California Independent System Operator

&

Valley Electric Association, Inc.

Joint Transmission Planning Base Case Preparation Process

Effective September 2018

NERC Reliability Standard MOD-032-1

Version 3.0

Table of Contents

Version History

Version	Date	Action	Change Tracking
1.0	6/1/15	New document for MOD-032-1	New
2.0	6/28/16	Annual review and update	Revised formatting; removed extraneous language; replaced appendices with MOD-032 Attachment 1; errata
2.1	8/28/17	Added WECC Anchor Data Set (ADS) case development	Minor edits to accommodate the WECC ADS requirements
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

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 Nevada Energy (NVE) 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 CAISO base cases. The CAISO and VEA use data format and content requirements provided herein for the development of common[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 (R1.3).

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

1.1.4. The following data types are part of the common base case (R1.1.1):

[1] A "common" 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, NVE's Area Coordinator area is a portion of the total WECC wide base case model. VEA or NVE modifications to a base case are "individual" base case changes.
[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

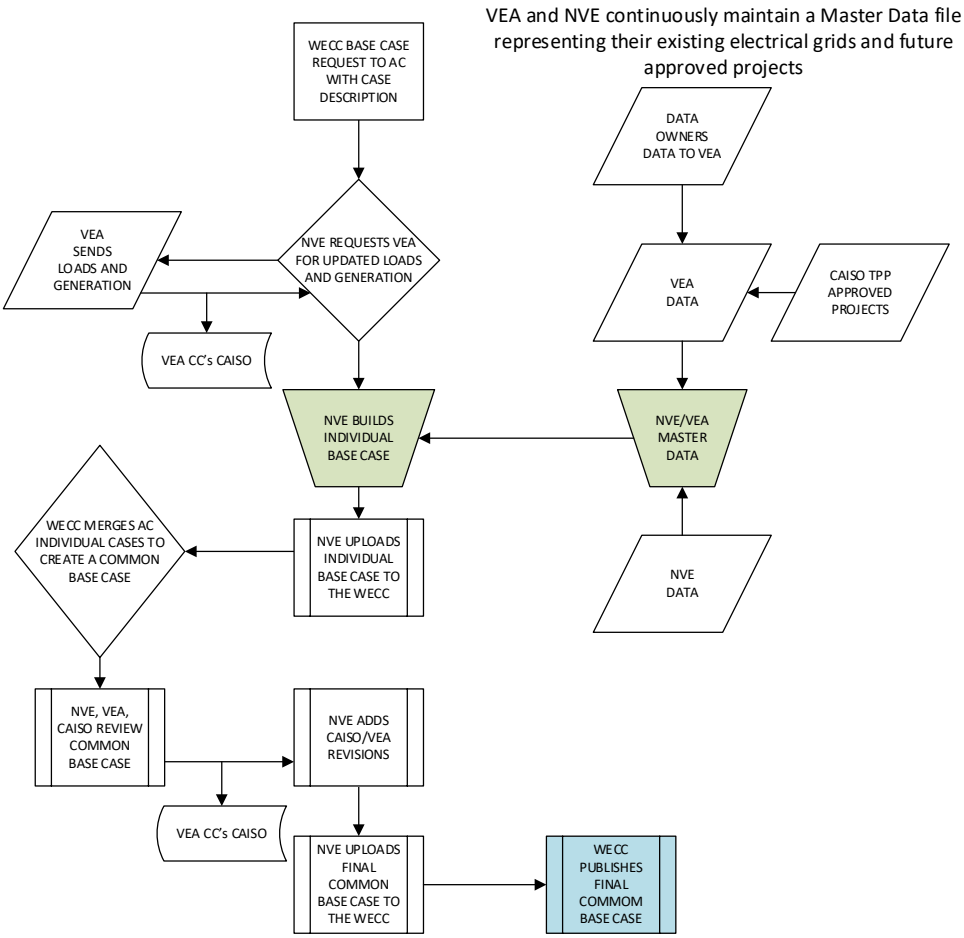
a. **Steady State** – Data required to represent the normal operation of the power system

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, NV Energy (NVE) and VEA utilize to build common WECC base cases. Descriptions of each coordinated step is explained following the diagram.



1.2.1. VEA and NVE maintain a Master Data File representing the existing electrical grids and future approved projects.

1.2.2. VEA starts with common base case received from its Area Coordinator, NVE.

1.2.3. VEA requests data from data owners in VEA's transmission area.[3] Data owners are responsible for providing the data necessary to model their assets per the criteria in this Process (R2). The data owners and responsibilities are listed in Section 2.

1.2.4. VEA uses the data supplied from the data owners and compares it to the common base case. VEA will evaluate, update and validate the common base case on an annual basis. The evaluation and validation will cover, at a minimum:

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

1.2.5. VEA will update the base cases with information from VEA's system and the data owners to match the WECC base case request. After the updates are made, VEA will submit the base case files to NVE by email and copy CAISO. VEA will confirm that NVE has submitted to WECC in accordance with the WECC's Annual Base Case Compilation Schedule.

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

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

1.2.6.2. VEA will review the common base case and inform NVE and the CAISO if the case is accurate or deficient in terms of VEA data.

[3] Currently, VEA is the only Load Serving Entity in the VEA Transmission Planner Area. There are no Generator Owners in VEA's transmission area. GridLiance West Transco (GWT) owns the 230 kV transmission facilities in VEA's Transmission Planner Area; however, GWT has contracted VEA to perform Transmission Owner services for its facilities. Therefore, VEA does not currently send formal data requests, as VEA is the data owner for all of the data for its area.

If deficient, VEA will identify the deficiencies and propose corrections to NVE and the CAISO.

1.2.6.3. The CAISO will review the common 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 NVE of revisions to the common base case as needed. VEA will copy the CAISO on the email to NVE.

1.2.6.4. NVE will ensure recommended revisions by VEA to the common base case are incorporated and uploaded to the WECC. NVE will upload common cases in accordance with the WECC's Annual base case Compilation Schedule.

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

1.2.8. As part of the CAISO's annual Transmission Planning Process (TPP), the CAISO will select a WECC base case to use in the process. The CAISO will request VEA to review and update as needed 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. 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 NVE 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, NVE and VEA will develop a set of power flow cases. 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, 2018, 2021, and 2026 would be modeled from the 2016 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). This should follow the base case Compilation Schedule provided by WECC on the WECC website. VEA will submit data to NVE, its Area Coordinator, per this schedule.

1.4.2. The CAISO will request VEA to update base cases for the annual TPP around March of each year. The CAISO shall then make available models for its planning area reflecting data provided to it under Requirement R2 to the Electric Reliability Organization or its designee to support creation of the Interconnection-wide case(s) that include the CAISO's planning area (R4).

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. **Generator Owner (GO)** provides the data to model its generating facilities. The required data is summarized in the table below. At a minimum, the GO 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 GO in addition to this information. For WECC base cases except ADS case, model generation in–service, under construction, or on an as needed bases. 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.

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[4] 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

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

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 this section 10 of the TPP BPM.

Steady-State	Dynamics	Short Circuit
Generator parameters PQ Capability Curves	Generator	For applicable Steady-State items, provide: • Positive Sequence Data • Negative Sequence Data • 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[5]	Protection Relays outlined in Section 4.5	
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 (System Topology)	Dynamics	Short Circuit (for applicable Steady State items)
Buses	Static VAR Systems	Positive Sequence Data
AC Transmission Lines	HVDC Facilities	Negative Sequence Data

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

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

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, NVE. NVE will submit the data to WECC. VEA will also include the CAISO on any data submittals to NVE.

3. Steady State Model Development

3.1. Level of Detail (R1.2.2)

3.1.1. 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.

3.1.2. 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)

3.1.3. 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.

3.2. Project Statuses

3.2.1. **Conceptual** – conceptual or vision plans

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

3.2.3. **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)

3.2.4. **In-Service** – In Service

3.2.5. **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

3.3. Ratings

3.3.1. Ratings shall be provided in MVA.

3.3.2. Rating definitions/assignments

a. 1 = Summer Normal

b. 2 = Summer Emergency

c. 3 = Winter Normal

d. 4 = Winter Emergency

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

f. 6 = Fall Emergency

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

h. 8 = Spring Emergency

3.4. 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.

4. Dynamics Model Development

4.1. Level of Detail

4.1.1. 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.

4.1.2. 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

4.2. Generators

4.2.1. 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.

4.2.2. 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)

4.2.3. 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.

4.3. Static VAR Systems & Synchronous Condensers

4.3.1. 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.

4.3.2. If the reactive power device is modeled as a generator (for example, a synchronous condenser), it should follow the guidelines in section 4.2.

4.4. Load

4.4.1. 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.

4.4.2. 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.

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

4.5. Additional Protection Relays

4.5.1. 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.

4.5.2. 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

5. Short Circuit Model Development

5.1. Level of Detail

5.1.1. Short circuit data is required for all generators, transformers, and lines that are required to be submitted in sections 3 and 4.

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

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

5.2. Short Circuit can be calculated using the base case and dynamics files in PSLF or ASPEN. VEA will not submit specific files to NVE or the CAISO for Short Circuit. However, VEA will provide ASPEN short circuit data to NVE, 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.

6. 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 common 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[6].

[6] https://www.wecc.biz/SystemStabilityPlanning/Pages/AnchorDataSet.aspx

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 Date
California ISO, Manager, Regional Transmission-South, Infrastructure Development

9-26-18

Kristin Mettke Date
VEA, Executive VP of Engineering

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[7] 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 (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** (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] a. nominal voltage b. area, zone and owner 2. Aggregate Demand[8] [LSE] a. real and reactive power* b. in-service status* 3. Generating Units[9] [GO, RP (for future planned resources only)] a. real power capabilities - gross maximum and minimum values b. reactive power capabilities - maximum and minimum values at real power capabilities in 3a above 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). d. regulated bus* and voltage set point* (as typically provided by the TOP) e. machine MVA base f. generator step up transformer data (provide same data as that required for transformer under item 6, below) g. generator type (hydro, wind, fossil, solar, nuclear, etc) h. in-service status* 4. AC Transmission Line or Circuit [TO]	1. Generator [GO, RP (for future planned resources only)] 2. Excitation System [GO, RP (for future planned resources only)] 3. Governor [GO, RP (for future planned resources only)] 4. Power System Stabilizer [GO, RP (for future planned resources only)] 5. Demand [LSE] 6. Wind Turbine Data [GO] 7. Photovoltaic systems [GO] 8. Static Var Systems and FACTS [GO, TO, LSE] 9. DC system models [TO] 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] a. Positive Sequence Data b. Negative Sequence Data c. Zero Sequence Data 2. Mutual Line Impedance Data [TO] 3. Other information requested by the Planning Coordinator or Transmission Planner necessary for modeling purposes. [BA, GO, LSE, TO, TSP]

[7] 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).

[8] 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

[9] Including synchronous condensers and pumped storage.

a. impedance parameters (positive sequence) b. susceptance (line charging) c. ratings (normal and emergency)* d. in-service status* 5. DC Transmission systems [TO] 6. Transformer (voltage and phase-shifting) [TO] a. nominal voltages of windings b. impedance(s) c. tap ratios (voltage or phase angle)* d. minimum and maximum tap position limits e. number of tap positions (for both the ULTC and NLTC) f. regulated bus (for voltage regulating transformers)* g. ratings (normal and emergency)* h. in-service status* 7. Reactive compensation (shunt capacitors and reactors) [TO] a. admittances (MVars) of each capacitor and reactor b. regulated voltage band limits* (if mode of operation not fixed) c. mode of operation (fixed, discrete, continuous, etc.) d. regulated bus* (if mode of operation not fixed) e. in-service status* 8. Static Var Systems [TO] a. reactive limits b. voltage set point* c. fixed/switched shunt, if applicable d. in-service status* 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