## Welcome, Call to Order

Song Wang, Modeling and Validation Subcommittee (MVS) Chair, called the meeting to order at 1:09 p.m. MT on February 1, 2023. A quorum was present to conduct business. A list of attendees is attached as Exhibit A.

## Review WECC Antitrust Policy

Doug Tucker, System Stability Engineer, read aloud the WECC Antitrust Policy statement. The meeting agenda included a link to the posted policy.

## Approve Agenda

Mr. Wang introduced the proposed meeting agenda.

**By consensus, the MVS approved the agenda.**

## Review and Approve Previous Meeting Minutes

Mr. Tucker introduced the minutes from the meeting on September 21–23, 2022.

Spencer Tacke, Auriga Corporation, offered changes in the meeting minutes.

**By consensus, the MVS approved the minutes from September 21–23, 2022.**

## Review Previous Action Items

Maddy Eberhard, Administrative Coordinator, reviewed action items carried over from the MVS meeting on September 21, 2022. Action items that are not closed and will be carried forward can be found [here](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/MVS%20Action%20Items.pdf&action=default&DefaultItemOpen=1).

## Approve MVS Charter

Mr. Tucker presented the draft MVS Charter.

The committee discussed how leadership for the dissolved committees will be represented in the merged MVS group. The subcommittee decided to postpone the approval of the charter due to feedback about how quorum and voting is worded in the charter.

## Review Approved Dynamic Model List

Unapproved model list in the WECC Master Dynamic File—Doug Tucker, WECC

Mr. Tucker presented the unapproved model list and stated that entities should review the list and suggest updates. The entries listed in the unapproved model list are either Phase 1 Wind models or the REEC\_B models, which are no longer approved. Mr. Tucker will be reaching out to entities to help them replace these unapproved models.

The presentation is posted on the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Unapproved%20Models%2024HW3.xlsx&action=default&DefaultItemOpen=1).

## Discuss In-Person Meetings

Mr. Wang introduced the topic of having in-person meetings and how often they should occur. The subcommittee discussed that they should collectively discuss what time would work for members and that members should try to come to one meeting in person per year. The subcommittee members continued to discuss the possible location for the upcoming meeting in May 2023. They also considered the date of the May meeting.

## Power Plant Modeling

Quincy Wang, British Columbia Hydro, presented the roadmap of power plant modeling for Power Plant Model Validation and Data Work Group (PPMVDWG) with February 2023 updates.   
The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/PPMVDWG%20Roadmap%20-%20Feb%202023.pdf&action=default&DefaultItemOpen=1).

Pouyan Pourbeik, PEACE, presented the generator modeling experience with the GENQEC model and how it differs from the GENTPJ model. The subcommittee debated whether to keep GENTPJ retired or not. The retirement of GENTPJ was decided by the subcommittee.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Generator_Modeling.pdf&action=default&DefaultItemOpen=1).

Mr. Wang presented the generator saturation with Kis, including additional saturation and smaller q-axis saturation. The committee discussed the stator teeth saturation effect and Mr. Wang’s conclusions.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Generator%20Saturation%20and%20Kis.pdf&action=default&DefaultItemOpen=1).

Jin Tan, National Renewable Energy Laboratory (NREL), presented the advanced pumped storage hydropower model. The committee discussed the technical feasibility and benefit of the different model pumps. Ms. Tan agreed to communicate with the device manufacturer to obtain test data in preparation for future model development and approval.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Summary%20PSH%20dynamic%20modeling_WECC_Tan_02012023_to%20share.pdf&action=default&DefaultItemOpen=1).

# Day 2—February 2, 2023, 8:30 a.m. to 12:00 p.m. Mountain Time

## Renewable Energy Modeling

Songzhe Zhu, GridBright, presented the roadmap of renewable energy modeling.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/1-REM%20roadmap%2020230202.pdf&action=default&DefaultItemOpen=1).

Wei Du, PNNL, presented updates on generic grid-forming inverter model development. The committee discussed the draft VSM GFM model, which is similar to a synchronous machine model.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Updates%20on%20VSM%20GFM%20Model.pdf&action=default&DefaultItemOpen=1).

Mr. Ramasubramanian presented the combined droop based GFM model. Mr. Ramasubramanian proposed a combined model, which would give the user an option for which model they use. The committee discussed concerns for this option, including the time step, and the time it takes to run the simulation,

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Combined_Droop_GFM_Model_final.pdf&action=default&DefaultItemOpen=1).

Mr. Pourbeik presented the final update on the latest RES models. This generator/converter model is for use in weak grid (low SCR) conditions. Mr. Pourbeik then presented the REGC\_C model for approval.

The committee discussed reservations about approving the model, including interloop, the time constant, and the parameters.

**A vote was taken at this time; however, upon further investigation, it was found that quorum was not met. In addition, the proposed model is not thoroughly and resoundingly supported by the original equipment manufacturers. Therefore, the vote is considered invalid and, in light of the issues revealed by the meeting discussion, the subcommittee will discuss whether to proceed with the approval of this model at the next MVS meeting.**

The presentation is posted to the [WECC website](https://www.wecc.org/Administrative/Memo_RES_Modeling_Updates_010523_Rev25_Clean.pdf).

Mr. Pourbeik presented the next set of model development and a list of options to prioritize.

The committee discussed items from the presented list and decided on the following:

* GMF Droop Based - REGFM\_A1;
* REEC\_E and REPC\_D;
* SVSMO4 Model;
* GFM VSM Based - REGFM\_B1 (if spec approved before SVSMO4);
* SCMOV; and
* Multi-Terminal VSC-HVDC.

The presentation is posted to the [WECC website](https://www.wecc.org/Administrative/ModelPriority.pdf).

## Active Transmission System Modeling Update

Mr. Pourbeik introduced the active transmission system modeling section and gave a brief overview of the topics to be presented.

Walter Mariscal, PTEI, presented an update on multi-terminal VSC-HVDC model. The committee discussed the development of a model for a hybrid multiterminal system with both current source and voltage source converters.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/PTEI%20Multi-terminal%20HVDC-MT%20GFM%20dVOC-Based.pdf&action=default&DefaultItemOpen=1).

Raul Perez, NextEra, presented an update on the Transbay HVDC line model. The committee discussed the currents in freezing states and which WECC case was used for this model.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Trans%20Bay%20Cable%20(TBC)%20user-model%20conversion.pdf&action=default&DefaultItemOpen=1).

Mr. Pourbeik gave a brief summary of the Active Transmission System Modeling Work Group (ATSMWG) activities which had been discussed in this section.

# Day 2—February 2, 2023, 1:00 p.m. to 5:00 p.m. Mountain Time

## Load Modeling

Bo Gong, SRP, presented an update of the Load Modeling Work Group’s (LMWG) progress.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/LMWG_roadmap_BG%20-%201-2023.pdf&action=default&DefaultItemOpen=1).

Bernie Lesieutre, University of Wisconsin Madison, presented an update on testing and modeling heat pumps in cooling mode. The committee discussed the results and possible causes.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/MVS02022023.pdf&action=default&DefaultItemOpen=1).

Kannan Sreenivasachar, ISO-NE, presented an update on transient voltage response criteria. The committee discussed how criteria is chosen and what it should be.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/TVR%20Presentation_MVS_Feb2023.pdf&action=default&DefaultItemOpen=1).

Tony Faris, BPA, gave an update on BPA load modeling experience and load composition work. The committee discussed the proposed next steps.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/WECC%20MVS%20Load%20composition%20update_2023_02.pdf&action=default&DefaultItemOpen=1).

Parag Mitra, EPRI, gave an update on the EPRI load parameterization tool. The committee discussed run times with the python NLLS optimization and if they are passed to a commercial solver.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/WECC_MVS_%20Feb2023.pdf&action=default&DefaultItemOpen=1).

Jamie Weber, PowerWorld, presented an update on DER\_B and specifying a fraction of the distributed energy resource that responds to a frequency droop signal.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/FractionalFrequencyDroopResponseForDER_B.pdf&action=default&DefaultItemOpen=1).

Nick Hatton, Reliability Modeling Engineer, reviewed the existing Composite Load Model spreadsheets WECC staff uses for building the base case.

The presentation is posted to the [WECC website](https://www.wecc.org/Reliability/WECC%20Load%20Composition%20Model%20-%20ver4c.zip).

# Day 3—February 3, 2023, 8:30 a.m. to 12:00 p.m. Mountain Time

## Review MVS Member List and Update—Doug Tucker, WECC

Ms. Eberhard presented the current member list for the committee to review. Any changes that need to be made will be emailed to Mr. Tucker.

The member list is posted on the [WECC website](https://www.wecc.org/RAC/Pages/MVWG.aspx#members).

## Dynamic Model for HVDC Pacific Transmission Expansion Project

Steve Metague, California Western Grid Development, and Garth Irwin, Electranix, presented the dynamic model for HVDS Pacific Transmission Expansion project. The committee discussed the initialization and stability during the project.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Dynamic%20Model%20for%20HVDC%20with%20Pacific%20Transmission%20Expansion%20Project%20case%20study%20-%20WECC%20-%203%20Feb%202023.pdf&action=default&DefaultItemOpen=1).

## Update on DOE National Transmission Study

Hamody Hindi, U.S. Department of Energy, presented an update on the national transmission study. The committee discussed the offshore wind sensitivities and whether there is a target for loss of load probability.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/NTPS%20WECC%20MVS%20Feb%203rd%202023.pdf&action=default&DefaultItemOpen=1).

## Coupling Water Data with Electrical Model – Slaven Kincic, PNNL

Slaven Kincic, PNNL, presented an update for the coupling water data with electrical model.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/Coupling%20water%20data%20with%20electrical%20model.pdf&action=default&DefaultItemOpen=1).

## Follow-up CHVDC2 Model in Base Case Discussion

This item was postponed until the next meeting.

## MOD-33 Update

Mr. Tucker gave an update on MOD-33 on the Southwest Power Pool (SPP) case. SPP has requested to add voltages angles into the system, which RC West is working on.

## Program Updates

Juan Sanchez-Gasca, GE, provided an update on PSLF. The committee discussed the spikes in the current results.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/PSLF%20Update%20Feb%202023%20v1.pdf&action=default&DefaultItemOpen=1).

Jay Senthil, PTI, provided an update for the current and upcoming releases of PSSE. The committee discussed using Python for PSSE.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/PSSE_Update_MVS_Feb_2023.pdf&action=default&DefaultItemOpen=1).

Jamie Weber, PowerWorld, gave an update for the load variable frequency drive model (LDVFD\_A).

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/WeberPowerWorld_VariableFrequencyDriveModel.pdf&action=default&DefaultItemOpen=1).

Jeff Bloemink, Powertech Labs, provided an update for the TSAT releases.

The presentation is posted to the [WECC website](https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/DSATools%20Update%20-%20MVS%20Feb%202023.pdf&action=default&DefaultItemOpen=1).

## Public Comment

No comments were offered.

## Review New Action Items

* Create a poll for a good time in the year for one in-person meeting, which all members will try to attend.
  + Assigned To: Maddy Eberhard and Doug Tucker
  + Due Date: 2/17/2023
* Update REGC\_C memo to clarify committee concerns.
  + Assigned To: Pouyan Pourbeik
* Work with Raul for the TBC model.
  + Assigned To: Pouyan Pourbeik and vendors
* Draft an improvised head pump model.
  + Assigned To: Berney Lesieutre and Parag Mitra

## Upcoming Meetings

May 23–25, 2023 Surrey, BC, Canada

September 26–28, 2023 Salt Lake City, Utah

## Adjourn

Mr. Wang adjourned the meeting without objection at 11:48 a.m.

## **Exhibit A: Attendance List**

### Members in Attendance

Juan Sanchez-Gasca GE Energy Consulting Group

Jayapalan (Jay) Senthil Siemens Energy, Inc.

Song Wang Portland General Electric Company

Angel Aquino PowerWorld Corporation

Hassan Baklou San Diego Gas and Electric

Kevin Brooks Southern California Edison Company

Daniel Cervantes Los Angeles Department of Water and Power

Lakmal Chandrasekara Turlock Irrigation District

Tuan Dang Public Utility District No. 1 of Snohomish County

Fangfang Du PacifiCorp

Roberto Favela El Paso Electric Company

Jonathon Flores Los Angeles Department of Water and Power

Chris Gilden Tri-State Generation and Transmission—Reliability

Joseph Gillette Utility System Efficiencies, Inc.

Bo Gong Salt River Project

Hamody Hindi Bonneville Power Administration—Transmission

Emily Hnatishin Puget Sound Energy, Inc.

Robert Jones Seattle City Light

Milad Kahrobaee AES Corporation

Gordon Kawaley Bonneville Power Administration—Transmission

Lesley Kayser-Sprouse Hetch Hetchy Water and Power

Dmitry Kosterev Bonneville Power Administration—Transmission

May Le Public Utility District No. 2 of Grant County

Hongtao Ma North American Electric Reliability Corporation

Ron Markham Pacific Gas and Electric Company

Saurav Mohapatra PowerWorld Corporation

Erik Olson Puget Sound Energy, Inc.

Shawn Patterson U.S. Bureau of Reclamation

Pouyan Pourbeik Power and Energy, Analysis, Consulting and Education, PLLC

Nathan Powell Deseret Generation & Transmission Cooperative

Benjamin Rodriguez El Paso Electric Company

Amanuel Selassie Los Angeles Department of Water and Power

Hari Singh Public Service Company of Colorado (Xcel Energy)

Spencer Tacke Auriga Corporation

Chifong Thomas Thomas Grid Advisor

Patrick Truong Sacramento Municipal Utility District

James Weber PowerWorld Corporation

Xiaokang Xu S&C Electric Company

Xiaofei (Sophie) Xu Pacific Gas and Electric Company

Steve Yang Bonneville Power Administration—Transmission

Jimmy Zhang Alberta Electric System Operator

### Members not in Attendance

Joel Ankeny PacifiCorp

Ian Beil Portland General Electric Company

Jess Boatwright NorthWestern Energy

Desmond Chan Seattle City Light

Ken Che Public Utility District No. 1 of Snohomish County

Ben Davis Vestas

Chris Effiong Western Area Power Administration

Abraham Ellis National Nuclear Security Administration - Sandia National Laboratories

Xiaoyuan Fan Pacific Northwest National Laboratory

Jennifer Galaway Portland General Electric Company

Aaron Hancock Tucson Electric Power

Allison Hidalgo U.S. Bureau of Reclamation

Siraji (Sam) Hirsi Bonneville Power Administration

Licheng Jin California Independent System Operator

James Keller Western Area Power Administration - Rocky Mountain Region

Jonathan Lesage MathWorks

Xi Lin Powertech Labs, Inc.

Saw Linn Los Angeles Department of Water and Power

Peter Mackin GridBright, Inc.

Monte Meredith Utility System Efficiencies, Inc.

Mitchell Miller NorthWestern Energy

Amir Mohammednur Southern California Edison Company

Avinash Narava Tucson Electric Power

Ram Nath Siemens Energy, Inc.

Mark Pigman Tacoma Power

Sergey Pustovit Bonneville Power Administration

Ryan Quint North American Electric Reliability Corporation

Matin Rahmatian Power System Consultants, Inc.

Ramu Ramanathan Maxisys, Inc.

Daniel Ramirez Energy Strategies

Alistair Rennie Salt River Project

Tracy Rolstad Public Utility District No. 2 of Grant County

David Roop Mitsubishi Electric Power Products, Inc.

Angel Omar Sandoval Salt River Project

Slavomir Seman Vestas

Karim Shaarbafi Alberta Electric System Operator

Alejandro Solis El Paso Electric Company

Jonathan Stahlhut TransCo Energy, LLC

Khanh Thai Tacoma Power

Jade Thiemsuwan Sempra Renewables Services, Inc.

Chad Thomson Utility System Efficiencies, Inc.

John Undrill Independent Subject Matter Expert

Andres Valdepena Delgado Idaho Power Company

Zhaoyu Wang Iowa State University

Chong Wang Iowa State University

Jianhui Wang Southern Methodist University

Jeffery Watkins NV Energy

David Wiley Arizona Public Service Company

Scott Wilson Avista Corporation

Reza Yousefian S&C Electric Company

Janice Zewe Sacramento Municipal Utility District

Dongbo Zhao Argonne National Laboratory

### Others in Attendance

Maddy Eberhard WECC

Nick Hatton WECC

Slaven Kincic Pacific Northwest National Laboratory

Jin Tan National Renewable Energy Lab

Doug Tucker WECC

George Zhou S&C Electric Company

Baj Agrawal Arizona Public Service Company

John Anasis Bonneville Power Administration

Steven Barnes Peregrine Engineering

Simrit Basrai Pacific Gas and Electric Company

Zach Beus Bonneville Power Administration

Jeff Bloemink Powertech Labs, Inc.

Arjun Boddu

Kent Bolton WECC

Miljenko Bradaric Shell Energy North America (US), L.P.

Sean Brosig US Army Corps of Engineers

Theo Brown Southwest Power Pool

Martin Caro-Garcia Los Angeles Department of Water and Power

Tamojit chakraborty Mitsubishi Electric Power Products, Inc.

Malati Chaudhary Public Service Company of New Mexico

Yunzhi Cheng Electric Reliability Council of Texas

Hung-Ming Chou Dominion Energy

Jon Cichosz PacifiCorp

Chris Corral El Paso Electric Company

Christian Danielson Electric Reliability Council of Texas

Jiaojiao Dong University of Tennessee

Wei Du Pacific Northwest National Laboratory

Shruti Dwarkanath GE Energy Consulting Group

Ryan Elliott National Nuclear Security Administration - Sandia National Laboratories

Donna Enriquez El Paso Electric Company

Ken Epp Three Rivers Energy Development, LLC

Tony Faris Bonneville Power Administration

Chris Fecke-Stoudt Salt River Project

Bryan Friesen British Columbia Hydro and Power Authority

Christopher Fuchs California Independent System Operator

Irina Green Guidehouse

Nick Haggerty Bonneville Power Administration

Kevin Harris PNNL

Jesse Harris Grid Subject Matter Experts

Eric Heredia Bonneville Power Administration

Rafael Idiatulin

Garth Irwin Electranix

Katie Iverson AES Clean Energy

Robert Jackson Burns & McDonnell (1898 and Co.)

Jinho Kim Pacific Northwest National Laboratory

Seongtae Kim PacifiCorp

Matthew Korytowski Siemens Energy, Inc.

Bernie Lesieutre WISC

Sam Li BC Hydro

Austin Linn Bonneville Power Administration

Yilu Liu University of Tennessee

Kristian Lund Powertech Labs, Inc.

Olushola Lutalo NERC

Rajat Majumder Orsted Onshore North America, LLC.

Walter Mariscal Power-Tech Engineers, Inc.

Stony Martin SERC Reliability Corporation

Chris Mclean California Energy Commission

Joe Mercer Bonneville Power Administration

Steve Metague Pacific Gas and Electric Company

Parag Mitra Electric Power Research Institute

Sheik Mohiuddin Pacific Northwest National Laboratory

Carlos Molina Power-Tech Engineers, Inc.

Samaan Nader Pacific Northwest National Laboratory

Quan Nguyen Pacific Northwest National Laboratory

Udoka Nwaneto

Kostas Oikonomou Pacific Northwest National Laboratory

Akila Perera Grid Subject Matter Experts

Raul Perez Geurrero NextEra Energy Resources, LLC

Vishal Puppala

Ebrahim Rahimi California Independent System Operator

Deepak Ramasubramanian Electric Power Research Institute

Ricardo Rodriguez El Paso Electric Company

Jonathan Rose Electric Reliability Council of Texas

Micah Runner Black Hills Corporation

Faranak Sarbaz Los Angeles Department of Water and Power

Richard Schafer Bonneville Power Administration

Paul Shockley Power-Tech Engineers, Inc.

Chris So California Department of Water Resources

Ahmed Soliman Siemens Energy, Inc.

Kannan Sreenivasachar ISO New England

Chris Stauffer Mitsubishi Electric Power Products, Inc.

Phaedra Taiarol Stantec Consulting

Jerod Vandehey Public Utility District No. 1 of Cowlitz County

Jerry Vang Mitsubishi Electric Power Products, Inc.

Zhibo Wang Mitsubishi Electric Power Products, Inc.

Cho Wang Advanced Energy Solutions

Shawn Wang Enel North America, Inc

Quincy Wang British Columbia Hydro and Power Authority

Guiha Wang British Columbia Hydro and Power Authority

Maggie Watkins US Army Corps of Engineers

Trevor Werho Arizona Public Service Company

Dennis Woodford Electranix

Michael Xia Powertech Labs, Inc.

Yuguang Xiao British Columbia Hydro and Power Authority

Nebiyu Yimer California Independent System Operator

Hongming Zhang SRP Renewables Management Services, LLC

Songzhe Zhu GridBright, Inc.

Wenchun Zhu Siemens Energy, Inc.

Scott Zuloaga Electric Reliability Council of Texas