W WECC

Electric Reliability and Security for the West

1. Welcome, Call to Order

Song Wang, Modeling and Validation Subcommittee (MVS) Chair, called the meeting to order at 02:00 p.m. MT on May 22, 2024. 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 meeting agenda included a link to the posted policy.

3. Approve Agenda

S. Wang introduced the proposed meeting agenda.

The MVS Agenda was amended as follows:

- The time after the break on day two was changed from 2:00 p.m. to 1:00 p.m.
- The meeting start time for day three was changed from 9:00 a.m. to 8:30 a.m.
- "Accepting User-defined Models (DLL)—Songzhe Zhu, Gridbright, Inc." was added as Item 10.

By consensus, the MVS approved the agenda.

4. Grid-Forming and Modeling of Power Converters in the Power System—Philip Hart, GE Vernova

Philip Hart, GE Verona (GE), presented on grid-forming and modeling of power converters in the power system. The MVS held a lively Q&A session with P. Hart. He demonstrated that only the lower order harmonics play a significant role in determining the eigenvalues of the system, and that in almost all cases, the use of the positive sequence software, such as GE's PSLF, is sufficient. There will be cases in remote weak areas of the system (i.e.. low short circuit ratio) where the EMTP will be needed for a complete accurate evaluation, but those should be special cases only. So a conclusion seemed to be that currently positive sequence models work well enough to capture the significant behaviors.

The presentation is on the WECC website.

5. Review and Approve Previous Meeting Minutes

S. Wang introduced the minutes from the meeting on January 24-26, 2024.

By consensus, the MVS approved the minutes from January 24-26, 2024

The MVS Minutes were amended as follows:

- "Mr." was corrected to "Ms." on item 16,
- "GEN QVC" was corrected to "GENQEC" on item 16,
- "REDC" was corrected to "REPC_D" on item 16,
- "Senthil" was corrected to "Siemens Energy, Inc." on item 16,
- "SPGI" was corrected to "PTI" on item 16, and
- "The presentation is posted on the WECC website" and "The presentations are posted on the WECC website" were added to all of day three's items.

6. Review Previous Action Items

D. Tucker reviewed action items carried over from the MVS meeting on January 26, 2024. Action items that are not closed and will be carried forward can be found here.

7. Review Approved Dynamic Model List

D. Tucker reviewed the Approved Dynamic Model list with the MVS and encouraged MVS members to review the list with their respective organizations to ensure their dynamic models are approved.

The Approved Dynamic Model List is the on the WECC website.

8. Review MVS Member List and Update

D. Tucker showed the MVS how to find the membership list on the WECC website and encouraged those present to check their organization's membership roster. He asked everyone to keep the membership list as accurate as possible. Anyone interested in joining the MVS membership or needing to update their organization's members must email D. Tucker at dtucker@wecc.org with the necessary information.

The MVS membership list is on the WECC website.

9. SCMOV Model Specification

Jamie Weber, PowerWorld (PWC), presented and led a discussion about the SCMOV Model Specification. The MVS voted to approve the SCMOV model specification. The model is based on an IEEE paper by D. L. Goldsworthy, "A linearized model for MOV-protected series capacitors", IEEE Transactions on Power Systems, Vol. PWRS-2, No. 4, November 1987. It describes a model that has transitions between 3 operating modes. NORMAL (Mode 0): use the Rcap + jXcap from the power flow case. CAP+MOV (Mode 1): use a special Rpc + jXpc curve

empirically determined and presented in the 1987 paper. BYPASS (Mode 2): Assume the bypass switch has operated and treat as a near zero impedance.

Approval Item: SCMOV Model Specification

By consensus, the MVS approved the SCMOV Model Specification.

The presentation is on the WECC website.

10. Accepting User-defined Models (DLL)—Songzhe Zhu, Gridbright, Inc.

Songzhe Zhu, Gridbright, Inc., discussed the criteria for accepting DLLs. This matter has been previously deliberated upon, and the committee has concluded against incorporating user-defined models into the WECC base case. One suggestion entail employing a generic interface, with each model furnishing a DLL. This approach has been previously explored in meetings. While it may offer a potential solution, its implementation poses challenges. Industry stakeholders are still in the process of hashing out the specifics. MVS has opted against immediate consideration of this option but pledges to maintain communication with the industry. Should there be advancements in pivotal technologies, reevaluation will be on the agenda.

11. Naming Models: Purpose and Representation

The MVS discussed the purpose of naming conventions for models. Currently, there is not a formal naming convention. Pouyan Pourbeik, Power and Energy, Analysis, Consulting and Education, PLLC (PEACE), shared the history of PEACE's naming convention and discussed how vendors develop naming conventions that work for them. D. Tucker explained WECC's naming convention is designed to apply to the entire Western Interconnection.

The group debated whether models should be tailored to specific vendors, incorporating the vendor's name into the model title. It was generally agreed that vendors, being owners of their device IP, could collaborate with software vendors to create standardized library models compatible with various software tools. However, the WECC generic models have been designed to be publicly accessible, open, and neutral to any particular vendor. While input from many vendors has been solicited and incorporated to ensure flexibility in representing different device types, the generic models cannot be branded with any vendor's name. Hence, there is no actionable outcome from this discussion.

12. Prioritizing the Next Set of Model Development

S. Wang encouraged the MVS to prioritize the following models' development:

- Grid-forming inverter model—REGFM_B1

- VHVDC2

- IBR Controls—REEC_E

- VHVDC3

- SVSMO4 model

- SCMOV (series capacitor MOV model)

- Multi-terminal VSC-HVDC

13. Renewable Energy Modeling

Wei Du, Pacific Northwest National Laboratory, presented the generic virtual synchronous machine grid-forming inverter model (REGFM_B1). The MVS voted to approve the REGFM_B1 model, and D. Tucker will add it to the approved model list by the September 2024 meeting. Xiaoyuan Fan, PNNL, updated the MVS on the wide-area oscillation evaluation with GFM inverter and hybrid power plant models. Spencer Tacke, Auriga Corporation, then presented findings from the investigation of IBR models short circuit response. The IBR short circuit current magnitudes continued from 6 cycles to 21 cycles after the system fault was removed, in strict contrast to the behavior of synchronous machines. Sushrut Thaka, Electric Power Research Institute (EPRI), followed with a presentation regarding the deliverability of system stabilization services from inverter-based resources. Discussions concerning offshore wind model development and GFM followed the presenters.

Approval Item: Generic virtual synchronous machine grid-forming inverter model—REGFM_B1—Wei Du, PNNL

By consensus, the MVS approved the Generic Virtual Synchronous Machine Grid-forming Inverter Model—REGFRM_B1.

The presentations are on the WECC website.

14. Load Modeling

Andreas Schmitt, Bonneville Power Administration (BPA), discussed BPA's load modeling work plan with the MVS. A. Schmitt's presentation included the following topics:

- Transition the load model to a modular-based structure,
- Parameter calibration,
- Testing/verification: including equipment testing and model performance verification, based on system events or other methods,
- WECC load model composition data,
- System-wide simulation,

- EV and data center control and protection, and
- Support NERC emerging load plans.

Following A. Schmitt, Jay Senthil, Siemens Energy, Inc. (SPTI), presented the benchmarking results of PSSE CMLDxxU2 versus Load Comp Models (the modular form of CMLDxxU2). Nick Hatton hopes to benchmark this modular CMLD model in PSLF by the September 2024 MVS meeting. Bernie Lesieutre, University of Wisconsin-Madison, updated the group on heat pump tests. Nick Hatton, Staff Engineer, followed with modular-based model updates and a discussion on D value for pumps/motors. Meng Yue, Brookhaven National Laboratory, discussed the partial tripping of DERs and its implication to aggregation modeling. It was concluded that a single DER aggregation model is unlikely to be sufficient. Lakshmi Sundaresh, ERPI, shared modeling large loads for transmission system planning studies with the MVS.

The presentations are on the WECC website.

15. Active Transmission System Modeling Update

P. Pourbeik presented an overview of the active transmission system modeling. The MVS discussed the model priorities and ongoing items. P. Pourbeik asked the MVS to send feedback back to them on the specs. Parag Mitra, EPRI, and P. Pourbeik then presented the updates to the VSC-HVDC models. Amanuel Selassie, Los Angeles Department of Water and Power (LADWP), finished the Active Transmission System Modeling update with a discussion about the IPP DC line model.

The presentation is on the WECC website.

16. Power Plant Modeling

Quincy Wang, British Columbia Hydro and Power Authority (BCHA), presented the consistency in MOD-025 & MOD-026 data. The MVS discussed the MOD-026 EMT-Positive sequence model and concluded that SSR or harmonics need the EMT, but for simple voltage-ride-through events the positive sequence model is sufficient. S. Wang followed with the GENQEC/GENTPJ plans. The MVS would like to investigate the discrepancies between the GENQEC and GENTPJ models, so D. Tucker, S. Wang, and Quincy Wang, British Columbia Hydro and Power Authority, will create a small group to discuss the issue further. Anyone interested should email their intent to join to D. Tucker at dtucker@wecc.org. Ningchao Gao, National Renewable Energy Laboratory (NREL), wrapped up the topic with updates to the APSH Specification Development.

The presentation is on the WECC website.

17. MOD-33 Update

Licheng Jin, CAISO, presented RC West updates. D. Tucker followed with SPP updates.

L. Jin's presentation is on the WECC website.

18. Program Updates

Mengxi Chen, GE, updated the MVS on the PSLF program. J. Senthil followed with PSSE program updates. J. Weber followed with PowerWorld program updates. Jeff Bloemink, Powertech Labs, rounded out the discussion by sharing Powertech Labs TSAT program updates.

The presentations are on the WECC website.

19. Public Comment

No comments were made.

20. Review New Action Items

- Add REGFM_B1 model to the approved model list.
    - Assigned To: Doug Tucker
    - Due Date: September 13, 2024
- Create a small group to investigate the discrepancies between the GENTPJ model and the GENQEC model.
    - Assigned To: Doug Tucker, Song Wang, Quincy Wang
    - Due Date: September 13, 2024

21. Upcoming Meetings

22. Adjourn

S. Wang adjourned the meeting without objection at 11:30 a.m. MT.

Exhibit A: Attendance List

Members in Attendance

Angel Aquino .... PowerWorld Corporation

Zachary Beus .... Puget Sound Energy, Inc.

Jess Boatwright...NorthWestern Energy

Kevin Brooks .... Southern California Edison Company

Emerson Butler...Puget Sound Energy, Inc.

Daniel Cervantes.. Los Angeles Department of Water and Power

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

Mengxi Chen .... GE Verona (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

Xiaoyuan Fan .... 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

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

Licheng Jin...California Independent System Operator

Robert Jones... Seattle City Light

Seongtae Kim ....PacifiCorp

Slaven Kincic .... Pacific Northwest National Laboratory

Yuriy Komlev .... U.S. Bureau of Reclamation

May Le...Public Utility District No. 2 of Grant County

Mitchell Miller...NorthWestern Energy

Saurav Mohapatra .... PowerWorld Corporation

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

Sergey Pustovit .... Bonneville Power Administration

Amanuel Selassie... Los Angeles Department of Water and Power

Jayapalan (Jay) Senthil .... Siemens Energy, Inc.

Spencer Tacke...Auriga Corporation

Doug Tucker..WECC

Ramin Vakili... GE Verona (GE Energy Consulting Group)

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

Song Wang... Portland General Electric Company

James Weber .... PowerWorld Corporation

Trevor Werho .... Arizona Public Service Company

Steve Yang ....Bonneville Power Administration—Transmission

James Yoopat... Bonneville Power Administration

Jimmy Zhang..Alberta Electric System Operator

Songzhe Zhu.. GridBright, Inc.

Members not in Attendance

Hassan Baklou... San Diego Gas and Electric

Sean Brosig .... US Army Corps of Engineers

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

Chris Effiong ....Western Area Power Administration

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

Carlos FloresLopez .... US Army Corps of Engineers

Joseph Gillette .... Utility System Efficiencies, Inc.

Bo Gong..Salt River Project

Allison Hidalgo.. U.S. Bureau of Reclamation

Gordon Kawaley...Bonneville Power Administration—Transmission

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

James Keller ....Western Area Power Administration - Rocky Mountain Region

Dmitry Kosterev ....Bonneville Power Administration—Transmission

Ron Markham .... Pacific Gas and Electric Company

Parag Mitra ....Electric Power Research Institute

Nathan Powell.. Deseret Generation & Transmission Cooperative

Deepak Ramasubramanian ....Electric Power Research Institute

Anthony Rendon ....Salt River Project

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

Micah Runner...Black Hills Corporation

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

Jonathan Stahlhut .... TransCo Energy, LLC

Chifong Thomas .... Thomas Grid Advisor

Jeffery Watkins..NV Energy

Maggie Watkins .... US Army Corps of Engineers

Xiaofei (Sophie) Xu... Pacific Gas and Electric Company

George Zhou.. S&C Electric Company

Others in Attendance [Only for technical committees]

Shounak Abhyankar ....ISO New England

Quedan Amro .... Electric Reliability Council of Texas

Eric Bahr..NorthWestern Energy

Jeff Bloemink .... Powertech Labs Inc.

Maya Brimhall...WECC

Greg Brooks .... US Army Corps of Engineers

Theo Brown ....Southwest Power Pool

Jared Campbell... Electrical Consultants Inc.

Lakmal Chandrasekara.. Turlock Irrigation District

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

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

William Dull .... U.S. Army Corps of Engineers-Walla Walla District

Ningchao Gao ....National Renewable Energy Laboratory

Jack Gibfried .... NERC

Ivan Guerrero .... El Paso Electric Company

Philip Hart .... GE Verona (GE Energy Consulting Group)

Nick Hatton ....WECC

Saman Hoshyarzadeh .... Powertech Labs Inc.

Stephen Jenkins...Public Service Company of New Mexico

Cici Jia.. UTK

Bernard Lesieutre .... University of Wisconsin-Madison

Shanna Love ....Salt River Project

Jose Macias .... ETAP - Operation Technology, Inc.

Elliott Mitchell-Colgan.. Bonneville Power Administration

Amir Mohammednur... Southern California Edison Company

Shawn Patterson .... U.S. Bureau of Reclamation

Juan Placid .... J J Power & Energy Inc.

Vishal Puppala .... Grid India

Ebrahim Rahimi..California Independent System Operator

Dipendra Rai .... British Columbia Hydro and Power Authority

Ben Rodriguez.. Tucson Electric Power

Ricardo Rodriguez... El Paso Electric Company

Rajarshi Roychowdhury .... AES Corporation

Juan Sanchez-Gasca...Independent Consultant

Andreas Schmitt .... Bonneville Power Administration

Liam Segarty.. British Columbia Hydro and Power Authority

Nitish Sharma.. BayWa r.e. Solar Projects LLC

Gary Simonson...PacifiCorp

Sachin Soni...I2R Grid Solutions, Inc

Lakshmi Sundaresh ....Electric Power Research Institute

Sushrut Thakar ....Electric Power Research Institute

David Tovar .... El Paso Electric Company

John Undrill ....Independent Consultant

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

Jerry Vang .... Mitsubishi Electric Power Products, Inc.

Giritharan Vijay Iswaran ....Electric Power Research Institute

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

Michael Xia .... Powertech Labs Inc.

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

Meng Yue .... Brookhaven National Laboratory