GridWise® Architecture Council

Meeting Minutes

February 2021

GWAC Members

David Forfia, GWAC Chair

Kay Aikin, Introspective Systems

Ron Ambrosio, Independent Energy Transformation Professional

Ron Bernstein, President, RBCG, LLC

Ron Cunningham, American Electric Power

Gerald R. Gray, Sr. Program Manager, Electric Power Research Institute (EPRI)

Lorenzo Kristov, Principal, Electric System Policy, Structure, Market Design

Stuart McCafferty, President, GridIntellect

Aaron Snyder, Director of Grid Technology Consulting, EnerNex

Leonard Tillman, Partner, Balch & Bingham, LLP

GWAC Associates & Emeritus

Rahul Bahadur, Mgr. of Eng., VMWare, Inc.

Mark Knight, Burns & McDonnell

James Mater, QualityLogic, Inc.

Jeff Morris, Principal, Energy Horizon Corp.

Chris Villarreal, President, Plugged In Strategies

Ken Wacks, Home, Building & Utility Systems

GWAC Members and Assoc. not present

Tanya Barham, Principal, Community Energy Labs

Andrew Bordine, VP Energy Mkts & Innovation, Anterix

Stephen Knapp, VP Quality Assurance & Energy Markets, Power Analytics Corporation

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

Mark Paterson, CSO, Strategen

GWAC Guests

Fatima Amara

David Toquica Cardenas

John Chowdhury

Toby Considine

Larisa Dobriansky

Christopher Fleck

Michael Hammersley

Jaime Kolln

Seemita Pal

Hayden Reeve

Elizabeth Sisley

Aaron Smallwood

David Wollman, NIST

PNNL Support

Karen Studarus, PNNL Administrator

Susan McGuire, GWAC Coordinator

Ron Melton, PNNL Administrator Emeritus

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GWAC Administration

David Forfia announced a quorum was reached.

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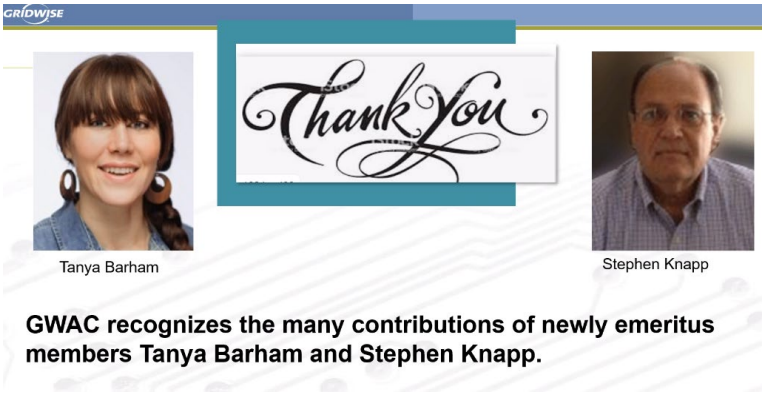
Karen Studarus recognized the many contributions of the GWAC class of 2019 to 2020. They are outlined in blue.

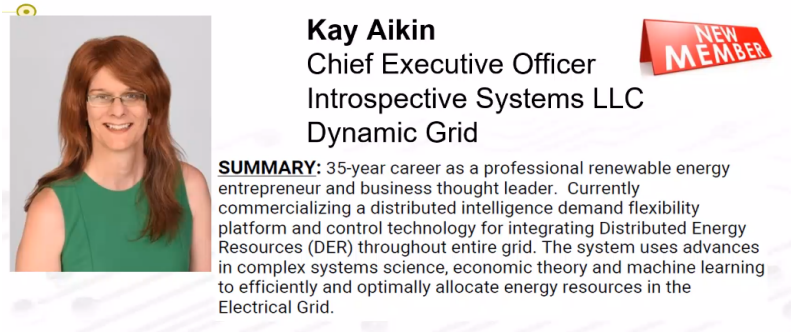
She called out the contributions of Tanya Barham and Stephen Knapp who will be moving to emeritus.

David Forfia also expressed his appreciation for the contributions of Tanya and Stephen.

Karen then recognized Kay Aikin as a new GWAC member.

Karen also recognized new GWAC member Ahlmahz Negash who was not able to attend today. A full recognition will be postponed.





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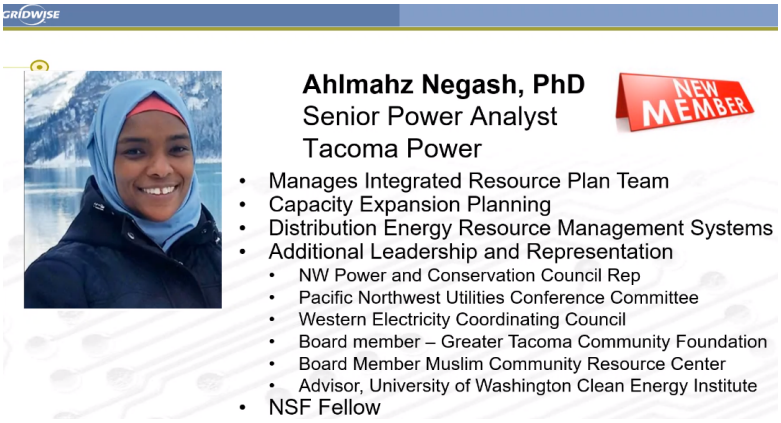

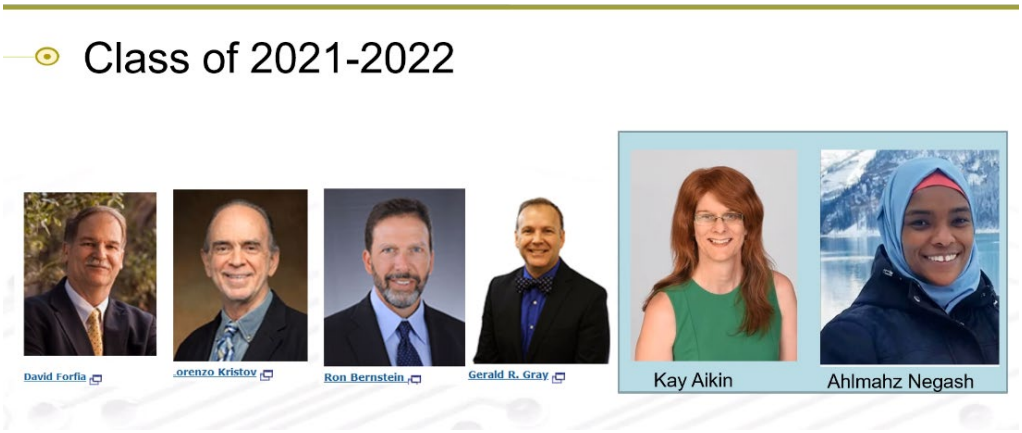

The class of 2021 - 2022 was recognized for staying on with the GWAC this year; David Forfia, Lorenzo Kristov, Ron Bernstein, and Gerald Gray.

Associate members and active Emeritus members were also recognized for their GWAC contributions.

Meeting participants recognized the new members with enthusiasm. Kay Aikin moved from GWAC Associate to a full voting GWAC member.

Ahlmahz Negash can't join us today but will be a regular attendee going forward. She is from Tacoma Power as a Senior Power Analyst. We will celebrate her addition to the group at a future meeting.

Karen noted that there were 30 participants on the call.

Lorenzo Kristov told the group that due to a conflict he will only be able to attend until 10:30am today. He commented on his deliverables for the new tasks that he took on including the task with Larisa Dobriansky and Chris Villarreal. He said things are moving forward although there is not much to report yet. But he has initiated contact with interested colleagues.

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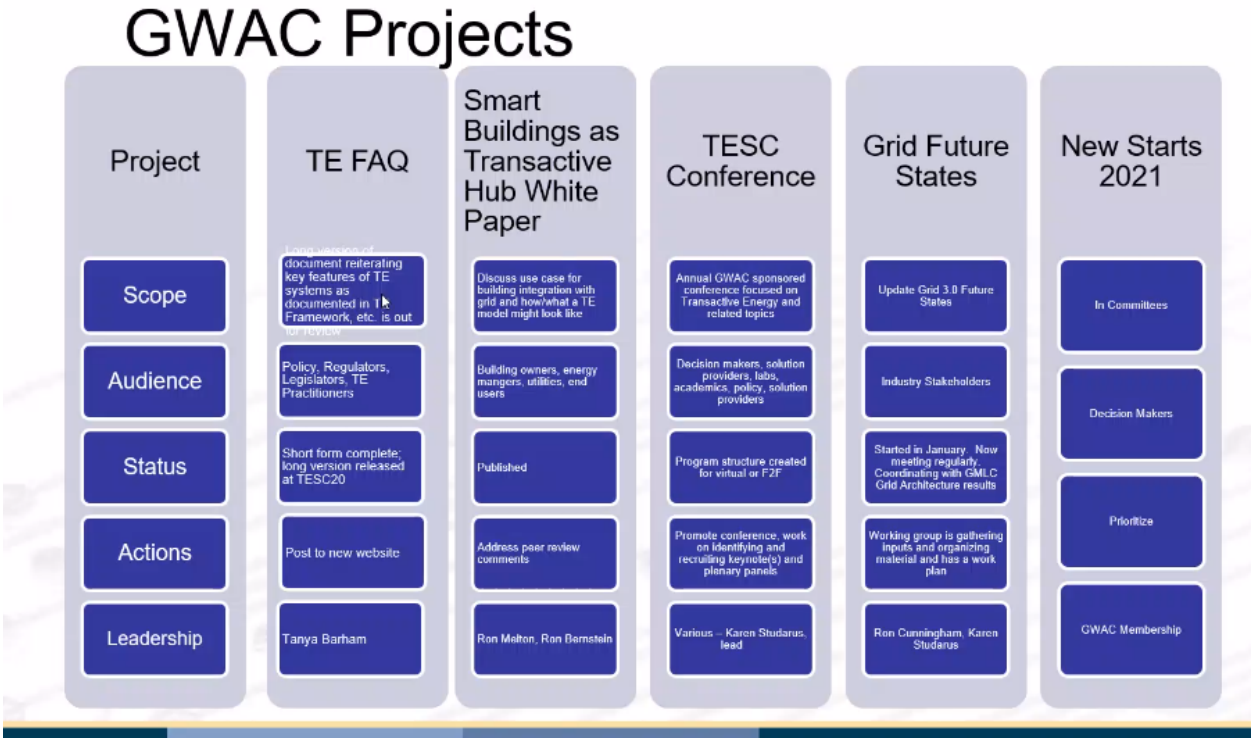
Karen and David asked for a motion to approve the January GWAC meeting minutes. Karen noted that edits had been received from Leonard Tillman and Farrokh Rahimi and the changes have been made to the master copy.

Karen asked if there were any other edits. Hearing none, David Forfia asked for a motion to approve the meeting minutes. Leonard Tillman gave the first motion and Ron Bernstein seconded the motion. With no objections the meeting minutes were approved.



GWAC Activities Matrix

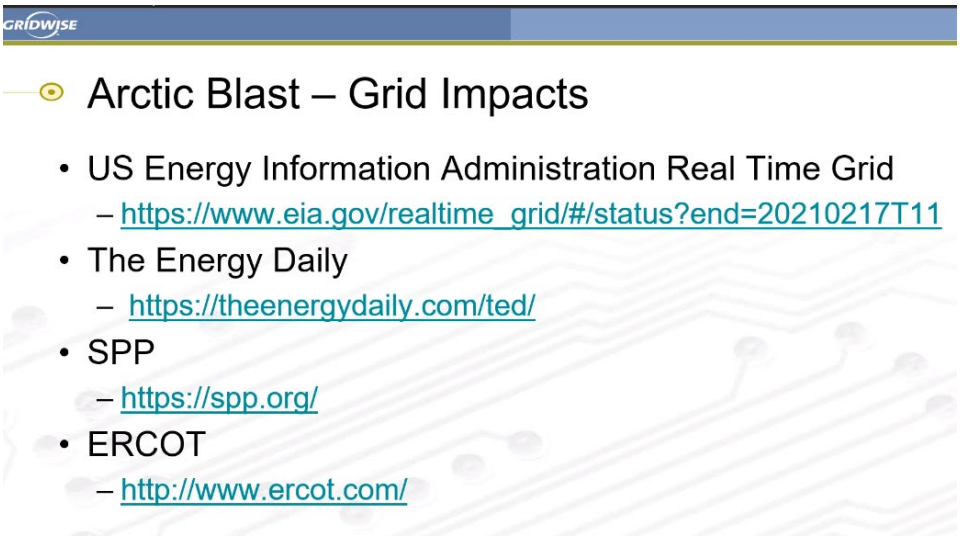
Karen reviewed the GWAC activities in progress.

SBATH is published and Ron B. said he is already promoting it; he noted that CTA and ASHRAE have picked it up in committees as a reference document.

Ron M. said that he and Ron B. will write an article based on the SBATH document for the IEEE Electrification magazine. Ron M. said that he had already committed to it. Leonard Tillman offered to help with it. Ron M. will locate the author guide by this publication as a starting point.

Action: Ron Melton to share the IEEE Electrification Magazine authors guide with Ron Bernstein and Leonard Tillman

Karen noted that TESC 2022 is on the GWAC Conference list and it is scheduled for May 2022.



Karen told the group that the current snowstorms in Texas are breaking records for cold and causing rolling blackouts. She said this event is very relevant to the GWAC and suggested that it is something that group should discuss today.

Gerald Gray said that related to real time grid, ERPI had worked with ORNL on the Outage Data Initiative (ODIN). This a standard format for sharing outage data. He said it is publicly available. The outage model is based on the CIM - Common Information Model; https://smartgrid.epri.com/ODIN.aspx

Ron Cunningham said he had worked on forecasting and load requirements for utilities in the past. He said they would try to find reliable information to forecast upcoming weather and markets. They would throw in extra capacity from a supply side to account for things. But over time the margin has gotten significantly tighter because there is a cost for that extra build to make ready. So then when severe weather swings happen there isn't much extra to be had. It becomes a gamble. This time both areas come up short.

Kay Aikin asked how we get beyond this problem and said that the consensus from feedback is that if we had more flex on the load side, the ERCOT system would have failed more gracefully rather than the blunt instrument of rolling blackouts. Kay said that TE could give better pricing signals to customers and that could help. This event could be a test bed as to how TE could make a difference to this type of problem.

David Forfia said he was at Austin Energy for 13 years running bucket trucks and then went on to ERCOT. He noted that ERCOT is an island by policy and connectivity. The state generates its own electrons. If you only have 600 generating units in the state and 185 of them are unavailable regardless of price, then things like rolling blackouts happen. There is not much flexibility. It is blunt. Some circuits can be turned off and some cannot. Some people's geographic position is an advantage in this situation such as being

on a two-way feed or being located near a hospital. He commented that the system is not fair or equitable and said to have more flexibility at the distribution level would be more fair. David also noted the asset owner has more influence on preparedness and policy makers; it's not the Grid Operator. Grid Operators don't have any control in this situation. ISOs often get the blame for what happens with the policy even though they have no control over policy.

David noted that at his first SGIP meeting, in March 2011, they discussed the interrelationship of gas and electricity and the impact of ERCOT rolling outages such as the one in 2011. Similar events occurred in 2011 and the outcome was very similar to this year. David said our job is to make people's lives better and to make sure these events don't happen very often. He said that outages are not fair and equitable. He said with climate change these events will continue. The more that GWAC can do as a community would benefit people and the Grid Operators trying to restore power after these events.

Ron Melton noted a good article in the NY Times today about the Texas rolling blackouts. Ron also reminded the group about grid reference architectures noting that high resilience architecture would be more of a graceful system as Kay noted and could provide architectural constructs that would address challenges such as what he currently has in Texas. As GWAC looks at reference architecture material - here is a great opportunity.

Gerald said these things are important. He saw numbers like 30 gigawatts from gas and 5 from wind that dropped in this event. This is about a third of their capacity. These are big numbers to try to mitigate. When you lose a third of your generators it is a lot.

Kay commented that Grid flexibility would not have solved the entire problem. With more flexibility it would have been better, but the problem would still be there. But it could have been more equitable and less traumatic.

David commented that units fail in clusters as temperatures drop and generation disappears. If it starts late at night such as with wind, that starts the cascade if other sources are not available. It's not one domino at a time. It is typically 10 dominos at a time in the same zone - a lack of grace as we discussed. This type of weather pattern causes a lack of grace - to go from $1000 to $9000 a megawatt. And prices increase - economics don't really work in that scenario. David said none of the systems are designed for this. You can get these big stair steps at a short interval. None of the systems are designed to handle this.

James Mater asked what technical architecture and policies could handle this situation? What could prevent people from being out of heat and light for an extended time?

David Forfia said that extensive DER would help. If you can handle things at the local level. Community aggregation at the distribution level could then take the buffer and slow down the effect.

James asked the group what would address it? Has this scenario been modeled out to assess what would address it?

Ron Melton answered that with Grid Architecture we might be able to do a logical model but not a detailed physical model. Grid Architecture work looks at structures and the relationships between the structures and how they can be put together to create flexibility and graceful degradation. Laminar coordination and all the things that you are familiar with it and the work we are doing is a part of it. It needs to be put into a context and looked at from the point of view as to how it could be put into an existing physical system that could be modified or if not, then a green field system. Then we can do some of the more detailed technical analysis to confirm that the structures provide the properties that we believe they provide and to be more focused on qualitative system approaches. He suggested that the council could do a case study such as this situation in Texas and show what could have happened instead. We could model potential structural changes and the resulting impact.

Jeff Morris was on a call last week hosted by Michael Kintner-Meyer and heard how different planning and intercoupling - state commissions need to focus on balancing substations on the distribution systems intercoupling and that balancing at that level up will give more resiliency. We need to have a DSO retail signal on those substations down to intercoupling. Right now, the commissions are in energy silos and not looking at it as outcome based. What can you do to provide capacity and ancillary services at the top? Right now, the commissions are in energy silos and not looking at it as outcome based. It flows into the conversation about top down or bottom up which is going to give more resilience. He stated that currently it is a silo situation.

Jeff said the talk was to the Western Governors Association and was focused on EV for the Rocky Mountain and Pacific Coast states.

Ron M. noted that Michael Kintner-Meyer has been updating an EV study that PNNL had done in 2010 so it could be results from that update. Ron doesn't think it is published yet but will be soon. Ron will find it for Jeff.

Action: Ron M. will talk to Michael and try to find a copy of the talk for Jeff.

Karen suggested getting a group together to look at what changes in policy and structure could be designed with the principal of greater flexibility in response to climate change and high variance conditions like this event in Texas.

In response to a question from Ken Wacks, Karen said she wants to use this experience to understand the system pieces that are usually invisible to consumers.

Ken Wacks suggested creating a list of what GWAC could do and presenting it to the DOE.

Kay said we could do this. One of the GWAC action items from last month is for the GWAC to produce more communications such as blog posts saying that this is a good time to connect such a widely visible problem to what GWAC does. Kay suggested that this needs to be timely such as with social media and then beyond that go to the DOE to ask how we can get more funding to look more extensively at this problem - how to get more flexibility can make a difference.

Ron A. agreed that Kay is spot on.

Gerald Gray said a blog post is just an opinion and people can take it or leave it.

James asked if grid flexibility and transactive systems are synonymous?

Kay said in her opinion they are different but TE methods can make a more grid flexible system.

Ron A. said he sees TE as a methodology that can be used to create more grid flexibility, among other things; it is a flexible methodology.

Gerald said that at a certain scale there is not a price point that can be delivered correctly; it is about recovering. The graceful failure point is the greater story.

Kay agreed that the greater story is that 30 to 40 % of people would not have had to lose their power because the other 60% of people would have lowered their load in a graceful way so that the existing 500 or so plants that were producing power would have been able to handle more of the people.

Ron A. said that in a newspaper article this morning he read that having meters that could clamp down on total power usage in this type of situation. But he doesn't see that as graceful - that sounds like a scissor switch that would cause an abrupt change. We ought to be able to do better than that and not have to throw the scissor switch.

Kay said let's give them candy instead of a sledgehammer - and Ron A. interjected "if we can act fast enough."

Karen asked if this group has the bandwidth to do a blog post in response to this event?

David said let's make it generic because the problem is a grid problem, not just a Texas problem. It is a multi-state event. He also said that he, Stuart McCafferty, and another colleague do regular blog posts on Energy Central. Their post for today will be on flexibility markets. It should be aligned with grid architecture; it should not be about specific solutions but on themes such as the high resilience architecture work on the GMLC.

Ken Wacks commented that the post should not claim that GWAC can solve the problem; but he said we can express an opinion.

Kay agreed.

David Forfia also said we don't want to recommend any policy changes either. Those would be out of the GWAC scope.

Toby Considine said he is a firm believer in TE. When we pay for services that we receive everything can be done on price. This situation was not solvable by price. He said this event was a situational awareness thing. If you know the hurricane is coming, you can charge your batteries. Batteries give a microgrid resilience. So, it is a resilience risk. We could say there will be a resilience risk next week; but we wouldn't say the price is going to be very high because the storm path may change; we don't know

for sure. There is another expression besides flexible, how do we communicate forward risk which is separate from risk?

David said the sales volume of generators at Home Depot could be the predictor.

Ron A. said that would be a lagging indicator.

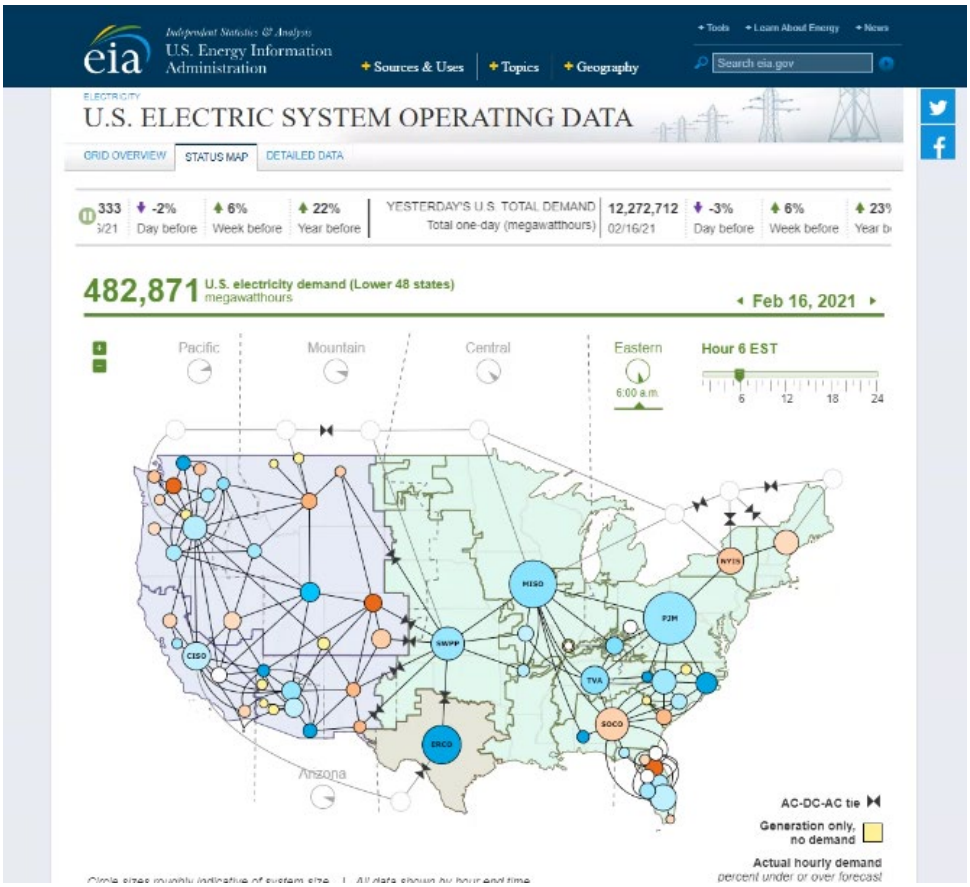
David said it would be a just-in-time indicator because people are shopping as the snow is falling.

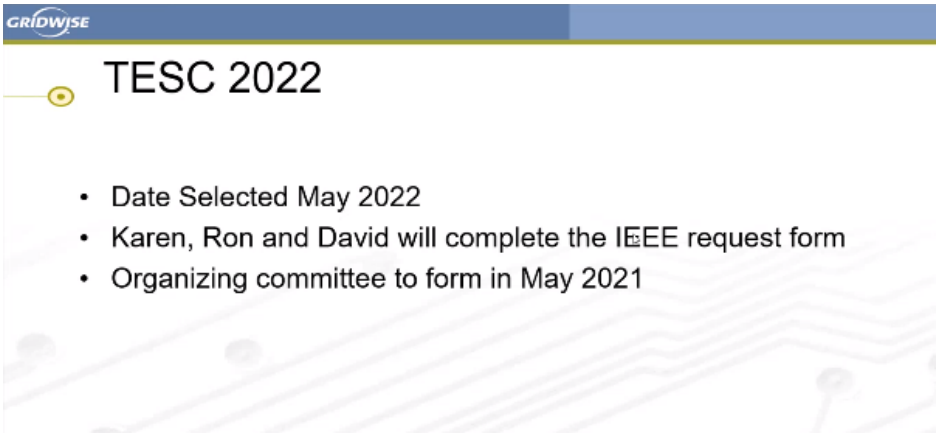
Karen noted that there seems to be interested in this message. We need a list of people.

Kay said she could edit the article but doesn't have the bandwidth to write.

Action: Karen will look at the chat at the end of the meeting on the blog post article.

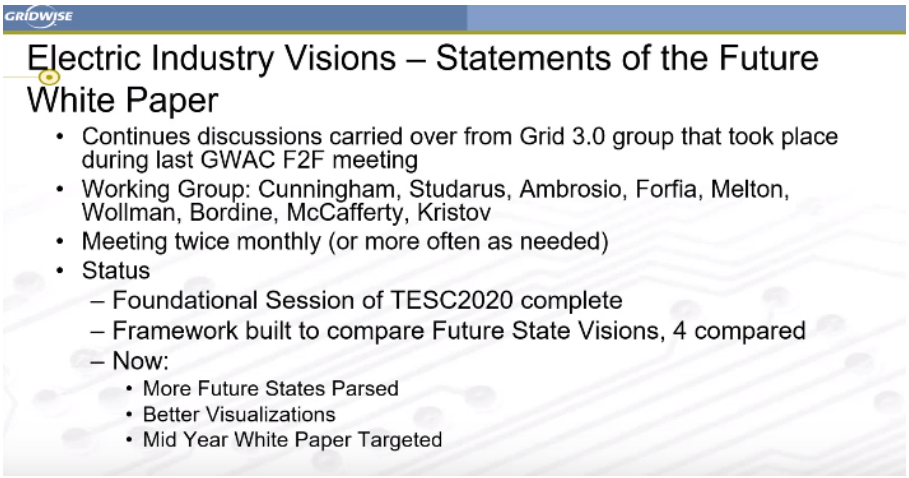
Kay and David said they would be happy to edit. Ron Ambrosio agreed to help.





TESC 2020

Karen Studarus noted that she is completing the IEEE request form. We have some time; the plan is to formalize the organizing committee this May.



Ron Cunningham gave an update of Statements of the Future white paper. On the last call the group discussed the development of visuals to better explain the future states representations. Several members of the group offered contributions. We will use parts of this discussion to get the message out. If any of the core team would like to help with the assessments, please contact him and Karen and they will get you involved. Comments received will affect the deliverables and messaging. If others would like to step in and help with these assessments, please let Ron C. or Karen know.

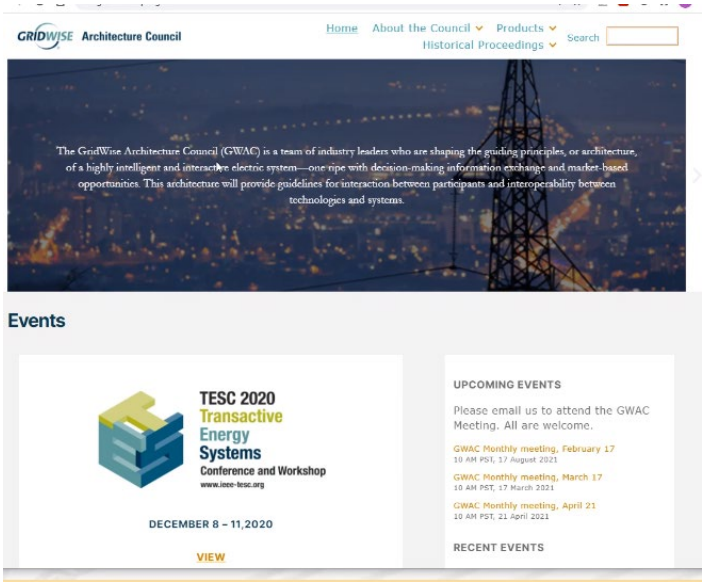
Leonard Tillman said he would like to help - please add his name to the list.

Action: Add Leonard Tillman to the Future States list for assessments work.

Other Pending Actions

- Action: Ron M and Gerry will follow up on synergy between architecture and EPRIs Use Case Capability Model and CIM usage in GridAPPS-D
- Action: Ron B., Ron M., and Farrokh Rahimi to discuss developing a paper based on SBATH for the ASHRAE summer virtual conference and for other uses in other locations.
- Website Refresh Demo
  - Coming soon
- TE FAQ long form – committee finished with their work, on gridarch.org, to feature on website. Feedback encouraged!

Gerald Gray confirmed that he and Ron M. met and discussed the CIM usage.



GWAC Website Refresh

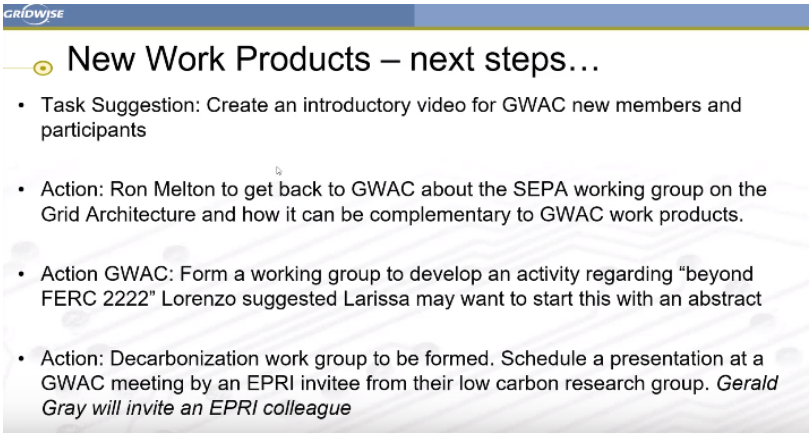
Karen showed the current website and commented on updates to the search feature. She also gave a brief view of the new site. The changes will be published soon.

Karen asked the group to send in any recent updates to their bio now, before the release.

Ken asked if there is a preview site?

Karen replied that a preview site is forthcoming. She will send the link out to the group when it is ready.

Action: GWAC members who would like to update their bio information on the GWAC website should send their updates to Karen and Susie in the new few weeks for inclusion in the updated GWAC website.



New work products - next steps

Kay Aikin said that due to connected communities' deadlines he won't get anything done before March 3, but he will be able to coordinate with Lorenzo on the Survey of Coordination. They will write a couple paragraphs on where to go with this idea. It is a survey of coordination among entities within Grid Arch regarding price, two-way, market clearing approaches toward TE systems.

Kay clarified that they were looking at what methods there are and to how make it clear. The intent is to show both strengths and weakness. They will build off a slide that Kay and Steve Widergren have used on coordination methods of electric grid systems. It's a survey of those and where they have been used. It is a high-level technical discussion.

Karen mentioned the potential decarbonization task. Tanya said she thought they were going to have a meeting later - after the 3rd of March. Tanya can help. (Group: Kay, Stuart, Tanya, and Larisa). Kay can't lead it.

Action: Karen will get the decarbonization group started with a meeting.

Gerald noted EPRIs participation in decarbonization and relative success. He will get the contact for that person; for now, he can be the interim point of contact.

Action: Gerald Gray to get back to Karen with an EPRI decarbonization contact name.

Tanya had to exit the call and the group expressed their appreciation for her many GWAC contributions.

Karen went through the other actions.

Ron M. will coordinate with the SEPA working group.

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There is continued interest in FERC 2222. Lorenzo and Larisa have been discussing this.

David will lead the social media effort to post 6 to 12 highlights this year such as the GWAC stack and other highlights.

David Wollman said he is interested in Digital Twin (chat)

Stuart had said he would lead Digital Twin. He would like to be involved with either digital twin or decarbonization.

Ron Cunningham said EPRI is doing some work on digital twin this year.

Ken asked if EPRI is doing applied modeling?

Gerald said that is what he is aware of. It is being worked on in the GIS space. Ron C. said that is what he was thinking.

Ken expressed some concern that this concept is not new. This started some group discussion.

Kay and Ron A. both said that digital twin is farther away from the mission of GWAC.

Stuart said this is what we discussed last month.

Karen said if someone does want to champion Digital Twin they can come back to the group with their idea.

Toby C. said he does attend meetings digital twin. He explained his view of it. He said it is a big area.

Mark Knight commented that digital twins rely on interoperability. He suggested a paper to explain digital twin and why they are or are not a focus for GWAC.

Ron B. said System Virtualization might be a better term and he agreed with Mark that it requires strong interoperability scope and definitions.

David said it may not be the GWAC mission.

Stuart suggested we table the digital twin at this time and focus on decarbonization.

The group agreed.

Karen said we are at the pen to paper part right now. We will do what supports the GWAC mission for now. She asked all the new task leads to document their ideas and bring them back to the GWAC for review.

Action: New Task leads develop an introductory paragraph or two and present to the GWAC for review.

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Liaison Reports

NIST - David Wollman said that the NIST Framework standards 4.0 will be available tomorrow. He posted an abstract and a link:

NIST Technical Note 2137 "Quantifying Operational Resilience Benefits of the Smart Grid" was just published (authors Cheyney O'Fallon and Avi Gopstein, NIST), and online at

https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2137.pdf

> Abstract: Automated systems for network protection, outage management, and restoration enable utilities to maintain service continuity through network reconfiguration even when confronted with a major hurricane. We employ a reduced form approach to evaluate the impact of interoperability investments on distribution system resilience and the propensity for customers to suffer sustained interruptions to their electric service during Hurricane Irma. This manuscript presents evidence that the expected number of interruption hours sustained during that hurricane was relatively lower for regions of the Florida distribution grid that made more interoperability enhancing investments, all else equal. We use advanced metering infrastructure penetration as a proxy and leading indicator of investment in interoperability enhancements. Employing only publicly available data resources, we conservatively estimate that Florida counties that made these enhanced interoperability investments realized nearly $ 1.7 billion of operational resilience benefits in the form of avoided customer interruption costs during Hurricane Irma.

ISO/IEC Ken Wacks -

ISO/IEC Ken Wacks - commented that the committee is expanding a family of more than 50 standards and technical reports for home and building systems with standards for the gateway, cybersecurity protection of data, privacy, and safety, device interfaces, communication protocols, an application platform, and guidelines for product interoperability. Also, there is a new focus on AI applied to energy management and a new position paper on ethics and AI.

The next set of virtual ISO/IEC meetings will begin Monday May 17 on zoom for a two-week period. Sessions will be 3 hours. Meeting times will vary from morning to evening to accommodate a variety of schedules. Anyone interested in attending should contact Ken Wacks.

SEPA- Aaron Smallwood - the Regulatory roadmap for vehicle to grid integrity was released just before Christmas. The episodes have been aired on TV. They have been looking at doing a paper on EVs in-depth. They also published a paper on managing high levels of DER. SEPA held a peer review committee to do lessons learned on managing DER.

They also recently released a paper on utility business models - it was a joint effort with some other groups.

Aaron said he is looking forward to presenting a technical project that SEPA is doing at a future GWAC meeting.

He also noted that SEPA is hiring for a principal of regulatory and business innovation. The job description is listed on the SEPA website. Anyone interested is welcome to contact him directly.

Gerald Gray - EPRI: Gerald noted the EPRI decarbonization initiative is underway and doing very well. Also, they are meeting on how to address FERC 2222 and are trying to move quickly on it.

ASHRAE and CTA - Ron Bernstein - At the ASHRAE conference last week Ron presented on building automation and cyber security. He also gave his talk to the Georgia bar association. Also, ASHRAE had a cyber security meeting two weeks ago and the focus of that meeting may be developed into a white paper. They are trying to find some cyber experts to help with the paper.

CTA - A new paper on buildings to grid interactions is moving. There are some new tasks in progress on topics such as water heaters and how things interact, cyber security requirements, monitoring and metering requirements.

Farrokh Rahimi was not able to attend today.

EBC - Ward Camp was not available, however, David Forfia promised to get an update for GWAC. He said EBC is currently coming up with use cases and approaches on use of blockchain.

NARUC - Chris Villarreal commented that last week was the winter policy meeting. There will be a document coming out on electricity planning. He noted that many states have differing positions including island states and territories. There was a meeting about the document recently and 200 people attended.

https://www.naruc.org/about-naruc/press-releases/twelve-states-announce-action-steps-to-plan-for-grid-of-the-future/

https://us02web.zoom.us/webinar/register/WN_hT3y2iuxSGevCw9LabH2Iw

In reply Karen asked:

– What is a state's role in aligning planning for maintaining a well-managed, efficient electricity system, now with rapidly changing requirements and many more participants?

– What planning capabilities exist and are needed for potential distribution-system level markets, and TSO & DSO coordination?

– What coordination opportunities exist for states, utilities, customers, RTOs, and federal entities and research institutions?

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Lorenzo Kristov sent a link https://www.naruc.org/nrri/nrri-library/research-papers/whither/ to a paper by NRRI by Dr. Carl Pechman.

David Forfia reminded the group that the next GWAC meeting is March 17 from 10am to Noon

Kay Aikin gave the motion to adjourn; Ron Ambrosio seconded the motion.

Hearing no objections David Forfia adjourned the meeting.