WECC
Electric Reliability and Security for the West

Reliability Assessment Committee
Meeting Minutes
October 18–19, 2022
Salt Lake City, UT

1. Welcome, Call to Order

Chifong Thomas, Reliability Assessment Committee (RAC) Co-Chair, called the meeting to order at 1:02 p.m. MT on October 18, 2022. A quorum was present to conduct business. A list of attendees is attached as Exhibit A.

2. Review WECC Antitrust Policy

Enoch Davies, Systems Stability Manager, read aloud the WECC Antitrust Policy statement. The meeting agenda included a link to the posted policy.

3. Approve Agenda

Ms. Thomas introduced the proposed meeting agenda.

On a motion by Chelsea Loomis, the RAC approved the agenda.

4. Review and Approve Previous Meeting Minutes

Maddy Eberhard, Administrative Coordinator, introduced the minutes from the meeting on June 29–30, 2022.

On a motion by Jamie Austin, the RAC approved the minutes from June 29–30, 2022.

5. Review Previous Action Items

Ms. Eberhard reviewed action items carried over from the RAC meeting on June 29–30, 2022. Action items that are not closed and will be carried forward can be found here.

6. PCDS—Jamie Austin, PacifiCorp

Jamie Austin, PacifiCorp, presented an update on the work of the Production Cost Data Subcommittee (PCDS), including recent enhancements in the ADS, dispatch results, and challenges, and a summary on the discussion on the Anchor Data Set (ADS) Lessons Learned. Kevin Harris, Pacific Northwest National Laboratory (PNNL), continued to present the tools developed for validating the dispatch and addressing transmission congestions.
The committee then discussed the Lessons Learned in the in-person meeting from October 5, 2022, with some stakeholders and the topics discussed in that meeting. Ms. Loomis, who led the Lessons Learned meeting, said that the people in attendance unanimously agreed that the ADS

development needs to continue. One of the issues brought up was the time and effort required to map the resources in the Load and Resources (L&R) Submittals from the Balancing Authorities into the buses. It was suggested that entities may be able to start the process of developing the ADS using L&R data from one year earlier rather than waiting for current year submittals with the understanding that some refreshing may be needed. This can allow more time for mapping the resources and validating the ADS. The RAC will continue to engage more ADS stakeholders. The committee discussed the proposal to adjust the ADS process and how they process may change year to year, as well as better placement for those resources.

The presentation is posted to the WECC website.

7. PCMS Update—Yi Zhang, CAISO

Yi Zhang, California Independent System Operator (CAISO), presented an update on the WECC-sponsored PCM program enhancements that the Production Cost Modeling Subcommittee (PCMS) is working on. These includes mapping the behind-the-meter (BTM) distributed energy resources (DER) to the Load IDs to support the Round-Trip process and reporting on transmission violations. The committee discussed the PCMS's work on the long-term plans for PCM program enhancements, such as multi-market model, hydro dynamic optimization, and some new issues that have emerged, such as increasing simulation time due to the increasing number of batteries modelled, development of the Long-Duration Energy Storage model and models for multiple Green House Gas (GHG) policies.

The presentation is posted to the WECC website.

8. SRS Update—Tracy Rolstad, Grant County PUD

Tracy Rolstad, Public Utility District No. 1 Grant County, presented an update for the base cases that the System Review Subcommittee (SRS) builds for WECC. The committee discussed the issues associated setting the base-load flag for resources that are not dispatchable but can respond to under frequency or under voltage conditions. There were also discussions on how non-dispatchable hydro plays a part in the base cases, preparing materials for new hires, possible discussions with Studies Subcommittee (StS) and how they use these base load flag in studies, and up and down regulations for frequency responses. Mr. Rolstad also mentioned that, in preparing the Year 10 base case, the Pacific Northwest had some trouble finding planned resources to provide the loading at the California–Oregon Intertie (COI) as specified in the case description. That was later resolved.
Mr. Rolstad did not present his approval item to the committee due to changes in the charter.

The presentation is posted to the WECC website.

Break

9. StS Update—Philip Augustin

Philip Augustin, Salt River Project, provided an update on the ongoing assessment projects conducted by StS. The Underfrequency Load Shedding Work Group (UFLSWG) is wrapping up its 2021 assessment and report. The next UFLS assessment will be performed by the planning coordinators. Mr. Augustin continued to provide an update on the 2022-2023 study program, and the Long-Duration Storage Assessment. Day two of the RAC meeting will be a workshop to gather more stakeholder input to develop the 2022-2023 study program.

BK Ketineni, Transmission Planning Engineer, provided a long-duration energy storage update. The study started off with the 80% clean energy case. The purpose for this study is to assess how long-duration energy storage (storage from 12 to 48 hours) would affect the reliability of the Western Interconnection and how longer duration energy storage can help increase clean energy to 80–90% of supply. The initial finding showed that most batteries under regular operating conditions usually charge and discharge between seven and 10 hours. The conclusion from this finding was that a 12-hour battery is sufficient for daily use. There are also two major battery options in GridView: battery model and long storage model. After studies between the two models, results show that long-term storage is a better option. Current cases represent nearly 80% clean energy, but the next step is to test whether increasing the maximum capacity of the batteries would move it above 80% clean. The committee notes that this study does not consider extreme system conditions such as multi-day, abnormally high or low temperatures.

The committee discussed the timing of the study and when a report can be expected. Mr. Ketineni is hoping to provide a report around mid-December of 2022. The committee continued to discuss the impact of extreme events and off-peak scenarios for both long duration and battery storage.

10. MVS Update—Song Wang, Portland General Electric

Song Wang, Portland General Electric Company (PGE), presented an update on the projects that the Modeling Validation Subcommittee (MVS) is conducting and upcoming activities. A number of documents were approved and are posted to the MVS webpage under "Approved Documents":

- Clarification on proper use of REPC model;
- Summary of all second-generation generic renewable energy system dynamic models;
- White paper on modeling hybrid power plants;
- White paper on converting REEC models;

- Proposal for new features for the renewable energy system generic models;
- Solar PV plant modeling and validation guideline; and
- Droop-based, grid-forming model specification.

The committee talked about the power plant voltage droop control power flow model, and what the parameters are for this model, and about the documents and guidelines that the MVS updated. The MVS also presented some preliminary results on responses of Grid-Forming inverter-based resource (IBR) vs. Grid-Following IBR models. Preliminary results at one bus seem to show that Grid Forming IBRs can improve frequency response. Upcoming activities include converting the IPP DC line model, GENTPJ model retirement, developing the Grid-Forming Inverter model, developing guidelines for modeling offshore wind plants, and developing a new Renewable Power Plant model – REPC_D.

The presentation is posted to the WECC website.

11. Committee Restructuring—Shelli Nyland, WECC

Shelli Nyland, External Affairs Project Coordinator, presented an update for the committee structure for RAC and its subcommittees. The committee discussed the process that restructured the RAC committees and how it could have possibly been improved. The committee continued to discuss the new structure and any changes in charters that might be made.

The presentation is posted to the WECC website.

12. RAC Work Plan—Enoch Davies, WECC

This topic was moved to be a topic of discussion for day two of the RAC meeting.

13. Long-term Planning—Saad Malik, WECC

Due to the new Federal Energy Regulatory Commission (FERC) Notice of Proposed Rulemaking (NOPR), there is rising interest. RAC held a round table on October 6, 2022, to provide an opportunity for stakeholders to share their perspective and discuss the challenges and opportunities of the 20-year and beyond long-term planning. Saad Malik, Reliability Planning Director, provided a report update on the long-term planning round table and topics discussed included the FERC NOPR and some highlights. The Scenarios Work Group (SWG) provided input about load and resources scenarios that can be used in studies on long-term transmission needs. Work group members also discussed what data is currently available, what data is needed to generate these assessments, and what kind of tools and cases are needed. The goal of the SWG discussion meeting was to focus attention to achieve an output that someone can use to make decisions.

More discussions will continue in the Study Program Workshop in day two.

14. Data Management Project—Amanda Sargent, WECC

Amanda Sargent, Senior Resource Adequacy Analyst, provided an update on the consultant chosen (Slalom) to set the requirements for a data solution that will be put into several types of models. This information will be used to create the Request For Proposal (RFP) for a vendor that will build the solution to meet the requirements. There will be a workshop for stakeholders in November 2022 to discuss the requirements.

15. SAR Submittals—Steve Rueckert, WECC

Steve Rueckert, Standards Development Director, presented an update on the SAR Submittals process.

The presentation is posted to the WECC website.

16. Public Comment

There is a CMC EV Grid Reliability Working Group on November 9, 2022, at 1:00 p.m. PT that everyone is invited to attend.

17. Review New Action Items

- Develop an approach to better publicize the MVS documents.
    - Assigned To: Chelsea Loomis, Chifong Thomas, and Song Wang
    - Due Date: Before Next Meeting

18. Upcoming Meetings

February 28–March 2, 2023 .....Salt Lake City, UT; Hybrid

June 20–23, 2023 .....Salt Lake City, UT; Hybrid

October 24–27, 2023 .....Salt Lake City, UT; Hybrid

Day 2—October 19, 2022, 8:00 a.m. to 12:00 p.m.

19. Study Program Workshop

Ms. Thomas called the meeting to order at 8:03 a.m.

20. Process and Context

Mr. Malik introduced the workshop's purpose for the studies and results of reliability risks. The committee discussed how other subcommittees and work groups are involved in this workshop.

Jon Jenson, System Adequacy Engineer, continued to introduce the goals for the workshop.

Katie Rogers, System Adequacy Senior Engineer, introduced the format of the workshop.

21. Proposed Study Assessments

Amy Mignella and Rafael Molano, Tribal Energy Policy consultants, provided an update for the four possible long-term scenarios topics that SWG has been working on. Those long-term scenarios are Climate Change–Driven "Worst Case," Microgrid Impacts Study, EV Development Impacts, and Impacts of Emerging Resources.

The presentation is posted to the WECC website.

The committee continued to the 2023 WECC Study Program presentation sections and discussion.

For clean energy scenarios, Mr. Ketineni presented the long-duration energy storage update. This study is an extension of the 2040 clean energy scenario study. This study started out with an 80% clean energy case that was completed earlier. The purpose of the case is to assess the impacts of long-duration energy storage on the reliability of the interconnection. A long-duration battery acts as a load when it is charging and a resource when it is discharging. The study will also ascertain how these batteries can help the system increase clean energy to 90–100% of supply in the future. The preliminary investigation shows that the typical operating duration of these batteries was between seven and 10 hours per day and could get to 12 hours. There are two types of models: one uses a pump storage model and the other uses a battery model. The pump storage model in GridView has a stronger dispatch than the battery model. Next steps include looking at increasing the maximum capacity of the battery. The committee discussed the information provided and the factors that can affect reliability.

For changes in system inertia, Enoch Davies, System Stability Manager, presented the changes in generation resources. The committee would look at the short circuit ratio (essentially fault current). This is similar to the 2019 study program, in which there was a system inertia task force that looked at changes in system inertia and changing resource mixes that used a 10-year power flow case. The current study is collecting short circuit data from protection work studies from the previous three to four years and now has a couple of ADSs that show how short circuit ratios and fault currents are changing. The current study would do the same fault calculations on the cases using data that protection engineers use to present a delta.

Doug Tucker, System Stability Senior Engineer, presented an update of the impact of grid-forming inverters. During the study it was found that spring conditions are susceptible to low inertia and frequency. The new Grid-Forming model performs better than the Grid-Following model. A similar study using different technology to focus on the spring and drought conditions may also be performed. The committee discussed long-term energy storage and how hydro affects the study, as well as how short circuit ratios are helpful if applied to grid computations.

For extreme natural events, Ms. Rogers presented the extreme cold weather event scenarios. Under extreme cold weather conditions, there could be additional limitations on renewables and generators, which can result in additional generation tripping. There could also be congestion on transmission lines.

Tyler Butikofer, System Adequacy Staff Engineer, presented studies on the high clean energy with an extreme natural event and extreme weather with high DER. The goal of the study on high clean energy with an extreme natural event is to get between 80% and 90% clean energy within the next 10 years. Another topic that could be included in the study is the need for the ramping provided by the gas generation or new technologies with similar characteristics to keep the system stable with high levels of clean energy resources.

Mr. Butikofer continued to present on extreme weather with high DER. This is built on the extreme natural event study case. There could be higher than normal loads, the high penetration of DER, and more frequent extreme weather. There is an increase in batteries going in as DER as well as solar. Some questions in mind during this study are: "Is there a need to keep gas generation online to balance during ramping needs?" and "How could batteries balance and assist with ramping needs?" The committee discussed wind performance in extreme cold and the potentials of offshore wind turbines, possible scenarios for new studies and time frames, and hydro data.

For variability in loads and resources, Ms. Rogers presented the study on impacts from heat waves with hybrid battery energy storage systems (BESS). The goal of this project is to look at the variability in loads and resources with hybrid BESS batteries. Transformers derates could be included in the study.

Ms. Rogers continued to present an update on the high renewable penetration with low renewable performance. The 80% renewable study was used, and this study focuses on the output rather than the input. The main questions of this study are: "What percentage of energy in the output comes from the renewables?" and "What does it look like if there is a system to facilitate that level of penetration if the output doesn't come in?" The committee discussed equipment performance under thermal stress, DER, and how much buffer there is.

For impact of higher DER, Nick Hatton, System Stability Engineer, presented on how the reduction of the use of thermal generation leads to system instability when DER is offline. There

was a decrease in dispatch in thermal and hydro units. There was also an increase in combustion turbines for ramping purposes. The proposed question was "How does this change the way things are dispatched?" A potential study can be looking at different times of year, possibly spring early hour for when thermal units are not dispatched due to the time required to start and stop.

Mr. Hatton continued to present the reliability risk/reward with potential inverter capabilities. The original DER study varied some of the parameters to try to emulate smart inverter controls, but there are additional parameters that could be modeled as part of the current model available for the DER.

Mr. Hatton concluded by presenting the research into the risk of inverter instability. The previous study program showed significant oscillations in the power output of the DER across the system. The Oscillation Analysis Work Group (OAWG) has been created to find the cause of the oscillations.

Mr. Jensen presented the integration of high DER with EV/battery integration. There is a potential for a 10-year project looking at different integration or penetrations of EV and battery with DER or high renewables to discover thresholds. Mr. Jensen continued to present an update for high DER with high loads. This study is also looking at a 10-year time frame. The study would be to look at the range of loads and look at loss of load expectation coupled with high DER.

Arkadeep Das, Associate Engineer, System Adequacy, presented the high DER case: this study shows system reliability with added DG-BTM PV or battery storage to the distribution side. This would build on the impact of high DER study from the previous study cycle, which was looking at different penetration levels of distributed solar generations. This new study would focus on the PV in the distribution system.

The committee discussed dispatch of DER, saturation, and microgrids.

For cybersecurity, Mr. Tucker presented the system control equipment loss due to hacking incidents. The study could focus on IBRs connected to a third party that gets hacked or the integration of cybersecurity and transmission planning. Due to the potential sensitive nature of the topic on system security, the committee discussed whether there is a plan to identify non-redundant systems or cybersecurity scenarios in a public forum.

For the remaining miscellaneous section, Mr. Jensen presented on the electrification study. The purpose of this study would be "What if we started electrifying sectors by replacing gas-powered machines in residential, agricultural, industrial, and transportation areas?" This could be a threshold study to see what complications arise at different levels of electrification. This could also be a 10-year study.

Mr. Jensen continued to present an update on the virtual power plants. This would be primary resources paired with batteries and management systems to create virtual power plants and

how they would work.
The committee discussed the impacts of hydrogen on supplies, microgrids, and industry electrification with increased load.

The presentation is posted to the WECC website.

22. Next Steps

Ms. Rogers presented next steps.

The presentation is posted to the WECC website.

23. Adjourn

Mr. Jensen adjourned the meeting without objection at 11:59 a.m.

Exhibit A: Attendance List

Members in Attendance

Hamid Atighechi ..... Powerex, Inc.

Gordon Dobson-Mack ..... Powerex, Inc.

Chelsea Loomis ..... Western Power Pool (formerly Northwest Power Pool Corporation)

Chifong Thomas ..... Thomas Grid Advisor

David Tovar ..... El Paso Electric Company

Jamie Austin ..... PacifiCorp

Thomas Carr ..... Western Interstate Energy Board

Ryan Hubbard ..... Tri-State Generation and Transmission—Reliability

Richard Maguire ..... Public Utility District No. 2 of Grant County

Erik Olson ..... Puget Sound Energy, Inc.

Tracy Rolstad ..... Public Utility District No. 2 of Grant County

Steve Schaarschmidt ..... Colorado Springs Utilities

Robert Smith ..... TransCanyon LLC

Gary Trent ..... Tucson Electric Power

Jerod Vandehey ..... Public Utility District No. 1 of Cowlitz County

Song Wang ..... Portland General Electric Company

David Wiley ..... Arizona Public Service Company

Kenneth Wilson ..... Siemens Energy, Inc.

Members not in Attendance

Ravi Aggarwal ..... Bonneville Power Administration—Transmission

Sharmen Andrew ..... MATL Canada L.P.

John Armenta ..... Farmington Electric Utility System

Paul Arnold ..... EnTranTek LLC

Robin Arnold ..... Renewable Northwest

Manuel Avendano ..... Southern California Edison Company

Ehsan Azordegan ..... Kinectrics US

Eric Bahr.....NorthWestern Energy

Nathan Barcic.....California Public Utilities Commission

Chris Benson..... Cascade Renewable Transmission, LLC

Constance Bergmark.....Imperial Irrigation District

Mitchell Betonie.....Farmington Electric Utility System

Scott Beyer.....Western Power Pool (formerly Northwest Power Pool Corporation)

Aseem Bhatia.....California Department of Water Resources

Jeffrey Billinton.....California Independent System Operator

Savina Blackman.....Clearway Energy Operating, LLC (NRG)

Brett Bodine..... Turlock Irrigation District

Chad Bowman..... Public Utility District No. 1 of Chelan County

Lindsay Briggs.....Black Hills Corporation

Marcus Brown.....NaturEner USA, LLC

Jeremy Brownrigg..... Platte River Power Authority

Shawn Carlson.....Basin Electric Power Cooperative

Andrew Chanko.....Guzman Power Markets, LLC

Tim Cherry..... Metropolitan Water District of Southern California

Ani Chopra.....MATL Canada L.P.

Tom Christensen.....Basin Electric Power Cooperative

Tim Cook..... DesertLink, LLC

Dennis Desmarais.....Copia Power DevCo, LLC

Bryce Dininger.....Central Arizona Water Conservation District

Rodica Donaldson.....EDF Renewable Energy

Thomas Duane.....Public Service Company of New Mexico

Jared Ellsworth.....Idaho Power Company

Greg Engels..... British Columbia Utilities Commission

Jonathon Flores..... Los Angeles Department of Water and Power

Thomas Flynn..... California Energy Commission

Ellie Foruzan ..... Transmission Agency of Northern California

Shaun Foster ..... Portland General Electric Company

Bryce Freeman ..... Wyoming Office of Consumer Advocate

Ron Grife ..... Leeward Renewable Energy, LLC

Ernie Griggs ..... Cascade Renewable Transmission, LLC

John Gross ..... Avista Corporation

Brenda Grossgebauer ..... Utah Associated Municipal Power Systems

Mike Guité ..... British Columbia Hydro and Power Authority

Val Guzman Ridad ..... Silicon Valley Power (City of Santa Clara)

Mark Hackney ..... Open Access Technology International

Laurie Hammack ..... Seattle City Light

Nadine Hanhan ..... Oregon Public Utility Commission

Jeff Hanson ..... Colorado Springs Utilities

David Hartman ..... Arizona Electric Power Cooperative, Inc. (Arizona G&T Cooperatives)

Jonathan Hayes ..... Southwest Power Pool

Fred Heutte ..... NW Energy Coalition

David Hodder ..... Pend Oreille County PUD #1

Bill Hosie ..... PSI Power System Innovation Corp.

Rhett Hurless ..... Absaroka Energy, LLC

Robert Jackson ..... Burns & McDonnell (1898 and Co.)

Richard Jackson ..... U.S. Bureau of Reclamation

Harley Johnson ..... Tacoma Power

Mike Johnson ..... Pacific Gas and Electric Company

Holly Johnson ..... City of Redding

Robert Jones ..... Seattle City Light

Lorissa Jones ..... Bonneville Power Administration—Transmission

Peter Jones ..... Puget Sound Energy, Inc.

Lesley Kayser-Sprouse ..... Hetch Hetchy Water and Power

Cathy Kim.....Copia Power DevCo, LLC

Ruth Kloecker..... ITC Grid Development, LLC

John Kyei..... TransCo Energy, LLC

Mike Larsen.....Public Utility District No. 1 of Cowlitz County

Josh Laurandeau .....NorthWestern Energy

Justin Lee.....Salt River Project

John Leland.....Northern Tier Transmission Group

John Liang..... Public Utility District No. 1 of Snohomish County

Todd Lichtas..... Tucson Electric Power

Patrick Ma..... Energy Exemplar, LLC

Peter Mackin.....GridBright, Inc.

Habibou Maiga .....San Diego Gas and Electric

Sarah Majok.....Sarah Aggrey Consulting Engineers LLC

Jessica Markovich .....Eugene Water & Electric Board

Tiana Marmitt ..... Energy Exemplar, LLC

Jesus Martinez.....Imperial Irrigation District

John D. Martinsen..... Public Utility District No. 1 of Snohomish County

Diana McMahon .....Salt River Project

Jerry Melcher.....California Public Utilities Commission, Office of Ratepayer Advocates

Pete Mensonides .....Turlock Irrigation District

Keegan Moyer .....Energy Strategies

Julie Myerholtz.....First Solar

Ramya Nagarajan ..... DesertLink, LLC

George Nail.....Public Service Company of New Mexico

Tyler Nice.....Eugene Water & Electric Board

John Nierenberg..... Tacoma Power

Mike Nitido ..... Tucson Electric Power

James O'Brien .....Power System Consultants, Inc.

Andrey Olennikov ..... Portland General Electric Company

Valeriy Jr. Oleshko ..... Western Area Power Administration

Vishal Patel ..... Southern California Edison Company

Dave Peck ..... California Public Utilities Commission, Office of Ratepayer Advocates

Mateusz Pena ..... Delta-Montrose Electric Association

Chris Pink ..... Tri-State Generation and Transmission—Reliability

Nathan Powell ..... Deseret Generation & Transmission Cooperative

Michael Pulskamp ..... U.S. Bureau of Reclamation

Justin Radl ..... EDF Renewable Energy

Sunny Raheem ..... Southwest Power Pool

Michael Rein ..... Public Service Company of Colorado (Xcel Energy)

Marco Rios ..... Pacific Gas and Electric Company

Rob Robertson ..... Leeward Renewable Energy, LLC

Philip Roice ..... Pend Oreille County PUD #1

Sam Rugel ..... Tucson Electric Power

Faranak Sarbaz ..... Los Angeles Department of Water and Power

Roy Sashwat ..... Renewable Northwest

Ronald Schellberg ..... Northern Tier Transmission Group

Erik Schellenberg ..... Idaho Power Company

Matt Scheppers ..... Platte River Power Authority

Tim Schiermeyer ..... Transmission Agency of Northern California

Gretchen Schott ..... Clearway Energy Operating, LLC (NRG)

Masoud Shafa ..... California Department of Water Resources

Tom Siegel ..... Longroad Energy Holdings, LLC

Gary Simonson ..... Energy Strategies

Hari Singh ..... Public Service Company of Colorado (Xcel Energy)

Alejandro Solis ..... El Paso Electric Company

Phillip Solomon ..... Deseret Generation & Transmission Cooperative

Jonathan Stahlhut ..... TransCo Energy, LLC

Rachel Stanford ..... Utah Associated Municipal Power Systems

Quincy Stormer ..... Electrical Consultants, Inc.

Jan Strack ..... San Diego Gas and Electric

Tom Studer ..... First Solar

Spencer Tacke ..... Auriga Corporation

Angela Tanghetti ..... California Energy Commission

Holly Taylor ..... Western Interstate Energy Board

Mark Thompson ..... TransCanada Energy Ltd.

Edwin Tso ..... Metropolitan Water District of Southern California

Boris Tumarin ..... Arizona Electric Power Cooperative, Inc. (Arizona G&T Cooperatives)

Guy Van Uytven ..... Guy Van Uytven

Darrel G. VanCoevering ..... EnTranTek LLC

Pushkar Wagle ..... Flynn Resource Consultants, Inc.

Jonathan Walcott ..... Delta-Montrose Electric Association

Jeffery Watkins ..... NV Energy

Steve Wickel ..... Public Utility District No. 1 of Chelan County

Scott Wilson ..... Avista Corporation

Wes Wingen ..... Black Hills Corporation

David Withrow ..... California Public Utilities Commission

Jeff Wyman ..... ITC Grid Development, LLC

Brian Young ..... Central Arizona Water Conservation District

Nick Zettel ..... City of Redding

Janice Zewe ..... Sacramento Municipal Utility District

Kevin Zhang ..... British Columbia Hydro and Power Authority

Others in Attendance

Rachel Allen ..... Tacoma Power

Steve Ashbaker ..... WECC

Kevin Conway.....Puget Sound Energy, Inc.

Enoch Davies.....WECC

Maddy Eberhard.....WECC

Angie Hall.....Pend Oreille County PUD #1

BK Ketineni.....WECC

Saad Malik.....WECC

Shelli Nyland.....WECC

Steve Rueckert.....WECC

Alan Wahlstrom.....Southwest Power Pool

Jeffrey Anderson.....Western Area Power Administration

Brittany Andrus.....WECC

Philip Augustin.....Salt River Project

Bharat Vyakaranam.....Pacific Northwest National Laboratory

Toxie Burriss.....Modesto Irrigation District

Tyler Butikofer.....WECC

Lorissa Cardoza.....Bonneville Power Administration—Transmission

Jyotsna Chatrati.....NV Energy

Alexis Cortez.....Transmission Agency of Northern California

Cory Danson.....Western Area Power Administration

Arkadeep Das.....WECC

Lisa DeCarlo.....California Energy Commission

Sony Dhaliwal.....Nova Clean Energy LLC

Kevin Harris.....Pacific Northwest National Laboratory

Richard Jensen.....California Energy Commission

Tim Kedis.....Southern California Edison Company

Rafael Molano.....Bonneville Power Administration—Transmission

Katie Rogers.....WECC

Amanda Sargent.....WECC

Louis Vigil..... El Paso Electric Company

Raymond Vojdani..... Tri-State Generation and Transmission—Reliability

Jimmy Zhang.....Alberta Electric System Operator

Yi Zhang.....California Independent System Operator