# California Independent System Operator

# &

# Valley Electric Association, Inc.

# Joint Transmission Planning Base Case Preparation Process

Effective October 2023

NERC Reliability Standard MOD-032-1

Version 4.2

## Table of Contents

## Version History

| Version | Date | Action | Change Tracking |
|---|---|---|---|
| 2.2 | 2/13/18 | Added GWT as a TO in VEA's Service Territory | Minor edits to add new TO (GWT) |
| 3.0 | 8/29/18 | Annual review and update | Revised Section 1.2; added the new BPM requirement that requests validated generator data; minor updates on the WECC ADS case development |
| 3.1 | 1/1/2020 | Changed data submitter to SCE | Replace NVE with SCE as a data submitter throughout the document |
| 4.0 | 10/30/2020 | Annual review and update | Added information on PTO and ISO's responsibilities in reporting generator data to WECC and ISO's responsibilities on the WECC base case review. DER modeling guideline is also included. |
| 4.1 | 1/1/2021 | Added guidance on WECC model submission regarding to EMT data | Minor updated on WECC model submission due to EMT model issues |
| 4.2 | 9/15/2023 | Removed history prior to five years<br>Added generator resource ID | Minor edits for clarity and updated Section 1.2.7 to include generator resource ID in the generator database. |

# 1. Introduction

## 1.1. Purpose

1.1.1. This document contains the Joint Transmission Planning Base Case Preparation Process (the Process) for the California Independent System Operator (CAISO) & Valley Electric Association, Inc. (VEA). The CAISO and VEA have jointly established this Process in accordance with the North American Electric Reliability Corporation (NERC) Reliability Standard MOD-032-1 and the Western Electricity Coordinating Council (WECC) base case processes (R1). The CAISO is the Planning Coordinator (PC) for the CAISO planning area, including VEA's operating footprint. VEA also closely coordinates with Southern California Edison (SCE) as the Area Coordinator, who develops and submit base cases to the WECC as described in section 1.2 below.

1.1.2. The Process provides guidance and clarity to VEA staff in developing base cases and to ensure consistency with the CAISO base cases. The CAISO and VEA use data format and content requirements provided herein for the development of compiled[1] and individual[2] base cases used in their respective studies. These requirements ensure consistent system models between VEA and the CAISO which support analyses of VEA's transmission system and WECC's interconnection-wide transmission system and avoid potential solution problems caused by inconsistent modeling. This Process is posted on the CAISO's public website and on VEA's public website (R1.3).

1.1.3. The Process describes the responsibility for data owners within VEA's Transmission Planner Area to provide new and updated modeling data for inclusion in the base case. Data owners include Load Serving Entities, Participating Generator Owners, and Participating Transmission Owners.

1.1.4. The data requirements in this document are intended to be consistent with those in the WECC Data Preparation Manual (DPM). The DPM can be found on the WECC website. In the case of conflict between the DPM

[1] A "compiled" base case means the merged WECC base case being reviewed, modified or submitted to the WECC or the CAISO. For instance, VEA's Service Territory is a small portion of the total WECC wide base case model. Similarly, SCE's Area Coordinator area is a portion of the total WECC wide base case model. VEA or SCE modifications to a base case are "individual" base case changes in development of a compiled WECC wide area base case.

[2] An "individual" base case means a particular part of a WECC base case being reviewed, modified or submitted to the WECC or the CAISO. VEA's individual base case are facilities in VEA's service territory.

and this Process, the DPM shall control. If this Process requires data not in the DPM, then this Process shall control for that data.

1.1.5. The following data types are part of individual and compiled base cases (R1.1.1):

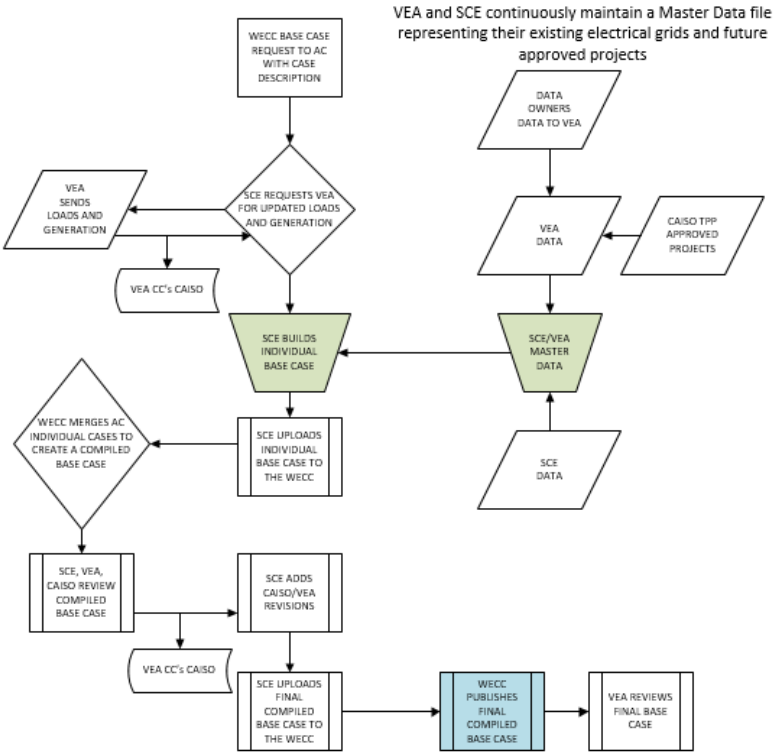
a. **Steady State** – Data required to represent the normal operation of the power system

b. **Dynamics** – Data necessary to support analysis of the power system stability

c. **Short Circuit** – Positive, Negative, and Zero sequence data as well as any mutual line impedance data

1.2. Coordination Process Used to Build WECC Base Cases:

The diagram below illustrates the coordinated process the CAISO, SCE and VEA utilize to build final WECC base cases. Descriptions of each coordinated step is explained following the diagram.



1.2.1. VEA compares data representing the existing electrical grids and future approved projects to the WECC base case under review and makes revisions as needed. Such data includes data supplied by data owners in VEA's transmission area. The schedule for supplying data is provided in Section 1.4; data owner categories and responsibilities are listed in Section 2.

1.2.2. The WECC base case build has three main stages: a request for Loads and Resources, a request to review the compiled base case, then a distribution of a Final base case. VEA provides its Area Coordinator with Loads and Resources that they use to develop an individual base case, which is then sent to the WECC. The WECC develops a compiled base case comprised of all individual base cases in the WECC footprint and sends the Compiled base case out for review. The compiled case is reviewed by Transmission Planners and Area Coordinators for individual case data and corrected, if needed, by sending comments to the Area Coordinator who then informs the WECC of changes needed to the compiled case. Then, the WECC distributes a Final base case incorporating changes received from the compiled base case. VEA specific tasks are described in the following sections.

1.2.3. VEA uses the data supplied from the data owners in its Master File and compares it to the compiled base case. VEA will evaluate, update and validate the compiled base case for each WECC base case under development. The evaluation, update and validation will cover, at a minimum:

- Transmission topology
- Transmission line and transformer impedances
- Transmission line and transformer facility ratings
- Generator and storage capabilities
- Dynamic models

1.2.4. VEA will update the stages of base case development with information from VEA's system and the data owners to match the WECC base case request. After the updates are made, VEA submits base case files to SCE by email and copy the CAISO (R2). The CAISO or its designee, the Area Coordinator, shall then make available models for its planning area

reflecting data provided to it under Requirement R2 to the Electric Reliability Organization to support creation of the Interconnection-wide case(s) that include the CAISO's planning area (R4).

1.2.5. The WECC merges all individual base case updates from their Area Coordinators to develop a compiled WECC base case. The WECC will email Area Coordinators, Planning Coordinators, and Transmission Planners a request to review and approve the merged compiled base case.

1.2.5.1. VEA is copied on the WECC's email requesting review and comments or changes on the compiled base case model.

1.2.5.2. VEA will review the compiled base case and inform SCE and the CAISO if the case is accurate or deficient in terms of VEA data. If deficient, VEA will identify the deficiencies and propose corrections to SCE and the CAISO.

1.2.5.3. The CAISO will review the compiled base case and inform VEA if the case is accurate or deficient in terms of VEA data. If deficient, the CAISO will identify the deficiencies and propose corrections to VEA. VEA will review the CAISO comments and email SCE of revisions to the compiled base case as needed. VEA will copy the CAISO on the email to SCE.

1.2.5.4. SCE will upload compiled cases in accordance with the WECC's Annual base case Compilation Schedule.

1.2.5.5. The WECC distributes a Final base case. VEA reviews the Final base case and records any discrepancies to the individual base case modifications.

1.2.6. Contacts for VEA communications regarding base case builds: VEA will communicate to the CAISO by email at GRIDMODELINGDATA@CAISO.COM and SCE at basecase@sce.com or equivalent for communications described in this MOD-032 process.

1.2.7. As part of the CAISO's annual Transmission Planning Process (TPP), the CAISO will select WECC base cases to use in the process. The CAISO will request VEA to review and update these cases as needed for VEA's portion of the model. VEA will provide updates to the VEA area for inclusion in the CAISO regional model and for use in regional planning. In addition, a list of ISO market resource identifiers for all ISO

Participating Generators in the VEA service territory should be populated into the generator data Long ID field in the GE PSLF model data and maintained by VEA in coordination with CAISO.

The CAISO will review this base case and provide written comments to VEA using the comment form shown in Appendix 2. VEA and the CAISO shall coordinate on the technical data submitted and reach consensus within 90 calendar days of the CAISO's initial comments. The CAISO will then post regional models on the CAISO Market Participant Portal. This information is available to the other participating transmission owners and stakeholders in the CAISO area. To match technical data between the CAISO's TPP and the WECC, VEA shall include any facility changes to the WECC base case made as part of the TPP into the next and future scheduled submittals to SCE as part of VEA's WECC base case review and submittal (R4).

1.3. Typical Scenarios (R1.2.3)

1.3.1. For each WECC planning cycle, SCE and VEA will develop a set of power flow cases requested by the WECC. Specific scenarios are posted on the WECC website annually for the upcoming year. A table of typical scenarios is provided below; this includes the type of scenario and years for which it is modeled. Typically, this would be two, five and ten years out for different load scenarios. For example, 2023, 2028, and 2034 would be modeled from the 2023 WECC base case development data request.

1.3.2. The definitions of typical scenarios are listed below.

- **Heavy Winter (HW)** – winter peak demand expected to be served per the WECC base case Compilation schedule
- **Light Winter (LW)** – winter demand expected to be served per the WECC base case Compilation schedule
- **Heavy Spring (HSP)** – spring demand expected to be served per the WECC Base Compilation schedule
- **Heavy Summer (HS)** – summer peak demand expected to be served per the WECC base case Compilation schedule
- **Light Summer (LS)** – summer demand expected to be served per the WECC base case Compilation schedule

| Model Year | Heavy Winter | Light Winter | Heavy Spring | Heavy Summer | Light Summer |
|---|---|---|---|---|---|
| 2 | X | X | X | X | X |
| 5 | X | | | X | |
| 10 | X | | | X | |

1.4. Schedule (R1.2.4 & R4)

1.4.1. All data owners are required to submit their data to their PC at least once every 13 calendar months (R1.2.4). Data owners in VEA's Area are required to submit data every year during the month of February or provide a written confirmation that there is no change to the previously submitted data. Data shall be submitted to VEAengineering@vea.coop.

1.4.2. The CAISO will request VEA to update base cases for the annual TPP around March of each year.

## 2. Data Submission Requirements (R1.2.1 & R2)

2.1. MOD-032 Attachment 1 lists the minimum modeling data required by the standard. This attachment is included as Appendix 1. The information is also summarized for each data owner in the following sections.

2.2. **Load Serving Entity (LSE)** provides the aggregate projected demand levels for each month for the next 10 years. The required data is summarized in the table below. At a minimum, the LSE shall provide the data listed in Appendix 1 and these sections of the DPM: Loads, Load Characteristics, Under Frequency Load Shedding (UFLS), and Under Voltage Load Shedding (UVLS). The CAISO may request supplemental data be provided by the LSE in addition to this information.

| Steady-State | Dynamics | Short Circuit |
|---|---|---|
| Aggregate demand on a bus level (Real and Reactive Power) | Load Composition of Characteristics | N/A |
| Location of new expected service loads | Protective Relays | |
| In-service status (monthly as needed) | | |

2.3. **Participating Generator Owner (PGO)** provides the data to model its generating facilities. The required data is summarized in the table below. At a minimum, the Generator Owner shall provide the data listed in Appendix 1 and these sections of the DPM: Generation, Transformers, Fixed and Controlled Shunt, Loads and Generation Requirements, and line and transformer protection. The CAISO may request supplemental data be provided by the Generator Owner in addition to this information. For WECC base cases except ADS case, model generation in–service, under construction, or on an as needed basis. For CAISO TPP base cases, model generation per the TPP Study Plan requirement. Actual dispatch and dispatch used in studies will be determined based on study needs.

MOD-032 explicitly requires the submission of data at least once every 13 calendar months. Therefore, at minimum, modeling data shall be submitted by the end of each calendar year, but not to exceed 13 calendar months between each submission. For data that has not changed since the last submission, a written confirmation that the data has not changed is sufficient. As a reminder, section 25.5 of the CAISO Tariff requires that the CAISO and VEA are notified at least 90 calendar days in advance of making modifications to generating facilities. Please refer to that section of the Tariff and the Generator Management BPM on the CAISO website for more details.

The CAISO recently updated its BPM for Transmission Planning Process (TPP) to include a multi-year phased approach to request data from generating units in the CAISO BA. Section 10 of the BPM[3] for TPP establishes: (1) what generator information and generator data must be submitted; and (2) the schedule, procedures, and format for submitting that information and data. Once the CAISO has accepted the submitted data as per section 10.4.3 of TPP BPM, the PTOs and CAISO will include the validated generating unit data in transmission planning process power flow and reliability studies. Generating units that achieve commercial operation after September 1, 2018, will be subject to section 10.4.6 of TPP BPM.

Notwithstanding this process, the CAISO may periodically request generator data, to meet requirements under NERC reliability standards. These requests will be due by deadlines set by the CAISO under those specific requests and will not be subject to the process outlined in the Section 10 of the TPP BPM.

| Steady-State | Dynamics | Short Circuit |
|---|---|---|
| Generator parameters | Generator | |

[3] https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Transmission%20Planning%20Process

| | | |
|---|---|---|
| PQ Capability Curves | | For applicable Steady-State items, provide:<br>• Positive Sequence Data<br>• Negative Sequence Data<br>• Zero Sequence Data |
| Generator step-up (GSU) transformer data | Excitation system | |
| Seasonal output capabilities | Turbine-Governor | |
| Station Service Load under normal conditions | Power System Stabilizer | |
| Reactive Power Compensation[4] | Protection Relays outlined in Section 6.5 | |
| In-service status | | |
| Wind/PV Collector System | | |

2.4. **Transmission Owner (TO)** provides the data to model the items listed in the table below. The required data is summarized in the table below. At a minimum, the TO shall provide the data listed in Appendix 1 and these sections of the DPM: Alternating Current (AC) Transmission line, Transformers, Fixed and Controlled shunt devices, High Voltage Direct Current (HVDC) transmission lines, UFLS, UVLS, Line and Transformer Protection, Back-to-Back DC Ties, and DC Lines, SVC, and D-VAR systems. The CAISO may specify supplemental data to be provided by the TO in addition to this information.

| Steady-State<br>(System Topology) | Dynamics | Short Circuit<br>(for applicable Steady State items) |
|---|---|---|
| Buses | Static VAR Systems | Positive Sequence Data |
| AC Transmission Lines | HVDC Facilities | Negative Sequence Data |
| HVDC Transmission Facilities | FACTS Devices | Zero Sequence Data |
| Transformers | Protection Relays | Mutual Line Impedance Data |
| Reactive Power Compensation | | |
| Static VAR Systems | | |

2.5. Data Submission Process and Format

[4] Additional reactive power support equipment (such as a switched shunt) used to maintain an acceptable power factor at the Point of Interconnection.

2.5.1. All data requests will require data for the 10 years following the year of the request. Base case models must be submitted in the form of a GE Power Sequence Load Flow (PSLF) Software .epc or .sav compatible with PSLF. (R1.2.1).

2.5.2. Dynamics modeling data must be submitted in the form of a PSLF Software .dyd file. (R1.2.1).

2.5.3. Using the base case and dynamics models, short circuit information can be calculated in PSLF. A separate file is not needed. However, VEA also has short circuit data available through ASPEN modeling software, which may be used for data submissions.

2.5.4. Standard WECC-approved library models should be used to represent all active elements (generators, static VAR compensators, etc.) The approved Dynamics model library can be found on the WECC Approved Dynamic Model Library on the WECC website.

2.5.5. VEA will submit data directly to its Area Coordinator, SCE. SCE will submit the data to WECC. VEA will also include the CAISO on any data submittals to SCE.

## 3. PTO and CAISO's responsibilities in reporting generator data to WECC

The CAISO and PTOs established a joint generator data review process in 2019 to implement Section 10 of the CAISO BPM for TPP to comply with the MOD-032-1 standard, which provides consistency in generator modelling data submission from generator owners and ensures the data be fully validated by VEA and CAISO. The purpose of this section is to specify roles and responsibilities for submitting generator data to WECC through its base case development process.

Once the CAISO and VEA have validated the generator data and determined that compliance requirements are met by the Generator Owner, the CAISO will upload the final data and documents for each generator and share the information to VEA within 60 calendar days after the CAISO sends out a compliance letter to the GO, unless a longer time period is agreed upon by the CAISO and VEA. A complete package of the following validated data and documents will be posted in a

special folder for each generator in the Market Participant Portal, and CAISO will send a notice to VEA representatives for them to access the folder.

- equipment data including short circuit data
- steady-state power flow model in GE PSLF .epc format
- dynamic model in GE PSLF .dyd format
- single-line diagram
- test report for generator real and reactive power capability
- test report for dynamic model
- electromagnetic transient model for sub-synchronous resonance study if applicable

VEA will submit the generator data in GE PSLF format to WECC (via the Area Coordinator) in response to the first WECC base case data request letter received from WECC after the validated generator data has been received from the CAISO, unless a longer time period is agreed upon by the CAISO and VEA[5]. However, if the only remaining data that has not been received or validated is the electromagnetic transient model (EMT) data, then VEA should provide the validated GE-PSLF power flow and dynamic data to WECC without waiting for receipt of the EMT data. If an update to the generator power flow and/or dynamic modeling data is required, the update will be submitted to WECC and CAISO in response to the next WECC base case data request. To provide consistency in data submittals, VEA will submit the generator data to the Area Coordinator per the guidelines outlined below.

- VEA is responsible for generating units that are located in Zone 890.
- The latest steady-state power flow model up to generator's POI should be included in the generation representation. The Generator data should meet the WECC base case development requirements. Steady-state and dynamic models shall be consistent (i.e., Bus Number, Bus Name, Unit Id)
- The latest validated dynamic model shall be submitted per the dynamic data requirements of WECC Data Preparation Manual, WECC Data Preparation Manual for Interconnection-

[5] If the due date for the submitting the data for the "first" base case to WECC is less than 60 days from the date of receiving the validated generator data from the CAISO then the PTO can submit the generator data in response to the second WECC base case data request letter received.

wide Cases, and WECC Solar Photovoltaic Power Plant Modeling and Validation Guideline

- The latest short circuit data should be used in VEA's short circuit analysis

The CAISO and VEA will review the generator data in the WECC case sent out for review and provide comments to the Area Coordinator during the WECC base case review process.

Roles and responsibilities summary

| Tasks | CAISO | PTO (VEA) |
|---|---|---|
| Save validated generator data as a complete package in the MPP site and send a notice to PTO for them to access the data PTO within 60 calendar days of compliance letter sent to GO | X | |
| Submit generator data to WECC (via the Area Coordinator) in response to the next WECC base case data request letter received from WECC | | X |
| Review the generator data in WECC base case review process (CAISO to provide comments to PTO) | X | X |
| Provide review package to WECC (via the Area Coordinator) and copy to CAISO | | X |

## 4. The ISO's responsibility on the WECC Base Case Review

The CAISO will review VEA's WECC Base Case Data submittal and will provide comments to VEA during the Base Case Review Process. In addition, the CAISO will keep documentation of VEA's Base Case Data that was submitted to the Area Coordinator and of the Area Coordinator providing this Base Case Data to the WECC staff. VEA will provide written response to CAISO, using the case review sign-off sheet, confirming that the WECC Base Case has been updated to address CAISO's review comments or provide an explanation for maintaining the current data. Below are critical actions and procedures that are necessary to review the WECC base cases effectively and accurately.

| Data Category | Check |
|---|---|

| | |
|---|---|
| Transmission | Approved transmission projects are modeled in accordance with the most recent expected in-service date. |
| | Canceled projects are removed from the base case. |
| | Known outages, as per the ISO TPP Study Plan, of transmission facilities with a duration of at least six months are modeled appropriately. |
| | Line rating (MVA1 and MVA2) are greater than zero. |
| | Check branches loading above 100% of RATE1 or RATE2 |
| | |
| Generation | Generator (new and to be retired) are modeled in accordance with assumptions in the study plan. |
| | Check- Pmin < Pmax & Qmin < Qmax |
| | Reactive resources output are at appropriate level based on their types. |
| | Known outages, as per ISO TPP Study Plan, of generation facilities with a duration of at least six months are modeled |
| | Check the accuracy of each generators representation and ensure that all data validated through the CAISO and PTO generator data review process has been included. Make sure that interconnection facilities are modelled up to its POI. |
| | |
| Load | Loads are consistent with CEC load forecast. |
| | Load modeling generator station service shall have Load ID set to 'SS.' |
| | Load power factor at major load buses is reasonable. |
| | |
| Dynamic Data | Read and initialize dyd file for errors |
| | Check for any missing generator models |
| | Check the accuracy of each generator's representation and ensure that all data validated through the CAISO and PTO generator data review process has been included. |
| | |
| **General** | Make sure the base case has representation of entire WECC system (full loop). |
| | Check and report 'dchk' in PSLF for NERC Quality Metrics violations |
| | Check the interties are modeled as appropriate facilities and not as a fictitious generator or a very-high impedance line. |
| | Area swing is within the Pmax/Pmin limits and is located outside of the local area of study. |
| | Generator zone numbers are accurate. |
| | Major path flows are set consistent with assumption in study plan. |
| | The sum of net Area Interchange Schedules in the PSLF Area Table is equal to zero |
| | Path definitions are accurate. |
| | Voltages at critical substations are reasonable. |

**Distributed energy resources (DER)**

Distributed Energy Resources (DER) should be modelled in steady-state and dynamic data per the WECC Solar Photovoltaic Power Plant Modeling and Validation Guideline either as an aggregated generator for in-front-of-the-meter distributed energy resources or as DG component in the composite load model for self-generation including behind-the-meter solar PV.

## 5. Steady State Model Development

5.1. Level of Detail (R1.2.2)

5.1.1. At a minimum, all generators with a nameplate greater than 10 MVA or a facility with an aggregated nameplate greater than 20 MVA must be modeled in detail and are to be submitted by applicable GOs.

5.1.2. Bus/load/generation and device profiles, which include:

a. Load forecast for each month at the bus level representing a coincident with the company peak (submitted by LSE)

b. Corresponding generation limits and level – Pmin, Pmax, Qmin, Qmax, Pgen (Generation limits submitted by GO; Generation level submitted by TO)

c. Setting on regulating equipment such as transformers, switched shunts, HVDC data (submitted by data owner)

5.1.3. The data submitted must be sufficient to perform reliability and economic studies on the Bulk Electric System (BES) as defined by NERC. Therefore, relevant data associated with sub-BES facilities may also need to be provided.

5.2. Project Statuses

5.2.1. Conceptual – conceptual or vision plans

5.2.2. Proposed – Projects that require additional review and are subject to change

5.2.3. Planned-Funded – Projects that have completed the planning process and there is intent to permit and construct the project (for generators, this means an executed Generator Interconnection Agreement and network upgrades)

5.2.4. In-Service – In Service

5.2.5. Corrections – Base case change to be submitted for correction of all future base cases

| Type & Status | Conceptual | Proposed | Planned-Funded | In Service | Corrections |
|---|---|---|---|---|---|
| **Steady State** | NOT IN MODELS | NOT IN MODELS | IN MODELS | IN MODELS | IN MODELS |
| **Dynamics** | NOT IN MODELS | NOT IN MODELS | IN MODELS | IN MODELS | IN MODELS |
| **Short Circuit** | NOT IN MODELS | NOT IN MODELS | IN MODELS | IN MODELS | IN MODELS |

5.3. Ratings

5.3.1. Ratings shall be provided in MVA.

5.3.2. Rating definitions/assignments

1 = Summer Normal

2 = Summer Emergency

3 = Winter Normal

4 = Winter Emergency

5 = Fall Thermal (based on a 20 deg C ambient temperature)

6 = Fall Emergency

7 – Spring Thermal (based on a 20 deg C ambient temperature)

8 = Spring Emergency

5.4. Wind and photovoltaic projects shall be represented through an equivalent generator, equivalent low-voltage to intermediate-voltage transformer, equivalent collector system, and substation transformer between the collector system and the transmission bus.

## 6. Dynamics Model Development

6.1. Level of Detail

6.1.1. Dynamics simulations analyze the transient response of the power system following a disturbance. These simulations are in a timeframe of 0 to 20 seconds with a typical time step of ¼ cycle. As such it is necessary to develop a model that sufficiently represents the automatic response of all active elements to a disturbance on the power system.

6.1.2. On an annual basis, each data owner is required to submit the following model data:

a. Dynamic models to represent approved future active elements such as, but not limited to, generators, Flexible Alternating Current Transmission System (FACTS) devices, or fast switching shunts.

b. Updates to existing dynamic models.

6.2. Generators

6.2.1. At a minimum, all generators with a nameplate greater than 10 MVA or a facility with an aggregated nameplate greater than 20 MVA must be modeled in detail.

6.2.2. A detailed model of a generator must include

a. Generator model

b. Excitation System Model (may be omitted if the unit is operated under manual excitation control)

c. Turbine-Governor Model (may be omitted if unit doesn't regulate frequency)

d. Power System Stabilizer Model (may be omitted if device is not installed or not active)

e. Reactive Line Drop Compensation Model (may be omitted if device is not installed or not active)

f. Over Excitation Limited (may be omitted if device is not installed or not active)

g. Under/Over Voltage Ride Through Relays (may be omitted if device is not installed or not active)

h. Under/Over Frequency Ride Through Relays (may be omitted if device is not installed or not active)

6.2.3. WECC-approved dynamic model should be used. In instances where detailed dynamic parameters of the generator unit are unavailable, default value as in the WECC model may be used.

6.3. Static VAR Systems & Synchronous Condensers

6.3.1. SVS and synchronous condensers are reactive power devices that can vary the amount of reactive power supplied or absorbed within the simulated timeframe (0-20 seconds). These devices must be modeled in sufficient detail in order to simulate its expected behavior.

6.3.2. If the reactive power device is modeled as a generator (for example, a synchronous condenser), it should follow the guidelines in section 6.2.

6.4. Load

6.4.1. The dynamic behavior of load must be modeled in sufficient detail to meet NERC TPL and TOP compliance obligations. Providing a specific dynamic load characteristic model or the load composition is acceptable.

6.4.2. The composition of the load shall be defined as referenced in the WECC Load Long ID Instructions. Based on the composition of the load, an appropriate dynamic representation will be developed using models available in the PSLF dynamics library.

6.4.3. Dynamics models for UVLS and UFLS are required when installed. The models must be WECC approved dynamic models.

6.5. Additional Protection Relays

6.5.1. Generic protection relays are applied during the simulation that scan for bus voltages, out-of-step conditions, and against generic protection zones for transmission lines. These generic protection relays only monitor system conditions.

6.5.2. Equipment specific detailed protection relays may also be submitted at the discretion of the data owner; however, detailed protection relay models need to be submitted for the following:

a. Voltage and frequency ride through capabilities of any generation facility with this capability

b. 3 phase overcurrent relays are required where it is the primary protection

c. Other relay models, as required by the WECC DPM

## 7. Short Circuit Model Development

7.1. Level of Detail

7.1.1. Short circuit data is required for all generators, transformers, and lines that are required to be submitted in sections 5 and 6.

7.1.2. Data owners are required to submit their positive, negative, and zero sequence data for all applicable equipment (e.g., lines, transformers).

7.1.3. TOs are also responsible for submitting any mutual impedance data.

7.2. Short Circuit can be calculated using the base case and dynamics files in PSLF or ASPEN. VEA will not submit specific files to SCE or the CAISO for Short Circuit. However, VEA will provide ASPEN short circuit data to SCE, WECC or the CAISO upon request, but not as part of regular data submittals in accordance with MOD-032, R4. WECC does not currently create interconnection-wide cases for the use of short circuit analysis.

## 8. Anchor Data Set (ADS) Case Development

This section is added to incorporate WECC ADS case development. For many years, WECC has been aware that data used in its various reliability assessment models (e.g., Power Flow-PF; Production Cost Model-PCM) has varying degrees of consistency and, to some extent, redundancy in terms of the data's development and collection. The concept of an Anchor Data Set (ADS) has been created with the goal of providing a compiled starting point for WECC's long-term reliability assessments, as well as other planning studies undertaken by WECC stakeholders. The process for developing the ADS is designed to eliminate redundant data development and collection while providing a mechanism for ensuring the accuracy, consistency, and completeness of the data.

The ADS is typically a 10 year out Heavy Summer compilation of load, resource and transmission topology information used by the Western Planning Regions (WPRs) in their regional transmission plans as well as by other stakeholders in various planning analyses. This data is compatible with PCM and PF models, including dynamic data and associated assumptions. The ADS is comprised of data developed by NERC Registered Entities in the U.S. and international entities in the Western Interconnection (Balancing Authorities (BAs), Transmission Planners (TPs) and/or Planning Coordinators (PCs) and is used by FERC Registered Entities in the U.S. that may be affiliated to the WPR whether or not they have FERC planning obligations as well as Transmission Owners (TO), Generation Owners (GO) or Load Serving Entities (LSE) not represented by the WPR or IPR.

The data included in the ADS must reflect applicable state and federal statutory public policy requirements such as Renewable Portfolio Standards (RPS). Resource and Transmission representation must be aligned with the most recent regional plan of the Planning Region. To achieve the goals of the ADS it is essential that the data submitted for the annual 10 year out WECC Powerflow cases, as part of the MOD-32 process, is coordinated with the planning regions and reflects the most recent regional planning case of the planning region.

VEA shall provide incremental change files with reference to the changes being made to the WECC approved/provided 10-year out Heavy Summer seed case and coordinate with the CAISO to ensure that the Resource and Transmission representation of VEA in the ADS case is aligned with the most recent CAISO transmission plan.

VEA shall coordinate with the CAISO to ensure the 10 year out WECC Heavy Summer ADS case meets the ADS data requirement.

For further information, please refer to WECC ADS Webpage.

This document represents the California Independent System Operator (CAISO) & Valley Electric Association, Inc. (VEA) Joint Transmission Planning Base Case Preparation Process (Joint Base Case Process) and each entity's individual and joint responsibilities for implementing Requirement 1 and its sub-requirements of the NERC MOD-032-1 Reliability Standard.

The Parties signing this document agree it accurately identifies their respective roles and responsibilities for implementing Requirement 1 and its sub-requirements for MOD-032-1.

Signatories:

Robert Sparks

10-12-2023

**Robert Sparks** Date
*California ISO, Sr. Manager, Regional Transmission-South, Infrastructure Development*

Toni Powell 10-12-2023

**Toni Powell, P.E.**
*Valley Electric Association, Director of Engineering* *Date*

## Appendix 1: MOD-032 Attachment 1

*The table, below, indicates the information that is required to effectively model the interconnected transmission system for the Near-term Transmission Planning Horizon and Long-Term Transmission Planning Horizon. Data must be shareable on an interconnection wide basis to support use in the Interconnection-wide cases. A Planning Coordinator may specify additional information that includes specific information required for each item in the table below. Each functional entity[6] responsible for reporting the respective data in the table is identified by brackets "[functional entity]" adjacent to and following each data item. The data reported shall be as identified by the bus number, name, and/or identifier that is assigned in conjunction with the PC, TO, or TP.*

| **steady-state**<br>(Items marked with an asterisk indicate data that vary with system operating state or conditions. Those items may have different data provided for different modeling scenarios) | **dynamics**<br>(If a user-written model(s) is submitted in place of a generic or library model, it must include the characteristics of the model, including block diagrams, values and names for all model parameters, and a list of all state variables) | **short circuit** |
|---|---|---|
| 1. Each bus [TO]<br>a. nominal voltage<br>b. area, zone and owner<br><br>2. Aggregate Demand[7] [LSE]<br>a. real and reactive power*<br>b. in-service status*<br><br>3. Generating Units[8] [GO, RP (for future planned resources only)]<br>a. real power capabilities - gross maximum and minimum values<br>b. reactive power capabilities - maximum and minimum values at real power capabilities in 3a above<br>c. station service auxiliary load for normal plant configuration (provide data in the same manner as that required for aggregate Demand under item 2, above).<br>d. regulated bus* and voltage set point* (as typically provided by the TOP)<br>e. machine MVA base<br>f. generator step up transformer data (provide same data as that required for transformer under item 6, below)<br>g. generator type (hydro, wind, fossil, solar, nuclear, etc)<br>h. in-service status*<br><br>4. AC Transmission Line or Circuit [TO]<br>a. impedance parameters (positive sequence)<br>b. susceptance (line charging) | 1. Generator [GO, RP (for future planned resources only)]<br><br>2. Excitation System [GO, RP (for future planned resources only)]<br><br>3. Governor [GO, RP (for future planned resources only)]<br><br>4. Power System Stabilizer [GO, RP (for future planned resources only)]<br><br>5. Demand [LSE]<br><br>6. Wind Turbine Data [GO]<br><br>7. Photovoltaic systems [GO]<br><br>8. Static Var Systems and FACTS [GO, TO, LSE]<br><br>9. DC system models [TO]<br><br>10. Other information requested by the Planning Coordinator or Transmission Planner necessary for modeling purposes. [BA, GO, LSE, TO, TSP] | 1. Provide for all applicable elements in column "steady-state" [GO, RP, TO]<br>a. Positive Sequence Data<br>b. Negative Sequence Data<br>c. Zero Sequence Data<br><br>2. Mutual Line Impedance Data [TO]<br><br>3. Other information requested by the Planning Coordinator or Transmission Planner necessary for modeling purposes. [BA, GO, LSE, TO, TSP] |

[6] For purposes of this attachment, the functional entity references are represented by abbreviations as follows: Balancing Authority (BA), Generator Owner (GO), Load Serving Entity (LSE), Planning Coordinator (PC), Resource Planner (RP), Transmission Owner (TO), Transmission Planner (TP), and Transmission Service Provider (TSP).

[7] For purposes of this item, aggregate Demand is the Demand aggregated at each bus under item 1 that is identified by a Transmission Owner as a load serving bus. A Load Serving Entity is responsible for providing this information, generally through coordination with the Transmission Owner

[8] Including synchronous condensers and pumped storage.

| | | |
|---|---|---|
| c. ratings (normal and emergency)*<br>d. in-service status*<br><br>5. DC Transmission systems [TO]<br><br>6. Transformer (voltage and phase-shifting) [TO]<br>a. nominal voltages of windings<br>b. impedance(s)<br>c. tap ratios (voltage or phase angle)*<br>d. minimum and maximum tap position limits<br>e. number of tap positions (for both the ULTC and NLTC)<br>f. regulated bus (for voltage regulating transformers)*<br>g. ratings (normal and emergency)*<br>h. in-service status*<br><br>7. Reactive compensation (shunt capacitors and reactors) [TO]<br>a. admittances (MVars) of each capacitor and reactor<br>b. regulated voltage band limits* (if mode of operation not fixed)<br>c. mode of operation (fixed, discrete, continuous, etc.)<br>d. regulated bus* (if mode of operation not fixed)<br>e. in-service status*<br><br>8. Static Var Systems [TO]<br>a. reactive limits<br>b. voltage set point*<br>c. fixed/switched shunt, if applicable<br>d. in-service status*<br><br>9. Other information requested by the Planning Coordinator or Transmission Planner necessary for modeling purposes. [BA, GO, LSE, TO, TSP] | | |

## Appendix 2: CAISO sign-off sheet for WECC Base Case review

Case Name

POWER FLOW CASE

DATA COMMENT AND SYSTEM REVIEW

PROCEDURE FOR SUBMITTAL

1) **ISO to PTO** (current form)
2) PTO to AREA COORDINATOR
3) AREA COORDINATOR TO WECC TECHNICAL STAFF

DATA COMMENT

CAISO Planning Engineers have reviewed the WECC Base Case 'case name.sav' and 'case name.dyd' for PTO name area. Please find below the identified deficiencies and the recommended changes:

| S.No | Deficiency | Recommended Change/s | PTO's comment |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |

ISO Engineer Name: Name

Review being submitted for PTO: PTO name

Date: date