WECC

2025 Data Preparation Manual for Interconnection-wide Cases

Applicable to the 2025 Base Case Compilation Schedule

System Review Subcommittee

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Introduction

The WECC Data Preparation Manual (DPM) is an outline of data requirements and reporting procedures necessary for Planning Coordinators (PC) to support creation of interconnection-wide cases for power flow and dynamic data.

Interconnection-wide cases are used to perform Near-term and Long-term Transmission Planning studies (seasonal Operating Transfer Capability (OTC) studies, WECC Path Rating studies, and regional- and local-area studies, etc.). Following the data requirements and reporting procedures, as specified in the DPM, will help WECC meet the needs of creating interconnection-wide cases.

WECC members and any other entities owning/operating facilities in the Western Interconnection may use the DPM. The System Review Subcommittee (SRS) maintains the DPM with oversight from the Reliability Assessment Committee (RAC) and its other subcommittees. PCs are responsible for making data and models available to WECC that accurately represent facilities for which they are responsible. WECC staff is responsible for collecting, archiving, modeling, and making available solved interconnection-wide cases for use by WECC members and others that have met the WECC data security requirements.

Navigating the electronic version of the DPM

Throughout this DPM, there are many references to supporting information within the DPM document. These internal hyperlinks begin with "See" or "Refer to" followed by text in quotation marks. Hover over that text and you will have the option of following the link to the supporting section.

Software Differences

Data fields that do not exist in each major software will be marked with a dagger (†).

Definitions

Area: A subset of the Western Interconnection-wide case composed of generators and connected contiguous elements to assist in the coordinated development of a WECC interconnection-wide case. Areas are defined by the SRS and listed in "Appendix 2—Area, Zone, and Bus Number Assignments."

Area Coordinator: WECC uses an Area Coordinator (AC) data collection model, whereas individual Planning Coordinators are part of one or more Areas. Area Coordinators collect modeling data from the PCs within their Area and submit this to WECC on behalf of the PCs. This process makes it much easier for WECC to compile the data and create the interconnection-wide cases by only receiving data from a few Area Coordinators instead of all the PCs in the Western Interconnection.

Balancing Coordinator: An entity who submits interchange schedules between Areas in coordination with adjacent Balancing Coordinators. Not a NERC functional entity.

Generation Netting: The representation of a generator(s) through the modeling of a load element with the real and reactive power requirements set to the net of generation and load. Alternatively, Generation Netting may be the representation of a generator(s) using a load element with a negative Real Power demand setting. Generation Netting may be used only in dynamic simulations by including the Generator element in the Netting section of the Positive Sequence Load Flow (PSLF) DYD file for a given WECC base case.

Interconnection-wide Case(s): Models representing the entire Western Interconnection, which may include WECC base cases.

Master Dynamics File (MDF): File in PSLF DYD format containing dynamic data for use in the compilation of all WECC base cases.

Master Tie-line File (MTLF): File in PSLF EPC format containing steady-state data used to model elements of the existing Western Interconnection that represent the tie-lines between Areas and other modeling data that pertains to multiple Areas.

Planned Facilities: Facilities that have not yet met their in-service date at the time data is submitted for inclusion in a base case. See the "General Data Requirements and Reporting Procedures" section.

Planning Coordinator: The Planning Coordinator (PC) is a NERC functional entity and is responsible, per NERC MOD-032, to collect modeling data within its PC area and submit this data to the ERO or ERO designee (in this case WECC). WECC uses an intermediate step of data collection, whereas PCs submit data to their AC, which in turn submits the data to WECC.

PSLF: General Electric's Positive Sequence Load Flow software tool for electrical transmission analysis.

PSS®E: Siemens PTI's Power System Simulator for Engineering software tool for electrical transmission analysis.

Retail-scale Distributed Energy Resources (R-DER): A set of distributed energy resources that offsets customer load, including residential, commercial, and industrial customers.

Utility-scale Distributed Energy Resources (U-DER): A set of distributed energy resources directly connected to, or closely connected to, the distribution bus or connected to the distribution bus through a dedicated, non-load-serving feeder.

WECC Base Case(s): A set of solved and solvable steady-state and dynamic data representing a specific operating scenario of the Western Interconnection compiled by WECC staff using the models and data provided by the Area Coordinators.

WECC Staff: Employees of WECC who participate in modeling and coordination of steady-state and dynamic data for use in creating WECC's interconnection-wide cases.

General Data Requirements and Reporting Procedures

The data requirements and reporting procedures included in this Data Preparation Manual are intended to provide guidance for PCs to support creation of interconnection-wide cases. PCs should develop processes to obtain and compile the requested data. More information on base case resources, submission procedures, and general business practices can be found in the Base Case Business Practices document.

Data Requirements

Data format and content requirements for the development of interconnection-wide cases are broken into two data types: steady-state and dynamic. An additional data requirements section is provided to address the modeling of contingencies and remedial action schemes.

In consideration of including Planned Facilities in submitted data, follow these guidelines:

The facilities:

- Should be in-service on the scheduled base case posting date;
- Should be in-service in the month and year represented in the case; or
- Must support proposed generation facilities that are modeled in-service in the case.

All data must be the best available data.

Provide generator dynamic data resulting from equipment testing if it is available. If test data is not available, provide design data. If design data is not available, provide generic dynamic data. In-service equipment should be supported by test data while far-term planned equipment may be modeled using generic dynamic data.

Data specific to Geomagnetic Induced Current (GIC) Data must be populated for all operating cases for facilities that include power transformer(s) with a high side, wye-grounded winding with terminal voltage greater than 200 kV, fixed shunts that are wye-grounded connected and have terminal voltage greater than 200 kV, and/or controlled shunts that are wye-grounded connected and have terminal voltage greater than 200 kV. PCs should provide appropriate GIC data for BES facilities greater than 100 kV.

Reporting Procedures

The schedule for PCs and ACs to follow is specified in the request for data submission from WECC staff. A preliminary schedule for providing data for interconnection-wide case creation is also included in the Base Case Compilation Schedule.

Steady-State Data Requirements

To provide consistency in data submittals and help avoid potential solution problems, PCs should follow the guidelines below to the maximum extent possible. However, WECC recognizes deviations from the guidelines may occasionally be needed. For these situations, PCs are requested to provide the SRS and Modeling and Validation Subcommittee (MVS) with the rationale for exceptions. In addition, refer to the "Year 20 Data Development Guidance" for modeling exceptions for requests beyond 15 years. The interconnection-wide base cases include the following steady-state data requirements:

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1. Except for collector-based generation such as wind and solar, all Bulk Electric System (BES) elements, as presently defined by NERC, within the Western Interconnection must be represented in WECC base cases without equivalencing.
2. Non-BES elements may also be included in WECC base cases and follow the data submittal requirements in this DPM. Any equivalencing of non-BES elements must be modeled to yield almost identical performance of a full representation in both steady state and dynamic analysis.
3. Non-BES elements must be included if they have significant interaction with BES elements. Non-BES elements that may have a significant interaction with BES elements may exhibit any of the following characteristics:
    a. Facilities that are operated at or above 50 kV,
    b. Facilities that are operated in parallel with BES elements,
    c. Facilities with connected individual generation resources ≥10 MVA or aggregate generation resources ≥20 MVA,
    d. Facilities with connected reactive resources ≥10 MVAr.
4. Non-BES Local Networks and Radial Systems that feed only load or parallel/looped systems that are normally operated in a radial configuration could generally be excluded from modeling.
5. Steady-state power flow data submitted to WECC must represent the existing BES elements plus planned transmission and generation facilities as described elsewhere in this document and as deemed appropriate by the PC.
6. Paths defined in the WECC Path Rating Catalog must be modeled to include all elements consistent with the path definition.

7. Data fields that are strings must not contain commas, single quotes, double quotes, or apostrophes.
8. Key element identifiers (e.g., number, name, base voltage, ID) that indicate an element representing the same equipment must be consistent between base cases.
    a. Devices with alpha characters must consistently use either uppercase or lowercase IDs.
    b. Bus names with alpha characters must consistently be either uppercase or lowercase.
    c. Data fields that are strings must not contain commas, colons, single quotes, double quotes, or apostrophes.
9. Uniqueness must not depend on names and IDs being case sensitive.
10. The requested data is listed below in the tables of data requirements. Any description provided for the field must be followed.

    Bus naming guideline: Although the criterion for bus names is that "Bus names must be unique within the same Base Voltage class," bus names should be the same for all equipment located in the same vicinity. For example, two substations that are in different Areas could both be named "Midway." Names could be set to "MIDWAY" at one location, and to "MDWAY" at the other. The SRS strongly suggests that naming of new buses added to the model adhere to the stated guideline. It recommends, but it is not mandatory, to eliminate spaces in bus names and use underscore characters instead. It is the responsibility of the PC adding the bus information to ensure they are not duplicating a name.
11. All facility ratings should be based on the most limiting element being represented.

AC and DC Buses

General Requirements:

1. Buses usually represent all the equipment in a substation that is at the same voltage level and connected. If desired, you can represent multiple bus sections within a substation by separate buses connected by Connectors or AC Transmission Line models that can be opened or closed as needed. Buses may also represent a node on a transmission line such as a tapping point or change in ownership.
2. Location of the bus will be identified by the combination of Area, Zone, and/or Owner fields. Optionally, you may submit the latitude and longitude fields using decimal degrees with data entered not to exceed five decimal places. Additionally, latitude and longitude fields are required with the substation data in the "AC Substation" section.

Table 1: Data Requirements (Buses)

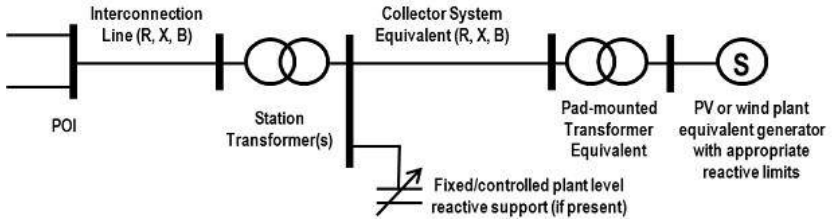
Field	Description	Requirements
Number	Bus number	B1. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Bus numbers. B2. WECC staff must provide DC Bus numbers.
Name	Bus name • Alphanumeric string containing 1 to 12 characters • At least one non-numeric character	B3. Bus names must be unique within the same Base Voltage class.
Base Voltage	Nominal voltage class of Bus (kV)	
Bus Type	AC Bus type {0,1,2,-2} • 0 = swing bus (voltage magnitude and phase fixed) • 1 = load bus (unconstrained voltage angle and magnitude) • 2 = generator bus (voltage control [terminal or remote] within generator limits) • -2 = generator bus with unlimited reactive power limits Other bus types may be used to indicate OFF status. Bus type -4 and smaller is the accepted convention for deleted buses. DC Bus type {1,2} • 1 = for a rectifier • 2 = for an inverter	
DC System Number	DC system number (not required for AC Bus)	B4. WECC staff must assign a DC system number for each DC system prior to model submission.

Field	Description	Requirements
Scheduled Voltage	Scheduled voltage (pu) • 5 decimals • Default: 1.00000	B5. If the Bus is regulated by a generator or other device, the scheduled voltage must be specified in per unit with respect to the Base Voltage of the Bus. B6. If the Bus is not regulated, the scheduled voltage is optional and for information purposes only.
Vmax	Maximum pre-contingency System Operating Limit (SOL) voltage provided to applicable Reliability Coordinator (pu)	
Vmin	Minimum pre-contingency System Operating Limit (SOL) voltage provided to applicable Reliability Coordinator (pu)	
Area	Area in which Bus is located	B7. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.
Zone	Zone in which Bus is located	B8. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.
Owner	Owner Number	B9. Owner Number must be the Transmission Owner, Generator Owner, or PC (as established by a written agreement). B10. WECC staff must assign Owner Numbers to required entities.
Substation (†)	Substation in which Bus is assigned	B11. Buses relative to GIC analysis must be assigned to a substation.
Balancing Authority (†)	Balancing Authority Area (BAA) in which bus is located	B12. All buses must be assigned to a Balancing Authority Area.
Data Maintainer	Maintainer of model designation	B13. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.

Generation

1. Generators selected for Area Slack Control, including the system slack, must meet the same technical requirements as selecting generators for automatic generation control (AGC) of a Balancing Authority Area (BAA). Generators selected for AGC typically have the following attributes:
    a. Changes in MW output cause minor changes in generator angle (suggested; dAngle/dP < 0.15 degrees/MW).
    b. Generation is dispatchable.
    c. Maximum MW output typically greater than 100 MW.
    d. Unit is expected to be in service for the time frame represented in the WECC base case.
2. Generator modeling must comply with the following:
    a. If the individual-generator-unit capacity is 10 MVA or larger, and the generator is connected to the WECC transmission system at 60 kV or higher, then submit steady-state data and dynamics data for each generator.
    b. If the aggregated-generator-unit capacity is 20 MVA or larger, the generators are connected to the WECC transmission system at 60 kV or higher, and it is not a collector-based generation facility, then submit steady-state data and dynamics data for each generator. (Wind and solar farms are examples of collector-based generation facilities.)
    c. If the aggregated-generation capacity is 20 MVA or larger, is connected to the WECC transmission system at 60 kV or higher, and is a collector-based generation facility, then submit steady-state data and dynamics data for the aggregated generation capacity as a single-unit generator model.
    d. Modeling of Utility-scale Distributed Energy Resources (U-DER) should comply with the following:
        i. Individual U-DER facilities with an aggregated generation capacity of 10 MVA or larger should be modeled explicitly at the low side of a transformer and include a dynamic model.
        ii. Individual U-DER facilities with an aggregated generation capacity under 10 MVA should be included in a load model at the low side of the transformer. See "Data Requirements (Loads)" for modeling details and details on modeling Retail-scale Distributed Energy Resources (R-DER).
    e. Generating facilities without DYD data must be netted in the DYD file and have their Non-conforming Load Flag set appropriately. Steady-state and dynamic generator data must be consistent.

3. Synchronous motors 10 MVA and larger must be modeled as individual machines, using a generator model with negative Real Power output and constant Reactive Power (Q) output.
4. Induction motors must be modeled as a load with the intent of using an induction motor model (MOTORW).
5. Synchronous condensers must be modeled individually using a generator model.
6. Generator step-up transformers must be modeled explicitly, they **must not** be modeled using the internal generator step-up transformer feature of a generator model. All related parameters must be set to the default values. See "Data Requirements (Transformers)."
7. Station service loads (ID = "SS") must be represented explicitly as separate loads on the generator bus. See "Data Requirements (Loads)."
8. Wind and photovoltaic plants must be represented through an equivalent generator(s), equivalent low-to-intermediate-voltage transformer, equivalent collector system, and substation transformer between the collector system and the transmission bus. See the WECC Wind Power Plant Power Flow Modeling Guide and PV Plant Power Flow Modeling Guide.



9. Large industrial sites may include imbedded generation. Industrial aggregated generation capacity of 10 MVA and larger must be represented in power flow instead of netting with the total load. If a generator is connected to the low side of the bulk-power-delivery transformer, then the transformer must be represented in the power flow, and the generator and load must be connected to the low-voltage side of the transformer.
10. Generator maximum Real Power (Pmax) in power flow must be consistent with the turbine capabilities defined in the Master Dynamics File.
11. Injection group data is not required except when needed for RAS models. When injection group data is provided, the string name should identify the data owner by naming the group models with the member system abbreviation and an underscore at the front. If a secondary owner

identifier is needed, a forward slash (/) may be used. Examples: CHPD_RockyReach, BPA/USBR_Grand Coulee.

Table 2: Data Requirements (Generation)

Field	Description	Requirements	Measure
Bus Numbers	Number of the Bus to which the generator is attached • See "Data Requirements (Buses)"		
Unit ID	Two-character Generator identifier		
Status	Generator status • 1 = in-service • 0 = out-of-service	D1. Out-of-service units must have status set to zero. D2. Retired units must be deleted rather than having status set to zero.	
Pgen	Real Power output (gross MW)	D3. Pgen must be at or within the unit Pmax and Pmin parameters for units that are in-service.	If Status = 1: Pmin ≤ Pgen ≤ Pmax
Qgen	Reactive power output (MVAr)		
Pmax	Maximum Real Power output (MW)	D4. Pmax must reflect the maximum Real Power output of the unit, also known as "gross" capability. D5. Pmax must not be greater than the maximum capability of the unit represented by the governor model. D6. Pmax for natural gas turbine generators in seasonal cases should have winter Pmax greater than summer Pmax.	

Field	Description	Requirements	Measure
Pmin	Minimum Real Power output (MW)	D7. Pmin must reflect the minimum Real Power output of the unit. D8. Pmin must be less than or equal to Pmax.	Pmin ≤ Pmax
Qmax	Maximum reactive power output (MVAr)	D9. Qmax must reflect the appropriate maximum reactive power output of the unit.	
Qmin	Minimum reactive power output (MVAr)	D10. Qmin must reflect the appropriate minimum reactive power output of the unit. D11. Qmin must be less than or equal to Qmax.	Qmin ≤ Qmax
Q Alloc Factor	Reactive power regulating assignment factor • 0.0–1.0 • > 0.0 for AVR control • 0.0 for constant PF control or gen Status=0		
Q Table Flag (†)	Reactive capability curve flag • 0 = do not use capability curve • 1 = use capability curve if it exists	D12. Q-Table data used for internal studies must be included in WECC base case submittals. D13. Pmax value must exist on the Q Table if used.	
Base Load Flag (†)	Base Load Flag • 0 = non-base load unit (responds to low frequency with additional mechanical power) • 1 = base load unit (cannot respond to low frequency with additional mechanical power) • 2 = base load unit (cannot respond to low and high	D14. Base Load Flag Must be consistent between steady-state and dynamics models.	

Field	Description	Requirements	Measure
	frequency with mechanical power)		
Turbine Type (†)		• 0 = unknown • 1 = steam turbine (except steam of combined cycle) • 2 = combined cycle steam part • 3 = steam cross-compound • 4 = combined cycle total unit (planned gens and details for separate model not available) • 5 = hydro • 6 = Internal Combustion Engine (diesel, piston, reciprocating) • 7 = diesel turbo charged • 11 = GT (single shaft, does not include turbine part) • 12 = aero derivative GT • 13 = single-shaft combined cycle • 14 = Synchronous condenser (no turbine) • 19 = Turbines used in a Binary Cycle (including geothermal) • 21 = type 1 wind turbine (onshore only) • 22 = type 2 wind turbine (onshore only) • 23 = type 3 wind turbine (onshore only) • 24 = type 4 wind turbine (onshore only) • 25 = wind turbine (offshore) • 29 = combined cycle combustion turbine part • 31 = photovoltaic (unknown or mix) • 32 = photovoltaic (fixed) • 33 = photovoltaic (tracking) • 40 = DC tie (generators representing DC ties) • 41 = motor/pump • 42 = energy storage – battery • 43 = energy storage – flywheel • 44 = energy storage – other • 46 = energy storage – compressed air • 47 = energy storage – concentrated solar power • 48 = fuel cell • 51 = hydrokinetic, axial flow turbine • 52 = hydrokinetic – wave buoy • 53 = hydrokinetic – other • 54 = energy storage – reversible hydraulic turbine • 99 = other	
Primary & Secondary Fuel Type (†)		• 0 = unknown • 10 = (ANT) Anthracite Coal • 11 = (BIT) Bituminous Coal • 12 = (LIG) Lignite Coal	

Field	Description	Requirements	Measure
	• 13 = (SGC) Coal-Derived Synthesis Gas • 14 = (SUB) Subbituminous Coal • 15 = (WC) Waste/Other Coal • 16 = (RC) Refined Coal • 20 = (DFO) Distillate Fuel Oil • 21 = (JF) Jet Fuel • 22 = (KER) Kerosene • 23 = (PC) Petroleum Coke • 24 = (PG) Gaseous Propane • 25 = (RFO) Residual Fuel Oil • 26 = (SGP) Synthesis Gas from Petroleum Coke • 27 = (WO) Waste/Other Oil • 30 = (BFG) Blast Furnace Gas • 31 = (NG) Natural Gas • 32 = (OG) Other Gas • 40 = (AB) Agricultural By-Products • 41 = (MSW) Municipal Solid Waste • 42 = (OBS) Other Biomass Solids • 43 = (WDS) Wood/Wood Waste Solids • 50 = (OBL) Other Biomass Liquids • 51 = (SLW) Sludge Waste • 52 = (BLQ) Black Liquor • 53 = (WDL) Wood Waste Liquids excluding Black Liquor • 60 = (LFG) Landfill Gas • 61 = (OBG) Other Biomass Gas • 70 = (SUN) Solar • 71 = (WND) Wind • 72 = (GEO) Geothermal • 73 = (WAT) Water • 80 = (NUC) Nuclear • 81 = (PUR) Purchased Steam • 82 = (WH) Waste Heat • 83 = (TDF) Tire Derived Fuels • 84 = (MWH) Electricity use for Energy Storage • 85 = (OTH) Other		
Reg Bus	Bus with voltage controlled by this generator	D15. Regulation of a remote Bus that does not represent actual system operation must be avoided.	
Vsched	Generator scheduled voltage (pu)		

Field	Description	Requirements	Measure
Area	Area in which generator is located	D16. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.	
Zone	Zone in which generator is located	D17. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.	
Base MVA	Generator base (MVA)	D18. Unit Base MVA must be equal to the MVA Base parameter of the unit's dynamic machine model.	Base MVA = Machine Base
Owner	Owner Number • Up to eight owners allowed	D19. Owner Number must be the Generator Owner. D20. WECC staff must assign Owner Numbers to required entities.	
G tap	Tap ratio of generator step-up transformer	D21. G tap must be set to 1.	G tap = 1
R TR	Resistance of generator step-up transformer	D22. R TR must be set to 0.	R TR = 0
XTR	Reactance of generator step-up transformer	D23. X TR must be set to 0.	X TR = 0
R Sub-transient	Sub-transient resistance of generator		
X Sub-transient	Sub-transient reactance of generator	D24. X Sub-transient must be equal to the sub-transient reactance represented in the unit dynamic machine model.	X Sub-transient = Xdpp (or Ldpp)
Balancing Authority (†)	Balancing Authority Area in which Generator is located		
Data Maintainer	Maintainer of model designation	D25. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.	

AC Transmission Lines

1. Series-connected reactive devices modeled in AC Transmission Lines must be modeled explicitly.
2. AC Transmission Line models connecting two Areas, as defined by WECC, must be maintained in the MTLF.
3. When breakers are explicitly represented in the model, they should be modeled as Breakers with the Connector Type field set to Breaker. See "Data Requirements (Connectors)" section.
4. AC transmission lines modeled with impedance below X = 0.00029 pu (the threshold impedance in PSLF) must not be used to represent a closed loop (ring bus representation).
5. Normal and emergency thermal rating fields for the seasonal scenario described in the base case data request letter must be populated for all AC Transmission Line models.
6. PSS®E base case data includes 12 facility ratings for transmission lines. If directed, WECC staff will move ratings into the appropriate seasonal ratings columns for the PSLF version of the base case being developed.
7. Line-connected transformers must not be modeled using the internal line-connected transformer feature of a transmission line model; all related parameters must be set to the default values. See "Data Requirements (Transformers)."
8. Data for AC lines will consider the length of the line when calculating line parameters. For example, long lines will be modeled with impedances adjusted to account for the uniform distribution of the series impedance and shunt admittance along the length of the line.

Table 3: Data Requirements (AC Transmission)

Field	Description	Requirements	Measure
FROM Bus Number	Number of the bus to which the FROM end of the transmission line section is attached. • See "Data Requirements (Buses)"		
TO Bus Number	Number of the bus to which the TO end of the transmission line section is attached. • See "Data Requirements (Buses)"		

Field	Description	Requirements	Measure
Circuit ID	Circuit identifier • Two-character circuit identifier	X1. AC Transmission Line modeling equivalent circuits must have Circuit ID set to "99" or "EQ."	
Section Number	Section number (1–9 in ascending order beginning at FROM end)	X2. AC Transmission Line with multiple sections must number the sections consecutively, starting with "1."	
Status	Branch status • 0 = out-of-service • 1 = in-service • 2 = bypass	X3. AC Transmission Line must have the anticipated status of the line in the case.	
Type	Branch Type • 0	X4. Branch type 1 must not be used (see "Data Requirements (AC Transmission Lines" item 7)	
R	Branch section positive sequence resistance	X5. Resistance used for modeling an AC Transmission Line must conform to the modeling practices as deemed appropriate by the PC.	
X	Branch section positive sequence reactance	X6. Reactance used for modeling an AC Transmission Line must conform to the modeling practices as deemed appropriate by the PC.	
B	Branch section positive sequence susceptance	X7. Susceptance used for modeling an AC Transmission Line must conform to the modeling practices as deemed appropriate by the Data Submitter.	
Rating MVA 1	Summer Normal Branch Rating (MVA)	X8. Line rating required.	Rating MVA 1 > 0
Rating MVA 2	Summer Emergency Branch Rating (MVA)	X9. Line rating required.	Rating MVA 2 > 0
Rating MVA 3	Winter Normal Branch Rating (MVA)		

Field	Description	Requirements	Measure
Rating MVA 4	Winter Emergency Branch Rating (MVA)		
Rating MVA 5	Spring Normal Branch Rating (MVA)		
Rating MVA 6	Spring Emergency Branch Rating (MVA)		
Rating MVA 7	Fall Normal Branch Rating (MVA)		
Rating MVA 8	Fall Emergency Branch Rating (MVA)		
From Loss Assign.	Loss factor (0.0–1.0) used to assign losses • 1.0 = 100% loss assigned to FROM end of AC Transmission Line • 0.0 = 100% loss assigned to "TO" end of AC Transmission Line		
Area	AC Transmission Line Area location	X10. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.	
Zone	Transmission Line Zone location	X11. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.	
Ohms	Ohmic data flag • 0 = impedances in pu • 1 = impedances in ohms		

Field	Description	Requirements	Measure
Owner	Owner Number (1 through 8)	X12. Owner Number must be the Transmission Owner of transmission facility and Generator Owner for lines within generation facility. X13. WECC staff must assign Owner Numbers to required entities.	
Data Maintainer	Maintainer of model designation	X14. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.	

Connectors

1. Connectors should be considered as objects other than transmission lines, series capacitors, series reactors, and transformers connecting two buses. Breakers can be modeled as Connectors.
2. MVA or Amp Ratings for Connectors are not required. The connected transmission line or transformer may include the connector rating if the connector is the most limiting element of the devices intended to be represented in the model.

Table 4: Data Requirements (Connector)

Field	Description	Requirements	Measure
FROM Bus Number	Number of the bus to which the FROM end of the Connector is attached. • See "Data Requirements (Buses)"		
TO Bus Number	Number of the bus to which the TO end of the Connector is attached. • See "Data Requirements (Buses)"		
ID	Connector identifier • Two-character identifier		

Field	Description	Requirements	Measure
Status	Connector status • 0 = out-of-service • 1 = in-service • 2 = bypass	B1. Connector must have the anticipated status of the line in the case.	
Connector Type	Connector device type • Breaker • Load break disconnect • Disconnect • Fuse • Ground disconnect		
Allow Consolidation	Flag for allowing topology processing to consolidate the Connector within a "superbus" • YES • NO		
Rating MVA 1	Summer Normal Connector Rating (MVA)		
Rating MVA 2	Summer Emergency Connector Rating (MVA)		
Rating MVA 3	Winter Normal Connector Rating (MVA)		
Rating MVA 4	Winter Emergency Connector Rating (MVA)		
Rating MVA 5	Spring Normal Branch Connector (MVA)		
Rating MVA 6	Spring Emergency Connector Rating (MVA)		
Rating MVA 7	Fall Normal Connector Rating (MVA)		
Rating MVA 8	Fall Emergency Connector Rating (MVA)		

Field	Description	Requirements	Measure
Data Maintainer	Maintainer of model designation	B2. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.	

Transformers

General Requirements

1. Transformers with no Tap Changing Under Load (TCUL) or phase-shifting capability must have the Tap Control Type field set to "1" and must not have TCUL or phase-shifting data included in the cases. Conversion from the latest approved version of PSLF to other widely used programs may create model discrepancies with partial TCUL or phase-shifting data. Actual transformer equipment type must be represented.
2. Transformer data can be entered on either the transformer base (transformer winding MVA base and winding voltage base) or the system model base (100 MVA and system nominal voltage base). Impedance values and tap position values must use a consistent unit base value for a given transformer.
3. Transformer models connecting two Areas, as defined by WECC, must be represented in the MTLF (see "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Areas").
4. Normal and Emergency thermal rating fields corresponding to the seasonal scenario described in the base case data request letter must be populated for all Transformer models.
5. PSS®E cases use ratings 1 and 2 for seasonal normal and emergency ratings corresponding to the season of the case. If directed, WECC staff will move ratings 1 and 2 into the appropriate seasonal ratings columns for the PSLF version of the base case being developed.
6. The Transformer Impedance Correction Table must be maintained in the MTLF.

Table 5: Data Requirements (Transformers)

Field	Description	Requirements	Measure
FROM Bus Number	Number of the bus to which the FROM end of the transformer is attached. • See "Data Requirements (Buses)"		

Field	Description	Requirements	Measure
TO Bus Number	Number of the bus to which the "TO" end of the transformer is attached. • See "Data Requirements (Buses)"		
Circuit ID	Circuit identifier • Two-character circuit identifier	T1. Transformer modeling equivalent circuits must have Circuit ID set to "99" or "EQ."	
Status	Transformer Status • 0 = out-of-service • 1 = in-service • 2 = secondary open • 3 = tertiary open • 4 = primary open	T2. Transformers must have the anticipated status of the transformer in the case.	
Tap Control Type	Transformer type code • 1 or 11 = Fixed • 2 or 12 = TCUL • -2 or -12 = TCUL-Disabled • 4 or 14 = Phase-Shifting • -4 or -14 = Phase-Shifting Disabled	T3. TCUL-Disabled and Phase-Shifting Disabled should be used to represent a temporary physical change in transformer control or to address potential modeling issues.	
Regulated Bus Number	Number of Bus with voltage regulated or "TO" bus number for phase-regulated transformers.	T4. Regulation of a remote bus that does not represent actual system operation must be avoided.	
Impedance Table Number (†)	Impedance correction table number.		
Tert Bus Number	Tertiary winding Bus number • See "Data Requirements (Buses)"		

Field	Description	Requirements	Measure
3wpt Bus Number	Internal "3-winding point" Bus number See "Data Requirements (Buses)"	T5. This bus number must be unique to the transformer and be consistent in all cases.	
Area	Area in which Transformer is located	T6. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.	
Zone	Zone in which Transformer is located	T7. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.	
FROM-TO Base MVA	Transformer MVA base (primary-to-secondary for 3-wndg)		
FROM-Tert Base MVA	MVA base—primary-to-tertiary for 3-wndg		
TO-Tert Base MVA	MVA base—tertiary-to-secondary for 3-wndg		
R FROM-TO	Resistance primary-to-secondary		
X FROM-TO	Reactance primary-to-secondary		
R FROM-Tert	Resistance primary-to-tertiary		
X FROM-Tert	Reactance primary-to-tertiary		
R TO-Tert	Resistance secondary-to-tertiary		
X TO-Tert	Reactance secondary-to- tertiary		
FROM Winding Nom Volt	Primary winding nominal voltage (kV)		
TO Winding Nom Volt	Secondary winding nominal voltage (kV)		

Field	Description	Requirements	Measure
Tert Winding Nom Volt	Tertiary winding nominal voltage (kV)		
FROM Fixed Tap	Primary winding fixed-tap position (pu)		
TO Fixed Tap	Secondary winding fixed-tap position (pu)		
Tert Fixed Tap	Tertiary winding fixed-tap position (pu)		
Variable V Tap or Variable Angle	TCUL tap position (primary winding) or phase angle position	T8. Variable V Tap or Variable Angle must be at or within Max Var. Tap and Min Var. Tap for Transformers that are in-service.	Min Var. Tap ≤ V Tap ≤ Max Var. Tap
Step Size	TCUL (pu) or phase-shift (angle in deg) step	T9. Step Size must reflect the capability of the transformer.	
FROM Angle	Primary-winding phase angle (deg)		
TO Angle	Secondary-winding phase angle (deg)		
Tertiary Angle	Tertiary-winding phase angle (deg)		
G-Core Loss	Magnetizing conductance (pu)		
B Magnetizing	Magnetizing susceptance (pu)		
Rating 1	**Summer Normal** Branch Rating (MVA) (primary winding for 3-winding xfmr)	T10. Transformer rating required.	Rating MVA 1> 0
Rating 2	**Summer Emergency** Branch Rating (MVA) (primary winding for 3-winding xfmr)	T11. Transformer rating required.	Rating MVA 2> 0

Field	Description	Requirements	Measure
Rating 3	**Winter Normal** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
Rating 4	**Winter Emergency** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
Rating 5	**Spring Normal** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
Rating 6	**Spring Emergency** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
Rating 7	**Fall Normal** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
Rating 8	**Fall Emergency** Branch Rating (MVA) (primary winding for 3-winding xfmr)		
TO Winding Rating MVA 1	Ratings–secondary winding for 3-winding xfmr		
TO Winding Rating MVA 2	Ratings–secondary winding for 3-winding xfmr		
TO Winding Rating MVA 3	Ratings–secondary winding for 3-winding xfmr		
Tert Wind. Rating MVA 1	Ratings–tertiary winding for 3-winding xfmr		
Tert Wind. Rating MVA 2	Ratings–tertiary winding for 3-winding xfmr		

Field	Description	Requirements	Measure
Tert Wind. Rating MVA 3	Ratings–tertiary winding for 3-winding xfmr		
FROM Loss Assign	Loss assignment factor (primary winding for 3-winding xfmr) (pu)		
TO Loss Assign	Loss assignment factor—secondary winding for 3-winding xfmr (pu)		
Tert Loss Assign	Loss assignment factor–tertiary winding for 3-winding xfmr (pu)		
Max Var. Tap	Maximum TCUL ratio (pu or deg)	T12. Max Var. Tap must be greater than Min Var. Tap.	
Min Var. Tap	Minimum TCUL ratio (pu or deg)		
Max Cont. V or MW	Maximum voltage (power) at controlled bus (pu or MW)	T13. Max Cont. V must be greater than Min Cont. V.	
Min Cont. V or MW	Minimum voltage (power) at controlled bus (pu or MW)		
Ohms	Ohmic data flag • 0 = impedances in pu • 1 = impedances in ohms		
Owner	Owner Number (1 through 8)	T14. Owner Number must be the Transmission Owner for transmission facility and Generator Owner for generator facility. T15. WECC staff must assign Owner Numbers to required entities.	
Data Maintainer	Maintainer of model designation	T16. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.	

Fixed-Shunt Reactive Elements

General Requirements

1. Fixed-shunt elements directly connected to a bus must be represented as bus shunts.
2. Fixed-shunt elements that directly connect to and switch with a transmission line must be represented as line shunts.
3. Fixed-line Shunt models connected to an AC Transmission Line model connecting two Areas, as defined by WECC, must be represented in the MTLF if requested by the process detailed in the data submission request.
4. Fixed-shunt reactive devices inside wind and solar projects must be modeled explicitly in power flow.

Table 6: Data Requirements (Fixed Shunts)

Field	Description	Requirement
FROM Bus Number	Number of the Bus to which the FROM end of the transmission line on which the shunt is connected for line shunts, or number of the Bus at which shunt is connected for bus shunts. • See "Data Requirements (Buses)"	
TO Bus Number	Number of the Bus to which the TO end of the transmission line on which the shunt is connected, for line shunts, or 0 for bus shunts. • See "Data Requirements (Buses)"	
Shunt ID	Shunt identifier • Two-character shunt identifier	S1. Line shunt connected to the FROM end of the transmission line must have Shunt ID starting with "F." S2. Line shunt connected to the TO end of the transmission line must have Shunt ID starting with "T." S3. Identifier must not be the same as a Controlled Shunt at the same bus.
Circuit ID	AC Transmission Line circuit identifier for line shunts or blank for bus shunts • Two-character circuit identifier	

Field	Description	Requirement
Section Number	Number of AC Transmission Line section to which shunt is connected if line shunt, or "0" if bus shunt	
Shunt Status	Shunt status • 0 = out-of-service • 1 = in-service	S4. Fixed shunts must have the anticipated status of the shunt in the case.
Area	Area in which fixed shunt is located	S5. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.
Zone	Zone in which fixed shunt is located	S6. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.
G	Actual shunt conductance (pu)	
B	Actual shunt susceptance (pu)	
Owner	Owner Number (1–4)	S7. Owner Number must be the Transmission Owner or Generator Owner. S8. WECC staff must assign Owner Numbers to required entities.
Data Maintainer	Maintainer of model designation	S9. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.
Balancing Authority (†)	Balancing Authority area in which fixed shunt is located	

Controlled Shunt Reactive Devices

General Requirements

1. Controlled shunt reactive device models should be used to represent the following devices explicitly in power flow:
    a. Mechanically switched shunt capacitors;
    b. Mechanically switched shunt reactors connected through a step-up transformer;

c. Static var compensators;

d. STATCOMs; and/or

e. Thyristor-switched shunt capacitors and reactors.

2. Controlled shunt reactive devices inside wind and solar projects must be modeled explicitly in power flow.

3. The number of explicitly modeled shunts on a bus should be minimized to aid solving.

Table 7: Data Requirements (Controlled Shunts)

Field	Description	Requirement
Bus Number	Number of Bus at which device is connected • See "Data Requirements (Buses)"	
SVD ID	SVD identifier • Two-character identifier	S10. Identifier must not be the same as a Fixed Shunt at the same bus.
SVD Status	SVD status • 0 = out-of-service • 1 = in-service	S11. Controlled shunts must have the anticipated status of the shunt in the case.
SVD Control Type	Device type • 0 = Fixed • 1 = Discrete • 2 = Continuous • 3 = All or Nothing • 4 = Discrete control using Voltage Dead Band • 5=WECC SVC • 6=WECC STATCOM • 7=WECC TSC/TSR	
Regulated Bus	Number of the Bus regulated by this shunt • See "Data Requirements (Buses)"	S12. Regulation of a remote Bus that does not represent actual system operation must be avoided.
Area	Area in which Controlled Shunt is located	S13. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.

Field	Description	Requirement
Zone	Zone in which Controlled Shunt is located	S14. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.
G Actual	Actual shunt conductance (pu)	
B Actual	Actual shunt susceptance (pu)	
B Min	Minimum susceptance of continuous element (pu)	
B Max	Maximum susceptance of continuous element (pu)	
Voltage Dead Band	Voltage control bandwidth divided by two (pu) (types 3 and 4)	S15. Voltage Dead Band must prevent regulated voltage from exceeding the Voltage Dead Band with a single Controlled Shunt step. S16. The minimum dead band must be 0.02.
B Step	Susceptance of each switched element in nth stage (pu) (types 1-4, 7)	S17. Step size must reflect the capability of the controlled shunt.
No. of Steps	Number of equal admittance steps in nth switched stage (types 1-4, 7)	S18. Number of steps must reflect the capability of the controlled shunt.
B Min	Minimum total susceptance for device (pu)	
B Max	Maximum total susceptance for device (pu) Maximum current for type 6 (pu)	
XC	Compensating (slope) reactance (pu) (types 5, 6, and 7)	
B Min SH	Minimum B for switching shunts (pu) (types 5, 6, and 7)	
B Max SH	Maximum B for switching shunts (pu) (types 5, 6, and 7)	
STSB	Slow reset control on/off status (pu) (types 5, 6, and 7)	
B Min SB	Minimum B for slow reset (pu) (pu) (types 5 and 7)	
B Max SB	Maximum B for slow reset (pu) (pu) (types 5 and 7)	

Field	Description	Requirement
VRFMIN	Minimum Voltage reference for slow reset (pu) (types 5, 6, and 7) Minimum Voltage reference for types 3 and 4 if Voltage Dead Band <= 0	S19. For types 3 and 4, VRFMAX – VRFMIN ≥ 0.04.
VRFMAX	Maximum Voltage reference for slow reset (pu) (types 5, 6, and 7) Maximum Voltage reference for types 3 and 4 if Voltage Dead Band <= 0	S20. For types 3 and 4, VRFMAX – VRFMIN ≥ 0.04.
dVdB	System dV/dB for slow reset (pu) (types 5, 6, and 7)	
Ni	Number of steps in shunt	
Owner	Owner Number (1 through 4)	S21. Owner Number must be the Transmission Owner or Generator Owner. S22. WECC staff must assign Owner Numbers to required entities.
Balancing Authority (†)	Balancing Authority Area in which Shunt is located	
Data Maintainer	Maintainer of model designation	S23. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.

Loads

General Requirements

1. Real and reactive power for each load must be provided.
2. Motors 10 MVA or larger must be modeled as machines (see "Data Requirements (Generation)").
3. Station service at modeled generation facilities with station service load greater than or equal to 1 MW must be modeled explicitly. As noted in the table below, load modeling generator station service must have Load ID set to "SS."
4. A climate zone must be provided for each load in accordance with the WECC MVS Load-Long ID Instructions, either within the case data provided, or in a separate spreadsheet file. The PC must select an appropriate Long ID that correctly represents the dynamic load characteristics and place it in the climate zone field. See "Dynamic Data Requirements (Load Requirements)."
5. Modeling of Distributed Energy Resources (DER) should comply with the following:

a. If data is available, all R-DER and only individual U-DER with an aggregated output below 10 MVA should be modeled using the distributed generation fields in the load model.

b. See "Data Requirements (Generation)" for details on modeling U-DER with an aggregated generation capacity of 10 MVA or larger.

6. Industrial loads and embedded generation not consistent with the R-DER modeling section must be modeled on the low side of the transformer, as shown in the figure below.

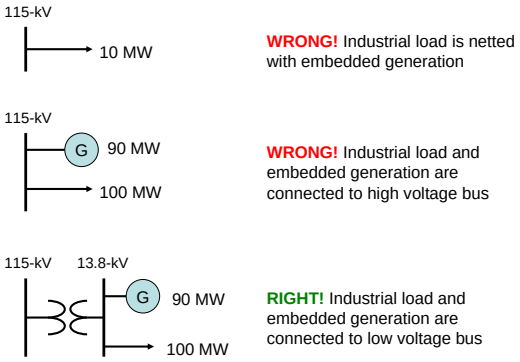


Table 8: Data Requirements (Loads)

Field	Description	Requirement
Bus Number	Number of Bus at which load is connected • See "Data Requirements (Buses)"	
Load ID	Two-character identifier	L1. Load modeling generator station service must have Load ID set to "SS." L2. Loads at the same Bus must have unique Load ID.
Load Status	• 0 = load out-of-service • 1 = load in-service	L3. Load must have the anticipated status of the load in the case.
Non-Conforming Flag	• 0 = load will change with scaling • 1 = load does not change with scaling	L4. Non-conforming Flag must be set to "1" for loads that should not be changed in load scaling operation of power flow software.

Field	Description	Requirement
Area	Load Area in which located	L5. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated Area.
Zone	Load Zone in which located	L6. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated ranges of Zones used by Area.
Const MVA P	Constant MVA Real Power load	
Const MVA Q	Constant MVA reactive power load	
Dist Status	• 0 = generator out-of-service • 1 = generator in-service	
Dist Gen P	Real Power output (MW)	
Dist Gen Q	Reactive power output (MVAr)	
Const CUR P	Constant current Real Power load	L7. Const CUR P must not be used.
Const CUR Q	Constant current reactive power load	L8. Const CUR Q must not be used.
Const Y P	Constant admittance Real Power load	L9. Const Y P must not be used.
Const Y Q	Constant admittance reactive power load	L10. Const Y Q must not be used.
Owner	Owner Number	L11. Owner Number must be the Transmission Owner for transmission loads, Generator Owner for station service, Distribution Service Provider for distribution loads. L12. WECC staff must assign Owner Numbers to required entities.
Climate Zone (†)	Climate zone and substation type identification	L13. Seven-character identifiers of the climate zone and load type—the first three characters represent the climate zone, followed by underscore, and three characters representing the substation/feeder load mix type. Details are included in the LID_Instructions and

Field	Description	Requirement
		Composite Load Model Implementation documents.
Balancing Authority (†)	Balancing Authority Area in which Load is located	
Data Maintainer	Maintainer of model designation	L14. Refer to "Appendix 2—Area, Zone, and Bus Number Assignments" for designated member system abbreviation.

DC Transmission Lines

General Requirements

1. Include (at a minimum) the following DC Transmission Line (overhead and underground) requirements: line parameters, Normal and Emergency Ratings, control parameters, rectifier data, and inverter data.
2. Megawatt set point of converter data must be equal to or less than the DC Transmission Line Rating.

Table 9: Data Requirements (DC Transmission)

Field	Description	Requirement	Measure
ifrom	DC "FROM" bus number		
ito	DC "TO" bus number		
ck[2]	DC line identifier		
projid	Project Identifier		
st	DC line status		
dcsys	DC system number		
Area	Area number		
Zone	Zone number		
r	DC line resistance		Ohms
l	DC line inductance		Henries
c	DC line capacitance		microfarad
rate[8]	DC current ratings		Amps
aloss	DC line loss assignment factor		per unit
nown[8]	Owner Number		

Balancing Authority	Balancing Authority Area in which DC bus & converter are located	
Data Maintainer	Maintainer of model designation	D1. Refer to "Appendix 2— Area, Zone, and Bus Number Assignments" for designated member system abbreviation.

Area Interchange Schedules

General Requirements

1. Area Interchange schedules must be coordinated between Areas to meet the objectives of the data request letter and maintain consistency in the imports/exports modeled.
2. The sum of net Area Interchange Schedules for the interconnection-wide case must be equal to zero.
3. WECC staff must set the Real Power Net Interchange Tolerance equal to 1.0 MW for each Area.

Master Tie-line File

When requested by the process detailed in the data submission request the MTLF contains:

1. Master lists of Owners, Balancing Authority Areas, and Zones;
2. Path definitions and ratings for paths in the WECC Path Rating Catalog;
3. Lists of lines and transformers that interconnect Areas; and
4. Placeholder for Area-to-Area transactions for the existing system.

General Requirements Used to Build Interconnection-Wide Cases

1. WECC staff must maintain the MTLF.
2. WECC staff must post the current MTLF in the present year's base-case files on the WECC website.
3. The MTLF is used to compile all base cases to ensure consistency of steady-state data common to multiple Areas.
4. Updates to the MTLF must be coordinated between Areas and submitted to WECC staff in an EPC file format or excel spreadsheet format as necessary by the PC.
5. The MTLF must be maintained and applied to all WECC base cases. The tie-line data pertaining to planning horizon cases will be handled on a case-by-case basis.

Data Requirements (Area Interchange)

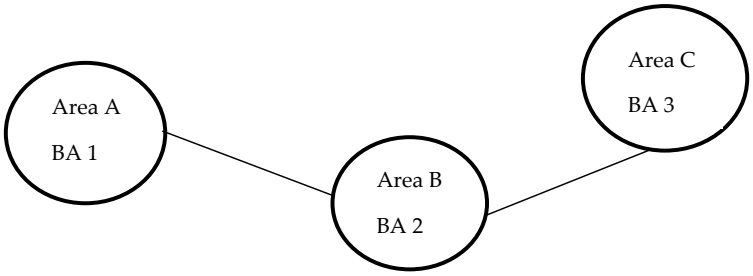
1. Tie-lines—Existing transmission lines (including line shunts) and transformers connecting two Areas must have steady-state data submitted to WECC staff for inclusion in the MTLF (see "AC Transmission Lines" and "Transformers" sections, respectively). Tie changes are not captured when only included in the case data submissions. These changes or updates must be submitted separately from typical case data submissions (or as separate files included within the case data).
2. Zones—Zone Names and Zone Numbers must be maintained in the MTLF in accordance with the process detailed in the data submission request. Zone assignments to the WECC member systems can be found in Appendix 2 (see "Appendix 2—Area, Zone, and Bus Number Assignments").
3. WECC staff must identify paths (as listed in the WECC Path Rating Catalog) in accordance with the process detailed in the data submission request. The Interface Number must match the WECC path number. Rating 1 must be used for the Path Transfer Limit for prevailing flow direction and Rating 2 must be used for the secondary flow direction Path Transfer Limit.
4. WECC path element information must be maintained in the MTLF in accordance with the process detailed in the data submission request. The responsible PC or AC must provide updates to WECC staff as changes are made or as facilities are placed in-service.
5. Facility owners of DC buses, lines, and converters that are part of any Area tie-line must provide the steady-state data to be maintained in the MTLF. (See Section "DC Transmission Lines").
6. Transformer Impedance Correction Table—Impedance correction parameters to be used for TCUL transformers and phase-shifting transformers must be maintained in the MTLF in accordance with the process detailed in the data submission request.
7. Owner Data—A list of Owner Numbers, names, and four-character abbreviations must be maintained in the MTLF in accordance with the process detailed in the data submission request.
8. Transaction Data—There must be a transaction for any ties between Areas. WECC Staff manages this data in accordance with the process detailed in the data submission request on a case-by-case basis.
9. Balancing Authority—WECC staff will maintain a list of BAAs used in the existing operation of the transmission system.

Pseudo-Ties

General Requirements:

1. It is recommended that elements be modeled in the area in which the facility is physically connected, especially when the elements are located a significant distance from the Balancing Authority Area.

a. In the figure below, Generation is physically interconnected to the transmission system in Area A, but generation serves load in BA 3. The generation is pseudo-tied to BA 3, so it is not within BA 1. For WECC base cases, the generation would be modeled in Area A and the BA code would be used to show that the generation is part of BA 3. The Area C coordinator would provide the dispatch to the Area A coordinator for each case. Generation would be scheduled to Area C through appropriate interchange schedules.



2. The Area Coordinator for the Balancing Authority Area is responsible for coordinating output.

3. The Area Coordinator for the transmission interconnection facilities is responsible for coordinating voltage schedules and other case-specific conditions required to capture facility operating requirements.

AC Substations

General Requirements:

1. Substations represent all the buses in a substation. These collections of buses are connected by transformer, bus sectionalizing breakers, switches and/or short transmission lines.

Table 10: Data Requirements (AC Substations)

Field	Description	Requirement
Sub Number	Substation Number	SU1. Each substation must have a unique number that matches one of the buses contained in the substation.
Sub Name	Substation Name	SU2. Up to 12 characters with a unique name. Substation name from West-wide System Model (WSM) is recommended.
Sub Latitude	Geographic Latitude	SU3. Actual latitude data of the substation in decimal degrees.

Field	Description	Requirement
Sub Longitude	Geographic Longitude	SU4. Actual longitude data of the substation in decimal degrees.

Dynamic Data Requirements

The Dynamic data for the Western Interconnection is maintained in the Master Dynamics File (MDF). To provide consistency in data submittals and help avoid potential solution problems in the reliability analysis of the interconnected transmission system, PCs must submit dynamic data to WECC per the guidelines listed here. However, WECC recognizes deviations from the guidelines may occasionally be needed. For these situations, PCs are requested to provide the SRS and MVS with the rationale for exceptions. In all cases, dynamic data must be consistent with steady-state data provided for each WECC base case. PCs are responsible for providing data for facilities in the WECC-approved format.

Dynamic data is submitted as soon as any new data becomes available. Dynamic data may become available outside the scheduled case building process due to individual entity equipment testing programs, such as the generator testing program.

Dynamic data for new generators and updates for existing generators are submitted via the WECC Generator Unit Model Validation Guideline. This guideline includes the roles and responsibilities of the Generator Owner, the Transmission Planner, and WECC.

Approved dynamic models conform to the WECC Dynamic Modeling Procedure. All dynamic models contained in the MDF must be those approved by the MVS. If the model you want to use is not on the approved list, you must go through the MVS and follow the WECC Dynamic Modeling Procedure.

The following approach to dynamic data must apply interconnection-wide:

1. Generators and other dynamic devices must be represented with approved dynamic data as recommended by the MVS to represent the designated dynamic equipment modeled in WECC base cases. The approved models can be found within the Approved Dynamic Model Library
2. When new models have been added to or obsolete models have been removed from the Approved Dynamic Model Library, SRS will determine an appropriate implementation schedule and scope for submitting the necessary data required by the newly approved models.
3. Estimated or typical manufacturer's dynamic data based on facilities of similar design and characteristics may be used to represent planned generators and other dynamic devices if specific design data cannot be obtained. MVS maintains the Typical Machine Data document. Specific dynamic design data must be submitted per the WECC Steady-State and Dynamic Data Criterion. See "General Data Requirements and Reporting Procedures."

4. Where there is a difference between the requirements of this document and the WECC Generator Unit Model Validation Guideline, the Guideline must preside.
5. Typical dynamics studies are up to 60 seconds from the initiating event. All models, on the Approved Dynamic Model Library list that can respond within that period, must be submitted.

Generation Requirements

1. Dynamic data for generators, synchronous condensers, excitation systems, voltage regulators, turbine governor systems, power system stabilizers, and other associated generation equipment must be derived from test results obtained by adhering to the WECC Generator Unit Model Validation Guideline for each unit represented in WECC base cases according to thresholds as specified in the Steady-State Data Requirements section. Generator Owners may submit test results and dynamic data to gentest@wecc.org to receive a Generator Testing Certificate. Dynamic data includes, as appropriate to the model, items such as inertia constant, damping coefficient, saturation parameters, and direct and quadrature axis reactances and time constants.
2. Generator Owners must submit power plant data in accordance with the voltage and MVA size thresholds for aggregating generator models described in the Steady-State Data Requirements section. See "Data Requirements (Generation)."
3. Netting of planned generators represented in WECC base cases must conform to the threshold requirements of the Steady-State Data Requirements section.
4. Pmax, MWCap, and other model specific parameters should be properly coordinated to avoid model initialization errors. MVA base and MWCap should not be changed.
5. Power System Stabilizer (PSS) Dynamic data must be submitted for all generators that have active PSS.
6. Existing generators must follow the WECC Generator Unit Model Validation Guideline.
7. User defined models for collector-based generator (Wind and Solar plants) representation must be avoided.

Load Requirements

Model voltage and frequency characteristics explicitly for each individual load if possible. However, use the Composite Load Model for loads when frequency and voltage characteristics are not explicitly known. The goal of this section is to model effects of voltage and frequency on load as accurately as possible.

1. A composite load model must exist for each load modeled in the steady-state data.
2. Keep dynamic load data characteristics consistent with reported steady-state data.

3. For loads less than 5 MW, PCs will work with WECC staff to establish a default load representation record for each Area to represent loads not modeled with the Composite Load Model. This is to avoid the load representation defaulting to constant power (PSLF default). If actual dynamic load characteristics are not available, load should be modeled as constant current P, and constant impedance Q. Bus specific exceptions to the default load representation must be submitted to WECC staff for inclusion in the MDF.

Underfrequency Load Shedding (UFLS)

1. Include UFLS records for all loads that have UFLS relays on the interconnected system.
2. The pickup frequency of each stage must be lower than that of the previous stage. UFLS must comply with WECC-coordinated off-nominal requirements as specified in the WECC Off-Nominal Frequency Load-Shedding Plan document.
3. Pertinent load data must be included in the MDF. All UFLS data in the MDF must match bus, load, and/or branch identifiers in the cases.
4. The UFLS models must correspond to UFLS information provided to the WECC Underfrequency Load-Shedding Review Group in accordance with WECC Underfrequency Load-Shedding Criterion.
5. To include data in Planning cases, submit the data with the case development and identify as planning data.

Undervoltage Load Shedding (UVLS)

1. UVLS records must be included for all loads that have under-voltage relays on the interconnected system.
2. The pick-up and time-delay settings must be coordinated for each stage with the previous stage.
3. Pertinent load data must be included in the MDF. All UVLS data in the MDF must match bus, load, and/or branch identifiers in the cases.

Relays

Relay models as approved for use by the SRS must be included per the timeline and scope it establishes for primary relays. PCs are also strongly encouraged to submit all relevant backup relay modeling data.

Back-to-Back DC Ties

Netting is allowed for back-to-back DC ties. Back-to-back DC ties must be represented as generation in the power flow but netted in dynamic data. The record should include an ID designation of “DC” on the generator record.

DC Lines, SVC and D-var systems

1. Device-specific dynamic data for dynamic devices must be modeled, including but not limited to, static var compensators and controllers, high-voltage direct-current systems, flexible AC transmission systems, and automatically switched shunt and series capacitors or reactors.
2. DC lines and SVC systems must be modeled, to the maximum extent possible, to accurately reflect actual system performance.
3. DC bus numbering must be coordinated with WECC staff prior to model submission.

Remedial Action Scheme Data

Remedial Action Scheme (RAS) data must be shared with WECC and WECC must securely store the information separate from the interconnection-wide cases.

The following approach should be taken when providing RAS data:

1. All models should be provided upon request by PCs in their preferred format until the WECC common format is available in the provider's preferred software.
2. RAS models should be provided if the affected elements are modeled in the case.
3. All models should identify the data owner by naming the models with the member system abbreviation and an underscore at the front. (e.g., "member system abbreviation_descriptive model name")
4. RAS models must be provided for all operations base cases. These are denoted by an "-OP" in the base case compilation schedule. New models must be provided when the RAS are placed in use by the Operations department of each member, while existing models need only be updated when changes occur. PCs must notify WECC staff if any already provided models are no longer online and should be removed.
5. RAS data will be available on the WECC website. Only those users who are logged in and authorized may access it.

Approving Committee, Entity, or Person	Approval Date
SRS	August 8, 2024

WECC receives data used in its analyses from a wide variety of sources. WECC strives to source its data from reliable entities and undertakes reasonable efforts to validate the accuracy of the data used. WECC believes the data contained herein and used in its analyses is accurate and reliable. However, WECC disclaims any and all representations, guarantees, warranties, and liability for the information contained herein and any use thereof. Persons who use and rely on the information contained herein do so at their own risk.

Appendix 1—Late Data Procedure

The objective of the Late Data Procedure is to preserve the original schedule for the development of base cases in accordance with each year's Base Case Compilation Schedule, and the Case Description sheet in the data request letter for each case. The Late Data Procedure describes data submittal responsibilities as well as actions to be taken for actual delays or anticipated delays in the submittal of data, or for the submittal of unusable data. This procedure does not take effect until one of the following occurs:

1. A data submittal date has been missed; or
2. There is sufficient reason to believe that a submittal date will be missed; or
3. It is determined that the submitted data is not usable.

Success of the case development program depends on timely and accurate data submittal, review, and support of the development of each base case. A PC or AC not meeting a scheduled response date listed in the Base Case Compilation Schedule with a usable response could result in a delay in the case development schedule if left uncorrected.

Examples of unusable data:

1. Data from two neighboring areas with inter-area schedules that do not match; and
2. Data with such significant problems that it cannot be used for the comment phase of the development process which; therefore, delays the progress of the case development.

Any unusable data received by WECC staff must be corrected by the PC to not further impair the schedule or it will be rectified in accordance with this Late Data Procedure, as will any late data or anticipated late data.

AC, PC, and WECC Staff Responsibilities

It is the responsibility of the ACs and PCs to submit timely and accurate data in accordance with the Base Case Compilation Schedule and the Case Description sheet in the data request letter. A schedule can be impaired either by data being submitted after the scheduled due date or by the submission of unusable data, even if it is submitted on time.

If, in the judgment of WECC staff, it appears that the schedule will be impaired due to lack of usable data response by the AC or PC, it will be the responsibility of WECC staff to provide the data for the case in question.

Actions to Take

There are two actions specified by this procedure in the event the WECC staff must exercise its late data responsibilities for a delinquent entity. The first is the action of assuming the responsibility for

submitting the data and the second is the notification of such action. If the staff takes over the responsibility for the submittal of data for the delinquent entity, the data to be submitted should always be the ***best data available*** in the judgment of the person submitting the data. The data should be submitted in such a way that the original schedule is maintained or not further impaired.

When WECC staff takes over data submittal responsibility for a PC:

1. WECC staff will notify the Data Submitter and copy the notification of the action taken to:
    a. RAC representatives of the PC; and
    b. SRS.
2. When the case involved is an operating case, the staff will send a notification letter to:
    a. The Reliability Risk Committee (RRC).

The notification will consist of the nature and extent of the action taken, and reasons. Those who consistently abuse the base-case development process by submitting late or unusable data may be significantly compromising the reliability of the Western Interconnection transmission system.

Backfitting of Late Data

The Late Data Procedure allows for the WECC staff to take over data submittal responsibilities for a PC if entity is unable to submit usable data in accordance with the defined schedule. If the PC's data should subsequently become available, the data must be submitted to the WECC staff to partially or fully replace that which was previously submitted. However, the staff may refuse to accept this backfit data if, in its judgment, the backfit data is no better than the data already in the case or if there would be unacceptable impairment of the schedule by accepting the backfit data.

Modifications to Approved Base Cases

After WECC staff has approved a base case, there may be a need to make changes to that case, or a group of approved cases. These changes can be submitted to WECC staff and posted on the Base Case Modifications page. The PC is responsible for data validation and is responsible that the submitted data does not impede the accuracy of the case solution. WECC groups and members that actively use approved cases are encouraged to coordinate case updates they identify via this process and to subscribe to the Base Case Modifications page to receive updates.

PCs are encouraged to have criteria for data changes that should be submitted to WECC, keeping in mind the need for case accuracy and the impact to other entities. Changes to tie-lines between adjoining utilities should be coordinated.

Suggested Criteria:

BES facilities that *should* be submitted to WECC for inclusion in its list of Base Case Modifications:

1. Missing or duplicate lines or transformers.

2. Impedance errors that would impact a major path.
3. Ratings errors that would impact a major path.
4. Missing or duplicate loads that would impact a major path.
5. Missing or duplicated generation resources that would impact a major path.
6. Significant load or generation profile changes that would impact a neighboring area.
7. Any other changes that would have an impact on a neighboring area or utility.

Appendix 2—Area, Zone, and Bus Number Assignments

Southwest Region

Area Number Range	10–19, 82
Zone Number Range	100–199 820–859 1000–1999 8200–8299
Bus Number Range	10,000–17,999 19,000–19,999 82,000–82,999 84,000–85,999 100,000–180,000 190,000–199,999 823,000–823,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
10	100–109 1000–1099	New Mexico	PNM	10,000–10,999 100,000–109,999
	120–139 1200–1399	New Mexico	TSGT	12,000–12,999 120,000–129,999
			LAC, NAPI, TNP	13,000–13,999 130,000–139,999
11	110–119 1100–1199	El Paso	EPE	11,000–11,999 110,000–119,999
14	140–149 840–859 1400–1499	Arizona	APS	14,000–14,999 84,000–85,999 140,000–149,999
15	150–159 1500–1599	SRP	SRP, APA	15,000–15,999 150,000–159,999
16	160–169 1600–1699	TEP	TEP, UES	16,000–16,999 160,000–169,999
17	170–179 1700–1799	AEPCO	AEPC, Others	17,000–17,999 170,000–179,999
18	180–188 1800–1889	Nevada	NEVP	18,000–18,899 180,000–188,999
19	190–199 1900–1999	WAPA–L.C.	WAPA–L.C.	19,000–19,999 190,000–199,999
82	820–829 8200–8299	SunZia	SZT	82,000–82,999 823,000–823,999

Southern California Region

Area Number Range	20–26
Unused Areas	27–29
Zone Number Range	200–299
	2000–2999
Bus Number Range	18,900–18,999
	20,000–29,999
	94,000–95,999
	200,000–299,999
	189,000–189,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
20	200–209	Mexico–CFE	CFE	20,000–20,999
	2000–2099			200,000–209,999
21	210–219	Imperial, CA	IID	21,000–21,999
	2100–2199			210,000–219,999
22	220–239	San Diego	SDGE	22,000–22,999
	2200–2399			220,000–229,999
			Others	23,000–23,999
				230,000–239,999
24	240–259	So Calif	SCE	24,000–24,999
	2400–2599			240,000–249,999
	890–899		VEA, GLW	18,900–18,999
				189,000–189,999
	940–959			94,000–95,999
	290–299			29,000–29,999
	2900–2999			290,000–299,999
			CDWR, MWD,	25,000–25,999
			Others	250,000–259,999
26	260–289	LADWP	LDWP	26,000–26,999
	2600–2899			260,000–269,999
			BURB, GLEN	27,000–27,999
				270,000–279,999
			Others	28,000–28,999
				280,000–289,999

Northern California Region

Area Number Range	30
Unused Areas	31–39
Zone Number Range	300–399 3000–3999
Bus Number Range	30,000–39,999 300,000–399,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
30	300–399 3000–3999	PG and E	PG&E	30,000–36,999 300,000–369,999
			SMUD	37,000–37,499 370,000–374,999
		WAPA	SNR	37,500–37,899 375,000–378,999
			REU	37,900–37,999 379,000–379,999
			NCPA	38,000–38,199 380,000–381,999
			MID	38,200–38,399 382,000–383,999
			TID	38,400–38,599 384,000–385,999
			CDWR	38,600–38,899 386,000–388,999
			Others	38,900–39,999 389,000–399,999

Northwest Region

Area Number Range	40
Unused Areas	41–49
Zone Number Range	400–499 4000–4999
Bus Number Range	40,000–49,999 90,000–90,999 400,000–499,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
40	400–499 4000–4999	Northwest	BPA, other Federal, WPPSS, Detailed Federal hydro	40,000–41,999 44,000–44,499 400,000–419,999 440,000–444,999
			PSE	42,000–42,999 420,000–429,999
			PGE	43,000–43,999 430,000–439,999
			PACW	44,500–45,599 445,000–455,999
			SNPD	45,600–45,999 456,000–459,999
			GCPD	46,000–46,199 460,000–461,999
			EWEB	46,200–46,399 462,000–463,999
			SCL	46,400–46,599 464,000–465,999
			TPWR	46,600–46,799 46,900–46,999 466,000–467,999 469,000–469,999
			CHPD	46,800–46,899 468,000–468,999
			Others—Public	47,000–47,499 470,000–474,999
			Others—Private or IOU	47,500–47,999 475,000–479,999
			AVA	48,000–49,999 480,000–499,999
			All members	90,000–90,999

Canadian Region

Area Number Range	50, 52, 54
Unused Areas	51, 53, 55–59
Zone Number Range	500–599 5000–5999
Bus Number Range	50,000–59,999 80,000–81,999 500,000–599,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
50	500–519 5000–5199	BC Hydro	BCHA	50,000–51,999 500,000–519,999 80,000–81,999
52	520–539 5200–5399	Fortis BC	FBC	52,000–53,999 520,000–539,999
54	540–599 5400–5999	Alberta	AESO	54,000–59,999 540,000–599,999

Central Region

Area Number Range	60, 62–65
Unused Areas	61, 66–69
Zone Number Range	600–699 6000–6999
Bus Number Range	60,000–69,999 600,000–699,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
60	600–619 6000–6199	Idaho	IPC	60,000–60,999 600,000–609,999
			BPA, Others	61,000–61,999 610,000–619,999
62	620–629 6200–6299	Montana	NWMT	62,000–62,999 620,000–629,999
63	630–639 6300–6399	WAPA UGP	WAUW	63,000–63,999 630,000–639,999
64	640–649 6400–6499	Sierra	SPP	64,000–64,999 640,000–649,999
65	650–699 6500–6999	Pace	PACE–UT, WY, ID	65,000–69,999 650,000–699,999

Eastern Region

Area Number Range	70, 73
Unused Areas	71, 72, 74–79
Zone Number Range	700–799
	7000–7999
Bus Number Range	70,000–79,999
	700,000–799,999

Area No.	Zone Range	Area Name	Member System	Member System Bus Range
70	700–719 770–789 7000–7199 7700–7899	PSColorado	PSC, WPE, TSGT	70,000–70,999 700,000–709,999 71,000–71,999 710,000–719,999 77,000–77,999 770,000–779,999
			PRPA	78,000–78,499 780,000–784,999
73	720–769 790–799 730–799 7300–7999	WAPA R.M.	TSGT	72,000–72,999 720,000–729,999
			WALM, CSU	73,000–73,999 730,000–739,999
			BHPL	74,000–74,999 740,000–749,999
			BEPC	76,000–76,999 760,000–769,999
			WAUC	79,000–79,999 790,000–799,999

Anchor Data Set Bus Number and Owner Assignment

Data associated with the ADS planning case will be labeled with the following bus number range and owner number to differentiate this data from other planning base case data. The bus number range and owner number must be reserved for ADS purposes only and not be populated by power flow data submitters.

Bus Number Range	810,000–873,999 882,000–882,999
Owner Number	899

Area No.	Area Name	ADS Owner Number	ADS Assignment Bus Number Range
10	New Mexico	899	810,000–810,999
11	El Paso	899	811,000–811,999
14	Arizona	899	814,000–814,999
15	SRP	899	815,000–815,999
16	TEP	899	816,000–816,999
17	AEPCO	899	817,000–817,999
18	Nevada	899	818,000–818,999
19	WAPA–L.C.	899	819,000–819,999
20	Mexico–CFE	899	820,000–820,999
21	Imperial, CA	899	821,000–821,999
22	San Diego	899	822,000–822,999
24	So Calif	899	824,000–824,999
26	LADWP	899	826,000–826,999
30	PG and E	899	830,000–839,999
40	Northwest	899	840,000–849,999
50	BC Hydro	899	850,000–851,999
52	Fortis BC	899	852,000–852,999
54	Alberta	899	854,000–859,999
60	Idaho	899	860,000–860,999
62	Montana	899	862,000–862,999
63	WAPA UGP	899	863,000–863,999
64	Sierra	899	864,000–864,999
65	PACE	899	865,000–865,999
70	PSColorado	899	870,000–870,999
73	WAPA R.M.	899	873,000–873,999
82	SunZia	899	882,000-882,999

Temporary Assignment

If requested, SRS will assign and maintain the assignment of bus and zone numbers through coordination with the PC or AC.

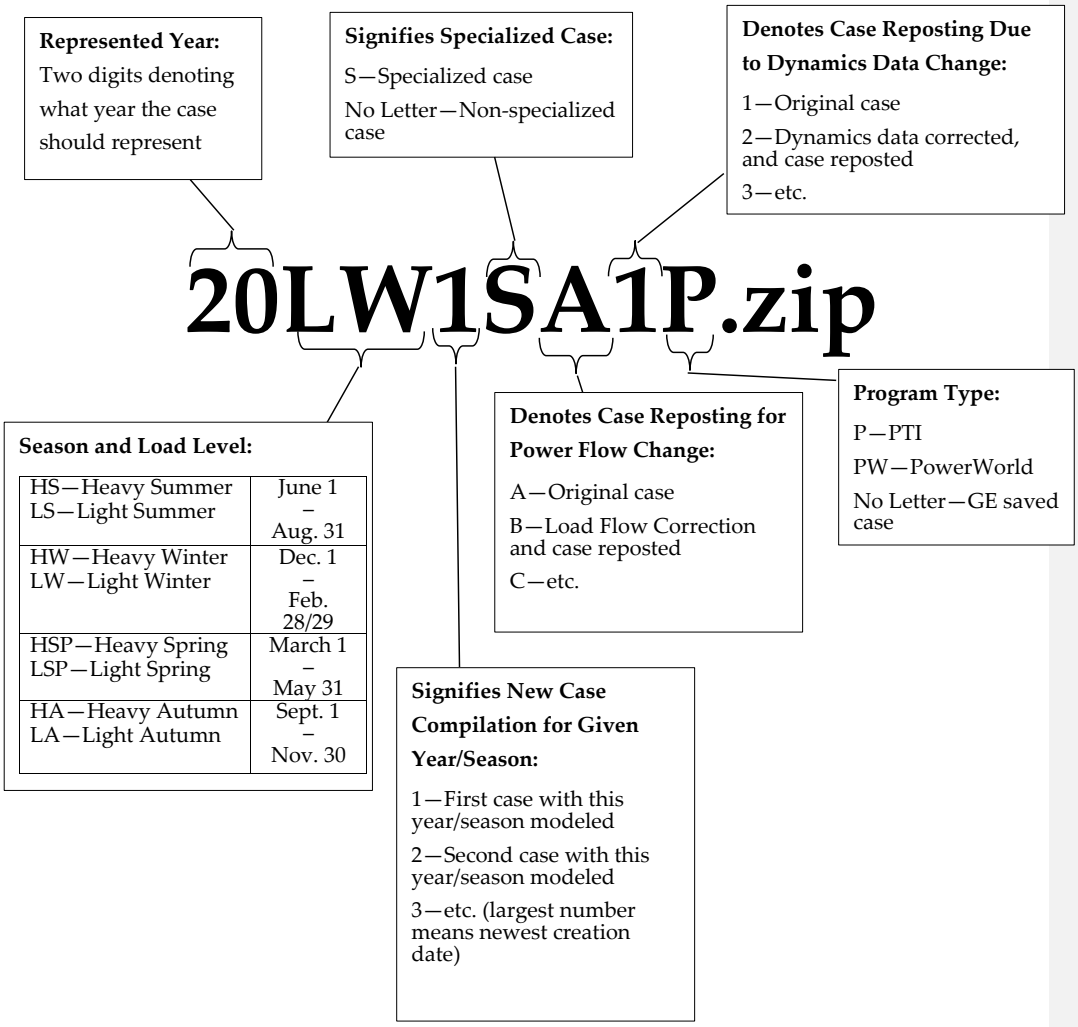
Area Number Range	Not Applicable	
Zone Number Range	8000–8199 8300–9000	
Bus Number Range	800,000–809,999 874,000–881,999 883,000–899,999	**Temporary Assignment**

Miscellaneous Assignment

Area Number Range	Not Applicable	
Zone Number Range	Not Applicable	
Bus Number Range	97,000–99,999 897,000–899,999 997,000–999,999	**Dummy Buses**
Bus Number Range	1–9,999	**Internal Use Buses**

Appendix 3—Base Case Naming Convention

In this document the designation of A, B, or C at the end of a case identified indicates revisions made to case data because of comments received during the review process or to create a case to represent a given scenario based on the base case. The numerical designation near the end of the case identifier is used to distinguish between different base cases, which were compiled for the same season with different load and generation patterns. A graphic illustrating this can be found below:



Appendix 4—Year-20 Data Development Guidance

Study cases are required beyond Year 15 and PCs should follow the modeling guidelines in this document to best of their ability, but WECC recognizes that there is a reduction in availability of quality data in this time frame. For requests beyond Year 15 PCs should follow the modeling recommendations below for data beyond Year 15. **Note that submitted data for these requests with in-service dates within the long-term planning time frame are not exempt from standard modeling requirements.**

Generation

1. Dynamics models are not required for any units.
2. Generator step-up transformers are not required. Connections can be made directly to the BES bus.
3. Wind and photovoltaic plant models are not required. Connections can be made directly to the BES bus.
4. Recommend identification of the less certain also known as Tier 3 resources by using the ID of X with a number for example X1.
5. Resource data that cross Data Maintainer areas must be coordinated with the other areas to ensure appropriate accounting, aligning with your organizations Loads and Resources data submittal.

Loads

1. Industrial loads and embedded generation not consistent with the R-DER modeling section do not require a transformer model to be modeled on the low side bus.
2. When adding large specific loads such as data centers that are less certain identify the load ID as X with a number for example X1.

Dynamics Data

1. Dynamics models are not required.
2. Underfrequency load shedding models are not required.
3. Undervoltage load shedding records are not required.

Commented [ED1]: We would love feedback. The goal is to make the data development and solution as easy as possible. If this makes the solution more challenging we can include step up transformers.

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Revision History

Version	Version Date	Editor(s)	Revision Description
	June 26, 2012	Mark Mallard Gordon Comegys Doug Tucker	• Added Turbine Type field for Generators • Expanded bus number ranges for Areas • Added dynamic data submittal requirement to include all devices that could respond within 60 seconds if an approved model exists
	October 12, 2012	Doug Tucker Gordon Comegys Don Streebel	• Added language for sub-100-kV elements • Fixed minor changes in text
	July 18, 2014	Jonathan Young Doug Tucker	• Accommodate BES Definition • Reword UVLS sections • Added Short Circuit Data info • Added Contingency and Remedial Action Scheme Data • Bus number ranges slightly changed • Few member abbreviations changed • Fixed minor changes in text
BCCS	BCCS Version	Jonathan Young	• Incorporated BCCS methodologies
BCCS-4	December 12, 2014 (SRWG Approval)	Jonathan Young J. Ramey	• Added four-digit zone number ranges • WECC Technical Writer edits and formatting
BCCS-5	January 21, 2015	Jonathan Young John Gross	• Incorporated MOD-032-1 implementation plan concepts
BCCS-5.1	April 24, 2015	John Gross	• Incorporated PCC comments regarding MOD-032 implementation plan approach. PCC did not approve version BCCS-5.
6	August 12, 2015	Jonathan Young John Gross Andrew Christensen	• Incorporated TSS comments to remove direct references to modeling standards. • Removed references to BCCS and reinstated Master Tie-line File language.
7	August 9, 2016	Jonathan Young	• Substations • Added language for BAs

7	August 10, 2016	Nicholas Hatton	• Minor updates as directed by WECC technical writer
8	August, 2017	Sirisha Tanneeru	• Added four DPM change requests—Change WAPA L.C. from Area 14 to Area 19, Turbine Type, Transformer Type, Swing Criteria and Branch Type • Changed existing WECC group names to the new RAC groups • Removed Short-circuit data requirement section
9	November 11, 2017	Sirisha Tanneeru	• Implemented RAS and APS Zones DPM change requests
10	January 24, 2018	Sirisha Tanneeru	• Tech Writer edits
11	January 24, 2018	Sirisha Tanneeru	• Updated Appendix 2 so Area-Bus-Zone aligned • Added TSGT to Area 73 • Added Bus Low and High Voltage Limits • GWT added to zone 189/1899 • Added new Areas (15, 16, 17)
12	November 30, 2018	Lukas Boler	• Clarified Balancing Authority as Balancing Authority Area (BAA) • Added Data Maintainer field • Added turbine types 48 and 60
13	August 2019	Elena Melloni	• Updated template • Added turbine types 32 and 33 • PRPA and CSU area designation change • Added modifications to approved base cases section • Added DER modeling to generation, load, and definition section
14	April 2020	Yara Khalaf	• Updated VEA/GLW Area Distinction from Area 18 to 24
15	October 2020	Elena Melloni	• Updated Load Long ID to climate zone • Added facility rating based on most limiting element • Added Fuel Type to Generation table

			• Removed Turbine Type 60 (SVC) • Added GIC data to Data Requirements section • Updated "Data Submitter" to "Planning Coordinator" or "Area Coordinator" • Updated SDWG, DS and MVWG to SRS and MVS as appropriate
16	July 2021	Elena Melloni	• Added AC Line type • Added ADS Bus Number Assignment • Removed turbine type 20 (unknown wind) • Added Base Case Naming Convention (appendix 3) • Added Pmax for natural gas generators in seasonal cases • Added Business Practices reference
17	July 2022	Logan Affleck Chad Coleman	• Swapped spring and fall normal/emergency rating numbering in Connectors and Transformer Data • Removed references to contingency data from RAS Data • Removed references to "Section IV" and changed to "Steady-State Data Requirements section" • Added requirement not to include colons in bus names to Steady-State Data Requirements section • Removed Pmax ≤ Governor Max requirement from Table 2 Requirement D4 • Changed Generation Requirement 4 in Dynamic Data Requirements • All uses of "shall" replaced with "must" • "In accordance *to*" corrected to "in accordance *with*" • Use of apostrophe as quotation mark changed to double quotes throughout.
18	August 2023	Logan Affleck	• Added svd VRFMIN and VRFMAX range requirement • Added requirement to include Balancing Authority for fixed shunts

			• Added requirement for mechanically switched shunt reactors connected through a step-up transformer to be explicitly modeled • Added requirement for pseudo ties • Moved bus number designation for CSU from area 70 to area 73 • Added requirement for fixed shunts and controlled shunts on the same bus to not have the same ID • Added dagger symbols (†) to PSLF-exclusive data fields • All uses of "Mvar" replaced with "MVAr"
19	August 2024	Logan Affleck	• Updated references to PSS®E to include trademark symbol • Fixed seasonal definitions in appendix 3 to include all calendar dates • Changed references to Generating Unit Model Validation Policy to Generator Unit Model Validation Guideline • Removed reference to WECC Power System Stabilizer Policy • Added injection group language to Generation section • Removed sentence saying that GIC data could not be directly incorporate into software and should be maintained in external sheet • Updated reference to Operating Committee to say Reliability Risk Committee
20	February 2025	Logan Affleck	• Added area 82, SunZia, to Appendix 2