Reliability Advisory Initiative Meeting Minutes

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July 6, 2023 – Kickoff Meeting
Reliability Advisory Initiative

MEETING PURPOSE

Explore how ZEROgrid's Reliability Advisory Council ("RAI") can support RTO and corporate collaboration towards achieving a reliable, cost-effective grid of the future.

PARTICIPANTS

RAI Participants:

- MISO
- PJM

ZEROgrid Member Participants:

- General Motors
- Meta
- Salesforce
- **RMI**

MEETING AGENDA

- Introduction
    - Purpose and objectives of the RAI
    - Overview of agenda
- RAI Meeting Structure
    - What do you hope to get from engaging with corporates through the RAI?
    - What other parties would you like to see participate in this Initiative?
    - Is there an ideal meeting size?
    - Are there other do's and don'ts we should be mindful of for these sessions?
- Corporate Activities
    - Currently, what corporate activities do you see that directly support (or do not support) grid reliability?
    - How do you see that set of corporate activities evolving in the next five years?
- Future Meeting Topics
    - What topics should be discussed in future RAI meetings?
- Closing and Next Steps
    - Summarize takeaways from discussion, propose next steps, describe path forward for the RAI.

MEETING SUMMARY AND KEY TAKEAWAYS

- **Goal**: Use the RAI to create a "two-way street" of information sharing between grid operators and corporates, particularly related to how corporates create their energy goals and challenges to grid operators' reliability mandates. RTOs would be limited to sharing guidance and feedback consistent with what is shared in public forums.
- Expanding RAI participants to other grid operators would be helpful to hear additional perspectives on reliable decarbonization. From the corporate energy buyer side, participation from heavy industry could add value.
- For grid operators, a recent challenge to maintaining reliability and planning transmission has been sudden, rapid load growth in specific areas due to new data centers. Tech companies are also beginning to experience this challenge as they approach the limits of individual utilities. Electrification (e.g., EVs, manufacturing, and buildings) is expected to contribute to this challenge as well.
- Other challenges for grid operators and corporates include:
    - Low visibility to behind-the-meter resource additions for grid operators;
    - Low awareness of grid reliability challenges from those planning data center buildouts, load growth from EV and battery manufacturing;
    - Lack of direct communication between corporates and grid operators;
    - The future grid resource mix potentially not supporting how grid operators traditionally review reliability;
    - An unclear view of load growth from a system perspective;
    - Insufficient investment in more flexible, clean resources;
    - Variable time horizons for different needs and milestones
- For future meetings, topics could include:
    - **Grids of the Future**: RTO perspectives of how grids of the future might look and how the voluntary market is helping, hurting, or could be doing more;
    - **Load Growth**: Corporate insights into EV, data center, building and manufacturing electrification load growth – where, when, and how much;
    - **Data capture and visibility**: How RAI participants can collect and share non-competitive data to support grid planning, project execution, and performance measurement;
    - **Generation**: H2, nuclear, fossil, solar, wind, etc., and ways to bundle or propose projects that make planning easier and support reliability;
    - **Grid hardening equipment and systems**: To support reliability;
    - **Policy**: How the voluntary market can lean in to adopt existing policies, federal funding incentives, or unlock policy roadblocks
- There was no consensus on specific meeting format and frequency, though attendees did express a preference for longer, more in-depth sessions.
- To close, attendees defined success over the next few months as:
    - Understanding what the roadmap looks like;
    - Developing the RAI into a forum;
    - Creating specific recommendations for corporates in various topic areas;
    - Understanding enhancements grid operators can implement to prepare for the future;
    - Creating a playbook for a broad swath of companies in the voluntary market

September 12, 2023 – RTO/ISO Viewpoints
Reliability Advisory Initiative

MEETING PURPOSE

The purpose of this meeting was to explore how the Reliability Advisory Initiative (RAI) forum can drive proactive, high-impact, system-level actions that support grid reliability and, in particular:

1. Hear how RTOs/ISOs think corporates could participate differently to support grid reliability;
2. Understand how RTOs/ISOs envision the grid evolving to meet decarbonization policy and load growth projections;
3. Prioritize deeper dive topics to explore in upcoming sessions.

PARTICIPANTS

RAI Participants:

- MISO
- PJM
- NYISO
- ISO-NE

ZEROgrid Collaborator Participants:

- Meta
- Salesforce
- GM
- Akamai
- RMI

MEETING AGENDA

- Introductions & Overview
- Corporate Actions Impact
    - What is the voluntary market is doing that's helpful and harmful for meeting grid operator mandates
    - What grid operator's biggest pain points and concerns are
    - If grid operators could harness the influence of the voluntary market, what they would have it do
- Future of the Grid & Priority Actions
    - How grid operators envision their grids evolving to meet load growth projections, reliability, and decarbonization policies
    - Activities corporates and other energy sector participants, such as utilities or developers, could collectively work on to support grid reliability
- Upcoming Agendas
- Closing

ZEROgrid.

MEETING SUMMARY AND KEY TAKEAWAYS

Corporate Actions Impact

- Pain Points and Concerns:
    - Across large parts of the east, renewables additions are primary driven by **state policy** rather than the voluntary market. In places where the voluntary market plays an important supplemental role to grid operator markets (based on the regions discussed), the current volume of corporate procurement is not viewed as an issue, and virtual PPAs are still a great option in the near- to medium-term for adding renewable energy capacity.
    - **Resource adequacy** remains the primary worry of most, if not all, grid operators because the pace of replacement capacity is not currently expected to keep up with fossil retirements and load growth. There's a perceived threat to resource adequacy in the near-term linked to price- or policy-driven fossil retirements.
    - The trend toward **24/7 procurement** appears welcome because it's viewed as putting a premium on resources that can generate in all hours to better match the customer load shape.
- How Corporates Could Support:
    - It would be useful for RTOs to know how behind the meter (**BTM) resources** will be operated by corporates. Much of the solar built in the Northeast is small enough to avoid having to participate in the wholesale electricity market, which will eventually become a challenge in some ISO regions.
    - Increased **off-taker certainty** produces higher quality projects with potentially shorter interconnection times.
    - **Demand must become much more flexible.**
        - It's difficult to know when demand-side resources can respond to reliability situations. Many states remain hesitant to expose any customer class to variable prices that could send a price signal to reduce load. Over the long term, as minute-to-minute variability increases on the supply side, grid operators will need higher flexibility on the demand side. W**holesale market participation** defines the current gold standard. Since this won't be possible for every load, grid operators would like greater transparency on loads participating at the utility level as well.
    - **Cleantech/reliability pilots** are essential.
        - Grid operators expressed a desire to see more evidence supporting the viability of emerging technologies. Otherwise, their default is to use traditional technologies.
        - Despite a desire to have more emerging technologies participate directly in wholesale markets, RTOs have limited staff capacity to evaluate emerging

technology projects internally. Corporate support for emerging technologies could be helpful in getting these adopted more.

- It was noted that some companies look at more than price signals, such as at reliability and decarbonization-related outcomes, to inform their energy-related actions.
    - A voluntary market that internalizes reliability and emissions values could allow faster uptake of emerging technologies in traditional energy and ancillary services markets.
    - While voluntary markets can support wholesale ISO ancillary services markets, they should remain separate as ISOs use ancillary services to maintain reliability. In other words, the ancillary services market must remain price responsive.

Future of the Grid

- **The importance of forecasting and planning:** Grid operators emphasized the critical role of forecasting and planning in understanding how the electricity system is going to evolve. They stressed that early information sharing can facilitate more proactive planning.
- **Load forecast:** ZEROgrid collaborators expressed interest in understanding how grid operators put together load forecast and how corporates could help inform them. Grid operators shared that they used different levels of information from different sources to form the forecast and were willing to invite their experts to walk through their forecasting process in future sessions. Industrial load growth from industries and data centers and widespread load growth from electrification and EVs were highlighted.
- **Interconnection:** ZEROgrid members asked about how to place load infrastructure closer to generation lines and were interested in discovering approaches for how to place infrastructure closer to where it is most needed.
- **Optimizing Existing Infrastructure:** The participants discussed the importance of maximizing the use of the existing grid system. In particular, grid-enhancing technologies (GETS) and clean repowering of retired or retiring fossil generation sites that already have interconnection could reduce the reliability impact of early retirement and long lead times for new renewable energy capacity interconnection.
- **Two-way Information Sharing:** Two-way information sharing between grid operators and developers at an early stage is key to being able to proactively plan the grid rather than always be reactive. For example, some grid operators were trying to provide tools of load locations to help customers be more informed when they submit new projects.
- **Stranded Transmission Capacity:** The potential for stranded transmission capacity due to excessive but unrealized load forecasts was raised. This apparently had happened in the past, although, high anticipated load growth may mitigate this now. ZEROgrid members expressed interest in working with grid operators to address this issue by exploring ways to place their load infrastructure along planned transmission lines by knowing where it is going in advance.

Upcoming Agendas (Tentative)

The group explored potential agenda topics to discuss in greater depth in upcoming sessions. A few potential topics included:

- Load growth

- Dynamic Load
- Behind the meter technologies
- Building electrification & datacenters
- Transportation charging infrastructure and manufacturing electrification
- Interconnection
- Transmission
- Two-way information sharing to support proactive planning
- New technology projects

Closing

- **Additional Experts:** ZEROgrid members and grid operators shared their interest in inviting other load growth and infrastructure planning experts to meetings, as applicable, to share more technical information.
- **Explore Deeper Problem Solving:** Participants want to get into deeper problem solving in the RAI forum now that the RAI has explored the bigger picture in the last two sessions.
- **Meeting Format:** Longer and less frequent meeting occurrences is still preferred so the RAI will continue following a bi-monthly cadence. RMI will work with the RAI members and corporate participants to identify and prioritize deeper dive topics and questions to explore over the next several sessions.

November 8, 2023 – Meeting
Reliability Advisory Initiative

MEETING PURPOSE

Explore how the ZEROgrid Reliability Advisory Initiative ("RAI") can support RTO and corporate collaboration towards achieving a reliable, cost-effective grid of the future. This meeting had specific focus on load growth and load forecasts.

PARTICIPANTS

RAI Participants:

- MISO, PJM, ISO-NE, NYISO

ZEROgrid Member Participants:

- Akamai, Amazon, General Motors, Meta, Prologis, RMI, Walmart

Other Participants:

- Entergy

MEETING AGENDA

1. RTO/ISO Load Information Needs
2. Industry Load Growth Projections
3. Solutioning for Reliability & New Load
4. Takeaways & Next Steps

MEETING SUMMARY AND KEY TAKEAWAYS

- RTO long-term planning models generally focus on historic, macroeconomic trends. These models help prioritize RTO planning activities. Load has been anemic for the past couple of decades and RTOs have been accused of over-forecasting growth in the past. Utility regulators do not want to approve infrastructure development for loads they are not convinced will appear or be maintained.
- RTOs strive to find lower cost solutions, however, the increasing speed with which new loads are trying to interconnect, limit the options that are available to immediately maintain reliability.
- Development timelines also pose a challenge: large lines can take 7+ years to build, which is much longer than many of these large loads would like to connect.
- RTOs have historically relied on utilities or other transmission owners for supplemental information on load growth. There is conservativism built into multiple levels of load forecasting. RTOs don't have good visibility yet into loads that are 3-5 years out to support advanced planning.
- Load growth forecasts from multiple industries project exponential growth over the next few years.
    - Some companies are forecasting up to a 10x growth in electric intensity by 2050.
    - These trends are markedly different from how load has grown over the past two decades.

- EV electrification and distributed energy resource (DER) challenges will likely start in the Western US and move east driven by California's regulatory standards. Urban areas are seeing relatively higher growth in EV loads.
- Datacenters: Beyond 2024, more companies are looking at developing secondary and tertiary markets outside the most popular metro areas. Large loads tend to cluster together and gravitate toward investor-owned utilities over co-ops or munis.
- Semiconductor and heavy industry voices would benefit the conversation.

- There are concerns that load may be double or triple counted, inflated, or temporary (e.g., due to consumer trends or policy incentives).
  - C&I's putting in load interconnection requests may be contractually protected from identifying themselves, making it challenging for RTOs to validate the information.
- If utilities and RTOs cannot keep up, C&I's may look to distributed energy (fossil and carbon-free) as a temporary way to interconnect large loads more quickly.
  - Virtual power plants may offer one potential solution C&I's are exploring.
- RTOs are working towards proactive planning, recognizing the reliability concerns inherent in these trends.
  - There's a shared desire to understand **where large load "pockets" will emerge**.
    - The point of interconnection is more important than geographic location in informing potential interconnection costs and challenges (e.g., two points of interconnection a mile apart might have a million-dollar interconnection cost difference).
  - RTOs would also benefit from visibility into behind the meter resources co-located with new loads.
  - It's not clear if forecasts and planners should account for C&I's that choose to grow smaller (e.g., 2 – 5 MW) loads that in aggregate might be significant.
- C&I's generally know where large loads in their sector will show up over longer time horizons and need a way to share this information with the RTOs.
  - Companies are limited by the granularity of their internal forecast and by data privacy – in general, they could maybe provide spatially aggregated data.
  - Using corporate load growth data would require a new planning process. It's unclear how RTOs would incorporate this almost qualitative data.
    - One option for consideration is whether a dedicated interconnection process for large loads could improve long-term planning and shorten load interconnection timelines.
  - Data privacy is a concern, yet C&I's are realizing that it's a better long-term strategy to help build out the grid collaboratively.

- Challenge with proactive planning: regulators and consumers won't want to raise electricity bills before load materializes, especially in locations with high energy burden. **How the costs and risks are allocated remain key challenges.**
- There is recognition that there are additional activities besides greater load transparency that C&Is can do to support grid reliability, including ancillary services, demand response, cost, and risk sharing, and behind the meter capacity additions that will be explored in future sessions.

February 14, 2024 – Meeting
Reliability Advisory Initiative

MEETING PURPOSE

The purpose of this meeting was to explore how the Reliability Advisory Initiative (RAI) forum can drive proactive, high-impact, system-level actions that support grid reliability. This meeting had specific focus on load growth visibility and specific actions companies and grid operators could pursue to improve reliability.

PARTICIPANTS

RAI Participants:

- MISO, PJM, ISO-NE, NYISO

ZEROgrid Member Participants:

- Akamai, General Motors, Meta, Prologis, RMI

MEETING AGENDA

5. Load Data Collection and Interconnection Processes
6. Load Growth Maps
7. Solutioning for Reliability & New Load

KEY TAKEAWAYS

- **Grid Operators' Role in Load Growth Management:** Grid operators are trying to reliably accommodate load growth and emphasize the importance of understanding both the quantity and uncertainty of this growth to inform transmission planning accurately. Their major concern is resource adequacy and noted there are a variety of resources needed and able to help support this.
- **Grid Operators' Load Interconnection Process and Timelines:** Grid operators have different processes for interconnecting large load, some more structured and formal than others for which they can exchange best practices. Grid operators emphasized the importance of providing as much lead time as possible on when and where large loads will emerge, even with varying degrees of uncertainty due to the dynamic nature of planning and impact study processes.
- **Challenges in Large Load Interconnection:** Grid operators noted that there are potential challenges when large loads trigger transmission builds vs. being accommodated by existing infrastructure, highlighting the need for process innovation to address these situations.
- **Scenario Planning and Uncertainty in Load Data:** participants expressed concerns about the uncertainty surrounding load growth. However, the group recognized that importance of load data provided by corporates to supplement information that grid operators receive from transmission owners (TOs) .

- **Value of Load Growth Mapping:** Participants saw value in the load growth map RMI developed using public data and suggested incorporating additional sources, such as automotive industry data.
- **Load Smoothing and Flexibility for System Reliability:** Grid operators emphasized the value of serving smoother loads for system reliability. Load smoothing technologies and processes such as demand response would be beneficial. They also highlighted the potential benefits of flexible and controllable loads for system reliability. There was discussion about using emissions signals (in addition to economic signals) to help shift non-urgent loads, with interest in further exploration of this topic.

NEXT STEPS

- Grid operators are considering how very large loads that require transmission upgrades get incorporated into existing or new interconnection processes.
- Grid operators to internally discuss how to address corporate concerns regarding data confidentiality and refine the process for requesting load data.
- The group would like to develop a menu of corporate actions that would support reliability and decarbonization.
- Grid operators and academics to follow up on exploring the types of data that would help improve the effectiveness of an emissions signal on demand response or siting decisions.

May 13, 2024 - Meeting
Reliability Advisory Initiative

MEETING PURPOSE

This convening's purpose was to hold a deeper discussion on industry-specific load growth and grid impacts. The participants discussed: 1) The need for a proactive planning approach for electric vehicle (EV) charging, EV load growth relative to grid capacity, load profiles across vehicle classes, and how EVs could support grid reliability; 2) U.S. Department of Energy's National Alternative Fuel Corridor plans.

PARTICIPANTS

Grid Operators:

- MISO, PJM, ISO-NE, NYISO

Companies:

- Amazon, General Motors, Meta, Prologis, RMI

Others:

- U.S. Department of Energy (DOE)

MEETING AGENDA

1. EV Load Growth Visibility
2. DOE National Alternative Fuel Corridor Plans

KEY TAKEAWAYS

- **EV Load Growth**:
    - The amount of EV load could surpass that of data centers and its impact on various utilities could be realized within the next few years.
    - Proactive planning will be necessary to keep pace with future EV loads and will require more granular data across vehicle classes and duty cycles:
        - EV adoption rates
        - Fleet electrification and public charging hub locations and in-service timing
        - Charging behavior patterns and flexibility
        - Managed versus unmanaged charging capabilities
    - This information is vital for forecasting EV charging needs and patterns, peak demand impacts, and for informing what grid infrastructure upgrades will be necessary when.
- **EV Charging Behavior:**
    - RMI research suggests that overnight charging could take place over several hours; there may be more flexibility in how quickly they need to charge. The average overnight down time varies by vehicle vocation (urban, regional, or long distance)
- **Scenario Analysis**:

- Scenario analysis that considers differing EV adoption rates, policy influences, managed versus unmanaged charging capabilities, variations in charging flexibility, and seasonal fluctuations in load profiles would be beneficial.

- **U.S. Department of Energy National Alternative Corridor Plans**:
  - The DOE is identifying where optimal EV charging hub locations could be sited but depends on states, utilities, and the private sector to building them.
  - RTOs want to be kept informed about the construction status and energy needs of each of these hubs for proactive planning.
- **Collaboration and Communication**:
  - Meeting participants agreed they'd like regular communication to discuss EV load – e.g., charging hub locations and energy needs, trends in vehicle charging behavior, vehicle demand response and V2G capabilities to inform grid planning and signal reliability risks.

NEXT STEPS

- Establish regular communication channels between utilities, RTOs, corporates, and government stakeholders to maintain situational awareness of EV loads and V2G capabilities and collaborate on ways to help minimize or eliminate impacts to customer rates or reliability as the grid evolves to accommodate new (EV) loads, V2G technology, or/and upgraded or new infrastructure, such as generation and transmission.

October 11, 2024 – Meeting
Reliability Advisory Initiative

MEETING PURPOSE

This convening's purpose was for grid operators and large load corporates to align on the key pain points of large load planning, identify process improvements and other solutions to address them, and decide next steps to collaboratively advance a focused number of solutions.

PARTICIPANTS

Grid Operators:

- MISO, PJM, ISO-NE, NYISO

Other Organizations:

- Amazon, General Motors, Meta, Microsoft, Prologis, RMI

MEETING AGENDA

1. Summary of Large Load Planning Pain Points
2. Converging on Solutions
3. Priorities for Future Collaboration

KEY TAKEAWAYS

- **Load Planning Pain Points:**
    - **Firm Commitments and Data Sharing**: The parties noted a lack of firm commitments from loads trying to interconnect. These introduce uncertainty in the interconnection process that can impede accurate planning. Grid operators emphasized that better (earlier and more granular) visibility into load timing, status, location, and profile from large load customers is key to plan transmission, maintain resource adequacy, and anticipate future needs.
    - **Coordination Gaps Between Utilities and Grid Operators**: Differences in regulatory approaches across regions, as well as variations in how utilities and grid operators handle interconnection requests, create planning and interconnection challenges for both load customers and grid operators. Corporates emphasized the need for better transparency into load queues, congestion, and forecasting to inform project planning.
- **Converging on Solutions:**

- **Data Sharing:** Aggregated load data sharing from large load customers, particularly data centers, was seen as a potential way to address confidentiality concerns while still improving transparency. The parties recognized the importance of sharing load information early, even if there are varying degrees of uncertainty, and considered the option for large load customers to share load information with grid operators at the same time they do with utilities.
- **Firmer Commitments**: Participants discussed the importance of financial, procedural, and other types of project readiness commitments. Grid operators place a higher value on financial commitments than other signals because they provide the clearest assurance that a project will move forward, supporting more confident and stable planning for transmission infrastructure.
- **Coordination with Utilities**: Utilities often handle load interconnections independently of RTOs. A more coordinated and transparent approach between utilities, large load customers, and RTOs could help ensure that all parties have the key information to plan and interconnect new loads more confidently and cost-effectively.
- **More Integrated Planning**: The parties agreed that more integrated planning between load, generation, and transmission would support long-term system planning. The co-location of load and generation could reduce transmission upgrade costs and better align with future resource adequacy requirements.

NEXT STEPS

- **Articulate Load Information Needs and Value Proposition**: ZEROgrid proposes drafting an outline of the information grid operators are requesting from large load customers, the preferred cadence for receiving this information, and the process the grid operators would want load customers to follow. It could also frame the associated value proposition for large load customers. This could take the form of a letter or slides, depending on the grid operators' preference. ZEROgrid can create an initial draft for feedback from the grid operators.
- **Develop Load Readiness Criteria**: We will initiate a follow-up call to explore the development of "load readiness" criteria. This process may require a more extensive effort, so we propose starting with a "light version" to establish foundational readiness metrics. From there, we can expand the criteria as needed based on further discussions and alignment with grid operator priorities.