

**Day 1—January 29, 2025**  
**2:00 p.m. to 5:00 p.m.**

**1. Welcome, Call to Order**

Song Wang, Modeling and Validation Subcommittee (MVS) Chair, called the meeting to order at 2:02 p.m. MT on January 29, 2025. A quorum was present to conduct business. A list of attendees is attached as Exhibit A.

**2. Review WECC Antitrust Policy**

Doug Tucker, Senior Engineer, read aloud the WECC Antitrust Policy statement. The policy can be found on [wecc.org](http://wecc.org).

**3. Approve Agenda**

S. Wang introduced the proposed meeting agenda.

The 2025-01-29 MVS Agenda was changed as follows:

- “Approved” was changed to “Un-approved” in Item 6;
- Item 8 and 9, “Discussion for Utilities on EMT/Positive Sequence Model Study Selection Criteria—Songzhe Zhu, All” and “Recap of the Applicability of the Generic Models, User-defined Model, and EMT Model—Song Wang, PGE”, switched places;
- “Load Modeling Testing and Verification—MVS” was removed from Item 13.

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

**4. Review and Approve Previous Meeting Minutes**

S. Wang introduced the minutes from the meeting on September 9-11, 2024.

The 2024-09-09 Minutes were changed as follows:

- “Break-node” was changed to “breaker-node” in Item 8;
- “Value proposition” was changed to “the value of” in Item 10;
- “Factor” was added to Item 13;
- “Situation” was changed to “saturation” in Item 13.

**By consensus, the MVS approved the minutes from September 9-11, 2024.**

## 5. Review Previous Action Items

Maya Brimhall, Administrative Coordinator, reviewed action items carried over from the MVS meeting on September 11, 2024. Action items that are not closed and will be carried forward can be found on the MVS page on the WECC website.

## 6. Review Unapproved Dynamic Model List

D. Tucker reviewed the unapproved dynamic model list.

## 7. Review MVS Member List and Update

D. Tucker encouraged MVS members to review and update their organizations' MVS representatives.

## 8. Recap of the Applicability of the Generic Models, User-defined Model, and Electromagnetic Transient (EMT) Model

S. Wang evaluated the applicability of the generic models, user-defined model, and EMT model.

## 9. Discussion for Utilities on EMT/Positive Sequence Model Study Selection Criteria

Songzhe Zhu, Qualus, LLC, led a discussion on utilities' criteria for EMT/Positive Sequence Model Study selection. She live edited a reference document with the MVS' inputs and stated that she will bring the document to relevant model planners to use in their model study selections.

## 10. Prioritizing the Next Set of Model Development

The MVS prioritized the following set of model development, listed from most important to least important:

- Series Capacitor MOV Model (SCMOV)
- VHVDC2
- IBR Controls—REEC\_E
- Grid-forming Inverter Model—Hybrid
- Large Load
  - EV Charging Model
  - Data Center
  - Electrolyzer model
- VHVDC3—Offshore Wind
- Advanced Pump Storage Model



- SVSMO4 Model
- Multi-terminal VSC-HVDC

## Day 2—January 30, 2025

9:00 a.m. to 5:00 p.m.

### 11. Renewable Energy Modeling

The MVS listened to the following presentations:

- Wei Du, Pacific Northwest National Laboratory, presented on the Model Specification of a Grid-forming Hybrid Inverter Control Model and called for a vote to approve both the REGFM\_C1 model and the REPCGFM\_C1 model.

*Approval Item: Model Specification of a Grid-forming Hybrid Inverter Control Model*

**By consensus, the MVS approved the Model Specification of a Grid-forming Hybrid Inverter Control Model.**

- S. Zhu shared the Inverter Based Resources (IBR) model and validation guidelines draft document on screen, describing which documents she compiled together and how she decided to organize the guidelines draft. Members of the MVS gave their feedback.
- Eric Heredia, Bonneville Power Administration (BPA), and S. Wang addressed renewable energy Interconnection requests and grid-forming requirements. He explained how clear grid-forming model (GFM) specifications will benefit system performance, shared example GFM requirement specifics, and asked the MVS whether a WECC whitepaper defining GFM minimum performance requirements would be beneficial. The MVS decided to move forward with developing a whitepaper.
- S. Wang updated the MVS on the study of the droop-based grid forming inverter model REGFM-A1 in the WECC system. He provided the background of the model and discussed the study purpose, parameters, scenarios, and contingencies. He also explained the IEEE 39 Bus System Test.
- P. Pourbeik updated the MVS on IBR model development and discussed adding enhancements and regional adaptations to generic WECC models. He also provided insights from Energinet and Global Applications. The MVS edited the model development priority list (see Item 10) to reflect the MVS's model specifications progress.
- The MVS discussed offshore wind model development. P. Pourbeik, S. Wang, and W. Du discussed the possibility of drafting a whitepaper and agreed to meet offline to evaluate whether offshore wind model development should stay on the model



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development priority list (See Item 10). The MVS decided to keep the offshore wind model on the model development priority list.

**12. Active Transmission System Modeling Update**

The MVS listened to the following presentations:

- P. Pourbeik reviewed the VHVDC2, VHVDC3, and SVSMO4 active transmission system models. He explained the differences between VHVDC2 and VHVDC3 and shared that there were not significant updates to the modeling progress.
- Jay Senthil, Siemens Industry, Inc., discussed the implementation of the VHVDC2 model. He explained the differences between the existing VHVDC1 and the proposed VHVDC2.
- W. Du introduced the Standard Library High Voltage Direct Current (HVDC) and Multi-Terminal High Voltage Direct Current (MTDC) model development plan for offshore wind integration.

**13. Load Modeling**

The MVS listened to the following presentations:

- Nick Hatton, Staff Engineer, discussed the Positive Sequence Load Flow (PSLF) Composite Load Model Modular Model and the steps to finalize this Modular Model for WECC use. He shared the current Python script used to validate the models and confirmed that he and Andreas Schmitt, BPA, will continue refining the modular model script with the hope to finalize it by May 2025.
- Meng Yue, Brookhaven National Laboratory, updated the MVS on the Multi-event Two-stage (METS) parameterization of WECC Composite Load Model (CLM). He presented the objectives, background, various tested methodologies, and case studies of the WECC CLM METS parameterization. He shared Brookhaven National Laboratory's efforts to release a paper detailing their findings.
- A. Schmitt and S. Wang presented the load modeling work plan, covering the following topics: transitioning the load model to the modular model; parameter calibration; testing and verification, including equipment testing and model performance verification based on system events or other methods; WECC load model composition data; system-wide simulation; Electric Vehicle and data center control and protection; and supporting NERC emerging load plans.

**Day 3—January 31, 2025**

**9:00 a.m. to 12:00 p.m.**



## 14. Power Plant Modeling

The MVS listened to the following presentations:

- Jin Tan and Ningcao Gao, National Renewable Energy Laboratory, and Zerui Dong, OPAL-RT Technologies Inc., presented pumped storage hydro (PSH) specification development updates. J. Tan shared the background, progress, and timeline of the PSH specification development. She presented a high-level overview of the ternary pumped storage hydropower system, configuration, and modeling and explained multiple model modes and simulations. J. Tan encouraged collaboration on the PSH specification modeling and asked for the MVS' feedback.
- Quincy Wang, British Columbia Hydro and Power Authority, shared his analysis of implementation errors in synchronous generator saturation functions across software platforms.
- Wayne Cassidy and Dan Leonard, Peregrine Engineering Consulting, compared the GENROU version to the GENQEC Models for a round rotor machine. The MVS agreed to continue the conversation concerning choice in modeling and D. Tucker encouraged the MVS to develop measurable next steps. D. Tucker will improve the language concerning the GENROU model in the Approved Dynamics Models list prior to the MVS meeting in May 2025.
- The MVS discussed saturation factors and their impact on field current accuracy.
- The MVS discussed the excitation system Type C model. Saurav Mohapatra, PowerWorld Corporation, showed where to find the Excitation Limiters information on the PowerWorld website.

## 15. MOD-33 Update

The MVS listened to the following MOD-33 updates:

- Licheng Jin, California Independent System Operator, shared which cases have been posted on the RC portal since the MVS meeting in September 2024 and which tools are getting updated.
- D. Tucker shared that Southwest Power Pool is still working on mapping their system one for one for California Independent System Operator. He also communicated that WECC has a mapping file for the generation for the RC West case; if anyone wants to build a case using the file, they can reach out to WECC to retrieve it.

## 16. Program Updates

The MVS listened to the following program updates:



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- Mengxi Chen, GE Vernova, stated that her team is working on a PSLF software development update, and it should be released soon.
- Jay Senthil provided Power System Simulation for Engineering (PSSE) recent and upcoming releases and PSSE dynamics enhancements.
- Jamie Weber, PowerWorld Corporation, stated that there are no new PowerWorld program updates.
- Fred Howell, Powertech Labs, shared Powertech Labs Transient Security Assessment Tool (TSAT) release schedule and recent enhancements for model support and user-defined modeling.

### 17. Public Comment

No comments were made.

### 18. Review New Action Items

- Include approval item for WECC to use SCMOV model specification on May 2025 MVS Agenda
  - Assigned To: Doug Tucker, Song Wang
  - Due Date: April 28, 2025
- Include approval item for WECC to use REEC\_E and VHVDC2 model specifications on May 2025 MVS Agenda
  - Assigned To: Pouyan Pourbeik; Doug Tucker; Song Wang
  - Due Date: April 28, 2025
- Improve GENROU language on the Approved Dynamics Models list
  - Assigned To: Doug Tucker
  - Due Date: May 9, 2025
- Create a presentation for the next MVS meeting on load modeling
  - Assigned To: Malati Chaudary, Jackson Daly
  - Due Date: May 9, 2025
- Create a presentation for the next MVS meeting on Excitation system Type C model
  - Assigned To: Saurav Mohapatra, James Weber
  - Due Date: May 9, 2025

### 19. Upcoming Meetings

May 7-9, 2025..... Salt Lake City, Utah  
September 10-12, 2025..... Virtual



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### 20. Adjourn

S. Wang adjourned the meeting without objection at 12:00 p.m. MT on Friday, January 31, 2025.



## MVS Meeting Minutes—January 29-31, 2025

### Exhibit A: Attendance List

#### Members in Attendance

Angel Aquino..... PowerWorld Corporation  
Hassan Baklou..... San Diego Gas and Electric  
Zachary Beus..... Puget Sound Energy, Inc.  
Jessica Boatwright..... NorthWestern Energy  
Kevin Brooks..... Southern California Edison Company  
Sean Brosig..... US Army Corps of Engineers  
Emerson Butler..... Puget Sound Energy, Inc.  
Daniel Cervantes..... Los Angeles Department of Water and Power  
Lakmal Chandrasekara..... Turlock Irrigation District  
Ken Che..... Public Utility District No. 1 of Snohomish County  
Mengxi Chen..... GE Vernova (GE Energy Consulting Group)  
Christopher Corral..... El Paso Electric Company  
Jackson Daly..... Idaho Power Company  
Tuan Dang..... Public Utility District No. 1 of Snohomish County  
Fangfang Du..... PacifiCorp  
Wei Du..... Pacific Northwest National Laboratory  
Roberto Favela..... El Paso Electric Company  
Christopher Fuchs..... California Independent System Operator  
Miguel Garcia..... Sacramento Municipal Utility District  
Chris Gilden..... Tri-State Generation and Transmission—Reliability  
Joseph Gillette..... Utility System Efficiencies, Inc.  
Bo Gong..... Salt River Project  
Allison Hidalgo..... U.S. Bureau of Reclamation  
Robert Jackson..... Burns & McDonnell (1898 and Co.)  
Licheng Jin..... California Independent System Operator  
Robert Jones..... Seattle City Light





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Lesley Kayser-Sprouse..... Hetch Hetchy Water and Power  
Seong Tae Kim ..... PacifiCorp  
Slaven Kincic ..... Pacific Northwest National Laboratory  
Rabi Kiran ..... Pacific Gas and Electric Company  
Dmitry Kosterev ..... Bonneville Power Administration—Transmission  
Mitchell Miller..... NorthWestern Energy  
Saurav Mohapatra ..... PowerWorld Corporation  
Pouyan Pourbeik ..... Power and Energy, Analysis, Consulting and Education, PLLC  
Sergey Pustovit ..... Bonneville Power Administration  
Iraq Rahimi ..... Alberta Electric System Operator  
Deepak Ramasubramanian ..... Electric Power Research Institute  
Jayapalan (Jay) Senthil ..... Siemens Industry, Inc.  
Spencer Tacke..... Auriga Corporation  
Jin Tan ..... National Renewable Energy Laboratory  
Anthony Taylor..... Black Hills Corporation  
Chifong Thomas ..... Thomas Grid Advisor  
Doug Tucker..... WECC  
Ramin Vakili..... GE Vernova (GE Energy Consulting Group)  
GuiHua Wang ..... British Columbia Hydro and Power Authority  
Song Wang..... Portland General Electric Company  
Jeffery Watkins..... NV Energy  
Maggie Watkins ..... U.S. Army Corps of Engineers-Seattle District  
James Weber ..... PowerWorld Corporation  
Trevor Werho ..... Arizona Public Service Company  
Steve Yang ..... Bonneville Power Administration—Transmission  
Ratanan Yoopat..... Bonneville Power Administration

### Members not in Attendance

Jim Ding ..... British Columbia Hydro and Power Authority



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Chris Effiong ..... Western Area Power Administration  
Xiaoyuan Fan ..... Pacific Northwest National Laboratory  
Jonathon Flores ..... Los Angeles Department of Water and Power  
Carlos Flores Lopez ..... US Army Corps of Engineers  
Gordon Kawaley ..... Bonneville Power Administration—Transmission  
James Keller ..... Western Area Power Administration - Rocky Mountain Region  
Yuriy Komlev ..... U.S. Bureau of Reclamation  
May Le ..... Public Utility District No. 2 of Grant County  
Ron Markham ..... Pacific Gas and Electric Company  
Parag Mitra ..... Electric Power Research Institute  
Nathan Powell ..... Deseret Generation & Transmission Cooperative  
Anthony Rendon ..... Salt River Project  
Tracy Rolstad ..... Public Utility District No. 2 of Grant County  
Amanuel Selassie ..... Los Angeles Department of Water and Power  
Hari Singh ..... Public Service Company of Colorado (Xcel Energy)  
Jonathan Stahlhut ..... TransCo Energy, LLC  
Patrick Truong ..... Sacramento Municipal Utility District  
Xiaofei (Sophie) Xu ..... Pacific Gas and Electric Company  
George Zhou ..... S&C Electric Company

### Others in Attendance

Shounak Abhyankar ..... ISO New England  
Bajarang Agrawal ..... Arizona Public Service Company  
Ishrak Ahmed ..... University of Tennessee, Knoxville  
Chris Albrecht ..... WECC  
Sayan Asamanta ..... Tesla, Inc.  
Eric Bahr ..... NorthWestern Energy  
Dirk Barton ..... Public Service Company of New Mexico  
Maya Brimhall ..... WECC



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Theodis Brown ..... Southwest Power Pool

Pedro Calle ..... Independent Subject Matter Expert

Jared Campbell..... Electrical Consultants, Inc.

Wayne Cassidy.....Peregrine Engineering Consulting

Malati Chaudhary .....Public Service Company of New Mexico

Jon Cichosz ..... Peak Power Consulting

Alejandro Conti..... Mitsubishi Electric Power Products, Inc.

Donovan Crane .....WECC

Paul Curtis ..... Public Utility District No. 1 of Chelan County

Christian Danielson..... Electric Reliability Council of Texas

Harsh Dinesh..... RWE Renewables Americas, LLC

Zerui Dong .....OPAL-RT Technologies Inc.

Silvanus D'silva..... Tesla, Inc.

Marcelo Elizondo..... Pacific Northwest National Laboratory

Michael Ellerington ..... British Columbia Hydro and Power Authority

Lingling Fan .....University of South Florida

Tony Faris ..... Bonneville Power Administration

Neil Flodin..... Puget Sound Energy, Inc.

Bryan Friesen..... British Columbia Hydro and Power Authority

Ningchao Gao .....National Renewable Energy Laboratory

Jack Gibfried..... NERC

Irina Green.....Public Utility District No. 2 of Grant County

Nicholas Hatton.....WECC

Eric Heredia.....Bonneville Power Administration—Transmission

Fred Howell..... Powertech Labs, Inc.

Brandon Johnson ..... Westwood Professional Services

Parth Kanagaraj ..... Tesla, Inc.

Lilan Karunaratne..... Tesla, Inc.



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Prasuna Katta .....Public Service Company of New Mexico  
Ronnie Lau..... Pacific Gas and Electric Company  
Luis Leon ..... Arizona Public Service Company  
Dan Leonard.....Peregrine Engineering Consulting  
Sam Li..... British Columbia Hydro and Power Authority  
Shanna Love .....Salt River Project  
Jose Macias .....Operation Technology, Inc  
James MacPherson.....Avantus  
Richard Maguire ..... Electrical Consultants, Inc.  
Jerry Mitchell .....Public Service Company of New Mexico  
Elliott Mitchell-Colgan.....Bonneville Power Administration—Transmission  
Mohammed Nassar ..... Tesla, Inc.  
Quan Nguyen..... Pacific Northwest National Laboratory  
Mohamed Osman ..... NERC  
Shawn Patterson ..... U.S. Bureau of Reclamation  
Juan Placid ..... JJ Power & Energy, Inc.  
Amro Quedan ..... Electric Reliability Council of Texas  
Kirha Quick .....WECC  
Ebrahim Rahimi.....California Independent System Operator  
Benjamin Rodriguez..... El Paso Electric Company  
Marco Salazar..... Siemens Industry, Inc.  
Juan Sanchez-Gasca..... Independent Subject Matter Expert  
Andreas Schmitt ..... Bonneville Power Administration  
Trevor Schultz .....Idaho Power Company  
Liam Segarty..... British Columbia Hydro and Power Authority  
Nitish Sharma..... BayWa r.e. Solar Projects LLC  
Sachin Soni.....I2R Grid Solutions, Inc  
Mauricio Soria ..... Escuela Politécnica Nacional



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Lakshmi Sundaresh..... Electric Power Research Institute  
Sushrut Thakar..... Electric Power Research Institute  
Lakshmi Thotakura ..... University of Tennessee, Knoxville  
John Undrill..... Independent Subject Matter Expert  
Jerod Vandehey..... Public Utility District No. 1 of Cowlitz County  
Brock Vanden Bos..... Southwest Power Pool  
Sai Gopal Vennelaganti ..... Tesla, Inc.  
Jeff Wai..... British Columbia Hydro and Power Authority  
Quincy Wang ..... EPE Consulting  
Bernd Weise..... DlgSILENT GmbH  
Michael Xia ..... Powertech Labs, Inc.  
Yuguang Xiao..... British Columbia Hydro and Power Authority  
Ali Yazdanpanah ..... Electric Reliability Council of Texas  
Meng Yue..... Brookhaven National Laboratory  
Augusto Zanin Bertolotti ..... Portland General Electric Company  
Jimmy Zhang..... Electric Reliability Council of Texas  
Zhiqi Zhao ..... British Columbia Hydro and Power Authority  
Chelsea Zhu..... National Grid USA Service Company, Inc.  
Songzhe Zhu..... Qualus Corporation  
Scott Zuloaga..... Electric Reliability Council of Texas

