordon Matthews said that as the pioneers of this concept should we stay with the vanguard – we know that there will be future versions of this document. This isn't the last one.

Tanya Barham said yes we are learning from those who are proactive and seeing the beginning of things here.

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

Chris Villarreal said that many other states see California and New York as being out of control, and that they don't want to do what they are doing, but it is accurate that states will over time come to a point where they want to do something. So they will eventually ask how they should position their states to what they want to do.

Jeff Morris said a lot of utilities are public power and the state must explain things to them. People like himself and Tom Sloan. He suggested that if you are writing for people who are working with states you need to think about how to write a "how to for dummies" document. Heather Sanders expressed support for additional clarity "in English" to benefit a broad audience.

Distribution Systems Platform Panel

Joe Paladino, US DOE

His talk on the Modern Distribution Grid Report explained the purpose of the report which is based on where US power utilities are at this point. All documents that he mentioned are available on the web.

The DOE recognizes the varied needs of power providers and sees that most of them are in Stage 1, moving to Stage 2[1] as noted in his presentation which was sent out to the GWAC membership during his talk.

He noted a gap in DER control and optimization systems at this time. There are tools and standards in development but there are none yet to manage mixed resources.

Distributed Energy resources provide a lot of value to the grid. How we assess a grid and how it enables efficient processes are shown the slide Integrated Planning Considerations. In stage 2 we are looking at how we source. We have a new report coming on how we analyze sources and how we improve energy efficiency, and goes on to how we can set up tariffs to maximize this.

Emerging Grid Complexity: Each component has its own constraints and optimization objectives. The grid owner must manage many variables in buildings with DER capability. We need to design a system that can provide reliability and optimization objective for each component. This is highly dynamic. The grid owner must ask how can I design a cyber physical system and manage in a way that preserves optimization at a system level and at a local level.

Ron Melton explained that Architecture is not a design, it is a discipline. Refer to the Coordination slide – the green nodes are substations in the illustration. These are physical objects connected to the grid but they will connect to the grid as the aggregator determines. It has to behave in a way that respects the grid environment that it is in.

---

[1] LBNL-1003797, October 2015, Distribution Systems in a High Distributed Energy Resources Future: Planning, Market Design, Operation and Oversight

Transactive Grid Codes slide – the rule set is called transactive grid codes. In current microgrid code development leads to a discussion of grid codes. What are the transactive requirements among the separate owners of the grid?

Platform Considerations slide – The question that utilities are now moving forward is how to I build out that layer, and how do I communicate the changes with the stakeholders?

Timing and Pace Considerations – These should inform platforms that one utility could use with its customers. This is being done in Chattanooga TN. With a myriad number of capabilities that cites want to build up. How is it's pace and scale determined by policy and by consumer behavior? We want to help them to understand the pace and scale.

We are forming relationships with utilities and commissions. We want to do a deep dive on vol. 3[2] which lays out how you move forward. There are some serious questions to be answered still, such as coordination framework – the technology exists to enable optimization and communications but more is needed in the coordination framework area.

Ron Melton – Distribution System Platform (DSP)

Ron noted his use of the acronym DISCO.

Ron provides some examples of layering to show a clean separation of responsibilities. It is a well-developed concept. Each layer should have a clear description of the functionality. It shows economics as well as behaviors. He relates this to Joe Paladino's slide on coordination frameworks.

When the USACE designed controls systems for Army bases around the world they identified what was needed and then developed the concept of a mutli-tier model where the various elements can work with each other. We developed this model objective to provide the checks and balances of working with various entities IoT and Cyber as well as Ethernet platforms. We want to go open source and open standards. We have hired vendors to validate for us. We want to reduce change orders and to have clear responsibilities.

The Interconnection challenge is how to model information connectivity between devices, sub systems and systems.

John Caldwell - SGIP and NIST have business and regulatory models for TE. TE Challenge (Farrokh Rahimi, Paul DeMartini, Ed Cazalet)

I will show some recent work done by third parties, to show the different approaches as to how REV models might work and how these agents in the TE systems interact. Jeffry Price wrote a white paper earlier this year on business models. His basic concept is an eco-system, which as a

---

[2] https://doe-dspx.org/sample-page/modern-distribution-grid-report/

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

number of different species that all have to be there. You have some anchors such as utilities, they are basically at the center of the electrical systems. But there are others that pay significant roles as well.

Utilities will evolve into different roles over time and new players may emerge. Utilities will continue to exist but will take on new forms and functions.

He presented a slide that outlined four paths to prosperity, this slide would have been relevant 30 to 40 years ago. Now we are talking about behind the meter, large scale solar, etc. Now we even have home uses such as lighting, home warranties, even vegetation management. Many of these are not big revenue generators. Other enhanced data services are now being implemented.

On his business model choices and elements slide, we see that the market is moving from an asset based approach to a service based approach.

The slide on Volume/Value Continuum, was created by Paul DeMartini. This slide originally had more detail. When you talk about revenue, on the volume side you have a large margin per transaction and on the other side you have a small margin per transaction.

Paul did a paper on "Channel vs Network," a comparison. The profit comes from controlling transactions. But as we develop a network and bring in more players and performers, you get profit from being a facilitator. If you are a good facilitator, like Amazon and Netflix, then you do better in the network and are more profitable.

Amazon expanded the seller role as well as the customer. The seller links with additional sellers and the customers communicate with each other to provide feedback for future busying decisions by others.

His slide on the structure of the internet shows a separation of layers (tier 1, 2 and 3). He notes that the physical electric system is a network but is managed as a channel.

The states that have restructured and moved into grid modernization and transactive energy may consider more new options. Utilities that are not restructured have a long ways to go.

Utilities will probably never be able to completely depart from regulated cost recovery.

Tanya Barham told Joe Paladino that she appreciated the multi-disciplinary panel earlier in the day. She understood the Missouri regulator to say that their position is "if it ain't broke don't fix it – and it better be cheap." She then asked if consumers do matter and expressed a need to break up monopolies and move things along. She cited the example of New York, and asked how we can get other utilities to move to this model and how to get things moving quickly. Joe Paladino replied that there is pressure from the top and from the bottom. Technology is more available and consumers are changing their preferences. At the top we have pressure from national, state and local levels. PV is so readily available

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

in FL and as we see customers want to adopt it – this is pressure from the bottom to drive integration regardless of the policy.

Joe also noted that "modernization is happening"– municipalities are building out their networks. However, it's hard to go from asset-based to performance-based but there is are places doing it like Burbank and Chattanooga that have robust capabilities and economic capabilities. John Caldwell noted that he had a slide that he didn't bring that would have been perfect – it shows that new generations like these new things but others like electricity to be cheap and reliable.

Newer customers also want low cost and they want greener energy. There is a growing contingent that seeks more control over their electric supply and it becomes progressively easier. So there is a bottom up movement. Anyone with distributed energy resources wants to be an active participant to influence the market direction.

Doug noted that internationally a lot of consumers want level pricing with electricity and with telecoms. They want reduction of costs to make it worth their time to become engaged. Yes there are activists but if you look at surveys that have been done, they are 8 to 9% of residential customers.

Doug Houseman said that one problem in Hawaii occurs where people use solar on their roofs but they don't maintain it. Their expectation was to place it and forget it. Then they neglect the system until it is expensive to fix. Doug also found resistance from his own mom, she didn't want to program a thermostat, and she just wants to be comfortable.

He also noted that the cost to utilities to do minute by minute billing was hundreds of millions of dollars a few years back, it has come down but it is expensive. And new innovations have changed things – the systems that did convert left out communications.

Jeff Morris referred to Ron's presentation, behind the meter there are values that are symbiotic like a company providing charging stations for staff with electric vehicles. How to reduce the peak charges?

Chris Villarreal said that there are a lot of institutional barriers in place. It will take a lot of effort, time and willingness of parties to want to change this. He wondered how to mimic competition in a regulated market. He commented that taking utility apps and determining if they are cost effective and then move along is how things will likely proceed in many markets. Regulators interpret legislation. Monopoly has a substantial impact on legislation. The challenge is to make things more flexible to respond to consumers but also keep things cost effective.

Ron Melton gave the example of flexibility such as just happened in Puerto Rico with Tesla getting a children's hospital online with solar generating capability in just a few weeks. That showed a great deal of flexibility.

Gordon Matthews gave the example of the growth of email saying that smart vendors put AOL software bundled with new computers. This got so many new users that it led to the breakup of the Bell

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

companies. Someone will build the energy platforms to a large number of consumers for low cost. Over time there is fluctuation, the pendulum swings back and forth.

Gordon Matthews asked Joe Paladino, how utilities would deal with a problem like what happened in Germany that was the fault of poor inverters. He also commented that it could be a wild ride in the next few years. Joe agreed with Gordon, saying that what we hope for is a proportional, prudent staged deployment with the right pace and scale – we have to pick up a pencil before the shovel. No one has it figured out yet.

Ron Ambrosio feels that forward modeling and forecasting will need ample feedback and the more immediate the better. Also needed is weather based forecasting built into the system. He commented that modeling analytics integration doesn't get enough attention, stating that we need to understand what is about to happen to be able to build a system that will operate reliably and be economically feasible.

Ron Bernstein noted that we now have building automation systems, and next comes energy and operational optimization. In buildings for example, a university with a very large class might use analytics to schedule the room in the morning when it's cooler rather than in the hottest part of the day. On a larger scale a utility could use that type of information and then manage it. To scale from a campus to a city will require a new set of tools.

Farrokh Rahimi wanted to go in a more specific direction. He feels that there are some functionalities that need to be defined for platform users. We need to lay out some functionalities. He noted that on slide 5 of Ron's presentation he didn't see anything about security and he feels this element would be very important to the platform.

Ron Melton replied that he didn't mean to ignore security.

Joe Paladino commented that he had a similar slide, and he said the way participants coordinate is an important point. All the players who coordinate will need an elegant solution to minimize the number of connections or touch points. Each point is a spot where security could be compromised.

Chris Villarreal noted the importance of planning in regards to DSP.

Break

Ron Bernstein reminded everyone of the upcoming AHR Expo Jan 22 from 3 to 5pm will host a GWAC session. It is a joint session with CABA, GMLC, DOE SSL and LonMark. He is looking for a speaker and Doug Houseman offered to lead it. Ron noted that this session is expected to have up to 150 attendees most of whom are involved with buildings.

Future of GWAC

Doug Houseman commented that in the Grid industry there seems to be a generation gap. This affects TE and hosting capacity. He said that there are a lot of workers at his company who are his age and will be retiring soon and then there are a lot of people in their 20's, and not a lot in the middle. He said that he wonders who will guide this group when the older group retires, particularly regarding extreme events and the impact on the grid. Ron Bernstein agreed with Doug's assessment.

Mark Knight asked for new topical directions for the GWAC annual conference. Ron Bernstein brought up Cyber and Privacy issues. He noted these led to legal issues. David Forfia noted that privacy can bump into some political issues and it would be hard to discuss it without making recommendations. He also noted that legal issues get more complex with privacy policy along the border of two countries. Ken Wacks noted that Europe has some of the most restrictive privacy laws. Ron Bernstein noted that there are variances between Canadian provinces. Mark found the subject interesting but not a focus area of GWAC.

Tanya brought up resilience. Mark said that resilience is already bubbling up to the top given current interest expressed by the US government.

Dave LeVee expressed an interest in looking at the demand and supply side for the next twenty years, particularly with regard to price. Joe Paladino noted some papers that might be of interest to Dave and offered to provide links to them. Mark also had some materials that might work for Dave. He noted that cross cutting issues that came up with the GWAC stack are really where the rubber hits the road.

Action Mark: send papers to Dave LaVee

Mark Knight noted that adaptability and flexibility also would complement TE and resilience.

Chris Villarreal asked how does transmission and resource planning work together to increase resilience and reliability? He noted the importance of resource planning and load growth in the forecasting for load growth.

David LeVee asked if a good topic might be about moving away from power resources that are scheduled to be retired in the next decade (coal, nuclear).

Jeff Morris added that if we are looking at DER resources, when heard when he talked to coops in the northwest, who have some of the lowest costs in the country, they are looking at low costs for solar and wind and at least where he is, coal and gas capabilities are all scheduled to be retired in the next two decades.

Doug Houseman brought up the scenario of bringing a grid back after a disaster and said that what he does is to give the crews trucks and a clip board. Lots of hands and bodies are useful at first. But then as you get to work in the neighborhoods with just a few houses needing work, less big equipment is needed and instead communication between control centers becomes really useful. His group put

GridWise® Architecture Council

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

together some use cases but didn't get far. He thought more such use cases might be good to do in GWAC.

Joe Paladino commented that Florida power and light created an app for use on tablets for field crews. It uses AMI and it has made restoration efforts a lot more effective. It's tied to GIS and uses multiple data sources. It is an interop system platform. He noted that he has been working in the resiliency space for a long time and at what has been used by different groups. When it comes time to invest in improving resiliency the decision seems to become political. When driven by high cost, forecasting and prioritizing are the best investment options, he said what he would then consider is how large the scope could be. He noted that at that time, most decisions will be local decisions.

Jeff Morris said one of the most misunderstood things is cost capital and the return on equity. In his experience a big concern is how not to shift the cost to rate payers, this drives decisions.

Ken Wacks, the Liaison for ISO/IEC, reminded Mark Knight that their next meeting is in March, let Ken know if any docs will be ready by then. Please let him know. For international publication. Mark Knight noted that the roadmap is ready to go out for public comments.

2:44pm

David Forfia asked for a motion to close the meeting. Ron Bernstein gave the motion and Doug Houseman seconded the motion.

Recap of Action Items

Actions:

Interop Vision Finalization

- **Action:** Ron would like to have a committee to help get this done in the remainder of this calendar year. Steve Widergren, Aditya Khandekar and Ron, Melton are working on it now. So they are hoping to have a document to circulate to those interested in the next four weeks as a review committee. Ron Ambrosio, Ron Bernstein, Doug Houseman, Ken Wacks, Gordon Matthews and also Mark Patterson, Tanya Barham, Steven Knapp, David Forfia and Chris Villarreal all volunteered to be on this committee.

- **Action: Mark Knight said that he would send Mark Patterson a copy of the TE Roadmap document.**

- **Action: Mark asked the group to make notes as they work on the TE Framework document about how to create more clarity. If you have an idea for a graphic send it to Mark Knight.**

Face to Face meeting – Kansas City, MO
Burns & McDonnell World Headquarters
Meeting Minutes
Oct. 25, 26, 2017

- **Action Mark – potential SGIP paper**
  Ron Melton noted that there is some material that Steve Widergren has led at PNNL that designs the basic characteristics of a TE agent that we believe are necessary with any TE transaction. Mark Knight told the group that this is commonly referred to as the **scenarios paper***.* He noted that a TE working group to build a conceptual model and to publish a paper through SGIP, would fit in. But he doesn't think we'd have a chance to complete the conceptual paper. He did think that John Caldwell's work on the TE Challenge as well as the TE Framework will help people to understand the document. **Action: Mark Knight took the action to a note and follow up on this**

- **Action Mark: send papers to Dave LaVee**
  Background: Dave LeVee expressed an interest in looking at the demand and supply side for the next twenty years, particularly with regard to price. Joe Paladino noted some papers that might be of interest to Dave and offered to provide links to them. Mark also had some materials that might work for Dave. He noted that cross cutting issues that came up with the GWAC stack are really where the rubber hits the road.