

1. Welcome, Call to Order

Song Wang, Modeling and Validation Subcommittee (MVS) Chair, called the meeting to order at 2:10 p.m. MT on May 24, 2023. 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, Reliability Assessments, read aloud the WECC Antitrust Policy statement. The meeting agenda included a link to the posted policy.

3. Approval of MVS Charter

Mr. Wang introduced the new MVS Charter.

By consensus of the members present, the MVS approved the charter.

The charter is posted on the WECC [website](#).

4. Approve Agenda

Mr. Wang introduced the proposed meeting agenda.

By consensus, the MVS approved the agenda.

5. Review and Approve Previous Meeting Minutes

Mr. Wang introduced the minutes from the meeting on February 1-3, 2023.

By consensus, the MVS approved the minutes from February 1-3, 2023.

The presentation is posted on the WECC [website](#).

6. Review Previous Action Items

Marie Smith, Administrative Coordinator, reviewed action items carried over from the MVS meeting on the last meeting date on February 1-3, 2023. Action items that are not closed and will be carried forward can be found [here](#).

7. Review the Approved Dynamic Model List

Mr. Tucker presented a review of the approved dynamic model list.

8. Review of WECC Model Approval Process

Mr. Wang discussed the review of the WECC Model Approval process. He showed the group where this is on the MVS website committee page.

9. Review MVS Membership List and Update

Mr. Tucker presented a review of the MVS membership list. If a member misses three meetings during the year, the member will be removed from the committee list. Once removed, the committee member should contact their liaison. This is according to the new MVS Charter.

10. Frequency Response Monitoring

Dimitry Kosterev, Bonneville Power Administration (BPA), presented on frequency response monitoring. Mr. Kosterev discussed how the historical data is a baseline. NERC BAL-003 Reliability Standard ensures the interconnection frequency. There is a link to this in his presentation.

Nick Hatton, Staff Engineer, Reliability Modeling, discussed having a conversation for baseline flag categories. Logan Affleck, Associate Reliability Engineer Modeling will follow up with Mr. Kosterev on attending the next Systems Reliability Subcommittee (SRS) meeting.

The presentation is posted on the WECC [website](#).

11. Automated Creation of Varying Penetrations of GFM IBRs for Western Interconnection Wide-area Oscillation Study.

Xiaoyuan Fan, Pacific Northwest National Laboratory (PNNL), presented on the Automated Creation of Varying Penetration of GFM IBRs for Western Interconnection Wide-Area Oscillation Study. The PNNL team will work with two university professors on assigned tasks.

The presentation is posted on the WECC [website](#).

12. Follow-up Discussion on CHVDC2 Model in Base Cases

Mr. Hatton has updates on the discussion about CHDCV2 Models in base cases. He discussed how optimization needs to align with BPA's standard data. He will present more at the next MVS meeting in September 2023.

Jayapal Senthil, Siemens Energy Incorporated, suggested reviewing one of these cases and then following up with the MVS.



13. Tesla Experience with User-defined Models

Prashant Kanal and Sai Gopal Vennelaganti, Tesla, presented on the experience with user-defined models to the MVS group.

14. Grid-Forming Virtual Synchronous Machine Technologies

Sasan Zabihi, Hitachi Energy, presented on the topic of grid-forming virtual synchronous machine technologies. This project in South Australia is called the Energy Storage for Commercial Renewable Integration (ESCRI). The ESCRI project will test on wind farms. One of the points mentioned in the presentation was that, for grid-forming inverters, Hitachi Energy can provide a short-circuit current of 2 pu for 2 seconds. The capability opens the way for GFM to enter the market in the future, both in terms of relay protection and fault ride-through.

15. Renewable Energy Modeling

Mr. Wang presented a project awarded by the U.S. Department of Energy. This will be the first demonstration of grid-forming IBRs, including both wind and battery storage, connected to the U.S. bulk power systems.

Wei Du, PNNL, introduced the REGFM_A1 model.

Approval Item: REGFM_A1

By consensus the MVS, postponed the approval of the REGFM_A1 until next meeting.

The presentation is posted on the WECC [website](#).

Brian Johnson, University of Texas at Austin, presented on Global Fault Management (GFM) Converters. The Unified Consortium is moving toward standards and how the units are to interact with each other.

The presentation is posted on the WECC [website](#).

The REGC_C model was discussed, and it was determined that the model did not meet the criteria for approval. For example, mathematical logic and physical meaning were not clear, and there was no vendor support. The model will need to provide new supporting evidence if approval is sought later.

The next set of model development is prioritized as follows:

1. Grid-Forming Inverter model,
2. REEC_E,
3. REPC_D (hybrid plant controllers),
4. Vhvd2,



5. SvSM04,
6. Off-shore winds DC (vhvdc3),
7. SCMOV (series capacitor MOV mindset),
8. Multi-Terminal HVDC VSC model.

Hossein Ashorian and Henry Gras presented on the Renewable Energy Systems (RES) WECC models in Electromagnetic Transients Program (EMTP). Mr. Ashorian discussed the four devices developed in EMTP based on WECC controller models. Future works created a benchmark EMTP WECC model and it is comparing results with other software platforms.

The presentation is posted on the WECC [website](#).

16. Load Modeling

Bo Gong, Salt River Project, presented on the Roadmap of Load Modeling. Deepak Ramasubramanian, Electric Power Research Institute (EPRI), has been working on a portion of this modeling. This group will start to work on the benchmarking for this group.

The presentation is posted on the WECC [website](#).

John Skeath, North American Electric Reliability Corporation (NERC), presented on Electric Vehicles (EV) modeling and characteristics. In July 2023, NERC implemented future goals for EV modeling and characteristics.

The presentation is posted on the WECC [website](#).

Rob O'Keefe, American Electric Power (AEP) presented on data center modeling and associated CMLD data.

The presentation is posted on the WECC [website](#).

Xiaokang Xu, S&C Electric Company (S&C), discussed PJM system stability. The method tests in three-phases. These three phases were developed from studies performed at this time. There needs to be a benchmark for the NERC Phase 3 CMLD.

The presentation is posted on the WECC [website](#).

Lakashmi Sundaresh, EPRI, spoke about the improvement for single-phase air-conditioning (AC) models; specifically, the phaser model. They have two different models: a single-phase: heating, ventilation, and air conditioning (HVAC) model, and a performance and phasor model.

Mr. Hatton presented on the DER_A model induced oscillation. There are WECC-wide simulations with composite load model and DER_A displayed. Deepak Rasmussen has a study on IEEE transmissions network in Electromagnetic Modeling Transients (EMT) domain with versions of utility distributions systems.



Andrew Larkins, Sygensys, presented on the fault ride-through converter-based loads. Information Technology Industry Council (ITIC) curves are based on how to develop consumer experience for small loads.

The presentation is posted on the WECC [website](#).

17. Active Transmission System Modeling Update

Pouyan Pourbeik, Power and Energy Analysis Consulting and Education, PLLC (PEACE), presented on the status of high-voltage direct current (HVDC) models. The work on multi-terminal VSC-HVDC and SVSMO4 will continue.

The presentation is posted on the WECC [website](#).

Sam Li, Powertech Labs, Inc., presented on experience sharing composite load model behaviors. These model behaviors compared by Powertech Labs to real-world events. The system total loads dropped, and the simulated event was comparable. The second event was not comparable. Mr. Hatton stated that he will email the PDF on load-based modeling to Mr. Li after today's meeting.

18. Power Plant Modeling

Quincey Wang, British Columbia Hydro, presented on the roadmap of power plant modeling.

Mr. Wang spoke about understanding the GENTPJ model.

The presentation is posted on the WECC [website](#).

Eric See-Toh, Powertech Labs, presented on hydro generation's rehabilitation effects on dynamic modeling. Newer generators are coming into the market with rewinds. The staff is moving toward a plan of action.

The presentation is posted on the [WECC website](#).

19. RRC Risk Process

Tim Reynolds, Manager, Risk Analysis, presented on the Reliability Risk Committee (RRC) risk management process. He is looking for a diverse group of people sharing their ideas on a subject.

The presentation is posted on the WECC website.

20. MOD-33 Update

Mr. Tucker updated the group briefly on MOD-33.



21. Program Updates

Jay Senthil, Siemens Energy, Inc. and Powertech Labs (PTL), presented an update on the Power System Simulation for Engineering (PSSE) Program. He discussed current and upcoming releases.

The presentation is posted on the WECC [website](#).

Jamie Weber, Power World, discussed program updates. Power World will be hosting a training at Washington State University.

Jeff Bloemink, Powertech Labs, presented on the latest WECC MVS updates.

22. Public Comment

There were no comments made.

23. Review New Action Items

- Discuss timeline for GENTPJ retirement.
 - Assigned To: Quincey Wang, British Columbia Hydro and Power Authority
 - Due Date: September 26, 2023
- Review the model acceptance criteria and make any updates.
 - Assigned To: MVS
 - Due Date: September 26, 2023
- Email a survey to MVS members on future meeting dates.
 - Assigned To: Doug Tucker
 - Due Date: September 26, 2023

24. Upcoming Meetings

September 26–28, 2023 Salt Lake City, Utah

25. Adjourn

Mr. Wang adjourned the meeting without objection at 1:17 p.m.



Exhibit A: Attendance List

Members in Attendance

Jeff Bloemink Powertech Labs, Inc.

Juan Sanchez-Gasca..... GE Energy Consulting Group

Song Wang..... Portland General Electric Company

James Weber..... PowerWorld Corporation

Xiaokang Xu S&C Electric Company

Jimmy Zhang..... Alberta Electric System Operator

Angel Aquino..... PowerWorld Corporation

Zachary Beus Puget Sound Energy, Inc.

Kevin Brooks Southern California Edison Company

Daniel Cervantes..... Los Angeles Department of Water and Power

Ken Che..... Public Utility District No. 1 of Snohomish County

Christopher Corral El Paso Electric Company

Wei Du Pacific Northwest National Laboratory

Xiaoyuan Fan Pacific Northwest National Laboratory

Roberto Favela El Paso Electric Company

Jonathon Flores Los Angeles Department of Water and Power

Chris Gilden Tri-State Generation and Transmission—Reliability

Bo Gong..... Salt River Project

Robert Jones..... Seattle City Light

Gordon Kawaley..... Bonneville Power Administration—Transmission

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

Seongtae Kim PacifiCorp

Dmitry Kosterev Bonneville Power Administration—Transmission

Mitchell Miller..... NorthWestern Energy

Saurav Mohapatra PowerWorld Corporation

Shawn Patterson U.S. Bureau of Reclamation



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Micah Runner..... Black Hills Corporation
Amanuel Selassie..... Los Angeles Department of Water and Power
Jayapalan (Jay) Senthil..... Siemens Energy, Inc.
Jonathan Stahlhut..... TransCo Energy, LLC
Chifong Thomas..... Thomas Grid Advisor
Chad Thomson..... Utility System Efficiencies, Inc.
John Undrill..... Independent Subject Matter Expert
Maggie Watkins..... U.S. Army Corps of Engineers
Trevor Werho..... Arizona Public Service Company
Xiaofei (Sophie) Xu..... Pacific Gas and Electric Company
Steve Yang..... Bonneville Power Administration—Transmission
Janice Zewe..... Sacramento Municipal Utility District

Members not in Attendance

Joel Ankeny..... PacifiCorp
Hassan Baklou..... San Diego Gas and Electric
Ian Beil..... Portland General Electric Company
Jess Boatwright..... NorthWestern Energy
Lakmal Chandrasekara..... Turlock Irrigation District
Tuan Dang..... Public Utility District No. 1 of Snohomish County
Fangfang Du..... PacifiCorp
Chris Effiong..... Western Area Power Administration
Carlos FloresLopez..... U.S. Army Corps of Engineers
Joseph Gillette..... Utility System Efficiencies, Inc.
Aaron Hancock..... Tucson Electric Power
Allison Hidalgo..... U.S. Bureau of Reclamation
Hamody Hindi..... Bonneville Power Administration—Transmission
Siraji (Sam) Hirsi..... Bonneville Power Administration
Licheng Jin..... California Independent System Operator



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Milad Kahrobaee AES Corporation
James Keller Western Area Power Administration - Rocky Mountain Region
Slaven Kincic Pacific Northwest National Laboratory
May Le Public Utility District No. 2 of Grant County
Jonathan Lesage MathWorks
Hongtao Ma North American Electric Reliability Corporation
Ron Markham Pacific Gas and Electric Company
Parag Mitra Electric Power Research Institute
Amir Mohammednur Southern California Edison Company
Avinash Narava Tucson Electric Power
Erik Olson Puget Sound Energy, Inc.
Mark Pigman Tacoma Power
Pouyan Pourbeik Power and Energy, Analysis, Consulting and Education, PLLC
Nathan Powell Deseret Generation & Transmission Cooperative
Sergey Pustovit Bonneville Power Administration
Ryan Quint North American Electric Reliability Corporation
Ramu Ramanathan Maxisys, Inc.
Deepak Ramasubramanian Electric Power Research Institute
Daniel Ramirez Energy Strategies
Alistair Rennie Salt River Project
Benjamin Rodriguez El Paso Electric Company
Tracy Rolstad Public Utility District No. 2 of Grant County
David Roop Mitsubishi Electric Power Products, Inc.
Karim Shaarbafi Alberta Electric System Operator
Hari Singh Public Service Company of Colorado (Xcel Energy)
Alejandro Solis El Paso Electric Company
Spencer Tacke Auriga Corporation
Khanh Thai Tacoma Power



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Jade Thiemsuwan Sempra Renewables Services, Inc.
Patrick TruongSacramento Municipal Utility District
Andres Valdepena DelgadoIdaho Power Company
Jianhui Wang.....Southern Methodist University
Jeffery Watkins..... NV Energy
Scott Wilson.....Avista Corporation
George Zhou..... S&C Electric Company
Songzhe Zhu..... GridBright, Inc.

Others in Attendance

Vahid Asgharian..... Powertech Labs, Inc.
Kyler Cordeiro
Bryan Friesen..... British Columbia Hydro and Power Authority
Robert Jackson..... Burns and McDonnell (1898 & Co.)
Xi Lin Powertech Labs, Inc.
Doug Tucker..... WECC
Zhibo Wang..... Mitsubishi Electric Power Products, Inc.
Bajarang L Agrawal..... Arizona Public Service Company
Viktor Aleschenko
Steven Barnes
Jessica Benitez Los Angeles Department of Water and Power
Mehdi Daryabak
Ziming Dong
Donna Enriquez-AlHakeem..... El Paso Electric Company
Alexander Fabian.....
Tony Faris Bonneville Power Administration
Christopher FuchsCalifornia Independent System Operator
Allan GianMarco
Sai Gopal Vennelaganti Tesla



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Nick Haggerty Bonneville Power Administration
Ryan Harrison
Ma Hontao
Eric Hy Los Angeles Department of Water and Power
Christian Jegues
Brandon Johnson Avangrid Renewables
Yuriey Kanely
Prashant Kansal Tesla
Benjamin Khorramdel
Ki Kin
Sundarest Lakshmi EPRI
Andrew Larkins Sygensys
Bernie Lesieutre University of Wisconsin
Sam Lin British Columbia Hydro and Power Authority
Shanna M. Love Salt River Project
Chaudhary Malati Public Service Company of New Mexico
Stony Martin SERC Reliability Corporation
Caro-Gar Martin
Joe Mercer Bonneville Power Administration
Emily Moore Puget Sound Energy, Inc.
Kiran Nandigam
Mohammed Osman North American Electric Reliability Corporation
Amro Quedan Electric Reliability Power of Texas
Matthew Reali TransCo Energy, LLC
Tim Reynolds WECC
Rostani
Mohapatau Saurav Power World Corporation
Eric See-Toh Powertech Labs, Inc.



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Amy Shi.....

Marie SmithWECC

Ahmed Soliman Siemens Energy, Inc.

Chakraborty Tamojit Mitsubishi Electric Power Products, Inc.

Will Tootle Southwest Power Pool

Ashhat Tullegen..... Tesla Energy

Oguz Ustundag..... Siemens Energy, Inc.

Jerry Vang Mitsubishi Electric Power Products, Inc.

Quincey Wang..... British Columbia Hydro and Power Authority

Lin Xi Powertech Labs, Inc.

Michael Xia Powertech Labs, Inc.

Yuguong Xiao..... British Columbia Hydro and Power Authority

Xuguang Xiao..... British Columbia Hydro and Power Authority

Michael Yao British Columbia Hydro and Power Authority

Quing Zhang

Jinhe Zhou

Chuanjiang (Chelsea) Zhu..... National Grid USA Service Company, Inc.

Qu Zhu

Qing Zhu.....

Scott Zuloaga.....Electric Reliability Power of Texas

