AS BUILT DOCUMENTATION CHECKLIST FOR GENERATOR INTERCONNECTIONS

Requirement:

Per Article 5 of the Large Generator Interconnection Agreement and Article 2 of the Small Generator Interconnection Agreement as well as stated in both the NERC and WECC standard the Interconnection Customer is required to provide as built data upon completion of their project.

Instructions:

Please complete one form for each generating unit. For wind farms, if all units are identical only one sheet must be submitted.
Please enter information as completely as possible.
If particular data elements are unknown, please state so.
If a particular section does not apply to your project please state so.
Please return the form(s) to the address or e-mail address below

PacifiCorp Transmission Services
825 NE Multnomah Street, Suite 1600
Portland, OR 97232

transmission.service@pacificorp.com

For questions and clarifications, please call: 503-813-6079

If you prefer to complete this form electronically, please request it by e-mailing transmission.service@pacificorp.com

I Generator Information

1. Generator Identification

Facility Information	Entry
Name of Plant	
Location of Plant	
Unit Identification	
Number of Units and Plant	
Type of Plant[1]	
Interconnection Voltage (kV)	

[1] Choose from: Steam Turbine, including nuclear, geothermal and solar steam; Combustion (Gas) Turbine; Internal Combustion (diesel, piston) Engine; Combined Cycle; Hydro; Pumped Storage; Photovoltaic; Wind Turbine; others.

General and Nameplate Information	Entry
Manufacturer	
Model Number	
Serial Number	
Date of Manufacture	
Rated Capacity (MVA)	
Terminal Voltage (volts)	
Speed (rpm)	
Frequency (Hz)	
Stator Amperes at Rated MVA (Amps)	
Field Voltage (volts)	
Inertia Constant, H (please specify units)	
Expected Average Generator Output (MVA)	

2. Generator Data (Manufacturer's Data Sheet Must be Provided)

2.1 Reactances (in per unit-kVA rated)

Item	**D-axis**	Included (√)	**Q-Axis**	Included (√)
Synchronous-saturated	X_{dv}		X_{qv}	
Synchronous-unsaturated	X_{di}		X_{qi}	
Transient-saturated	X'_{dv}		X'_{qv}	
Transient-unsaturated	X'_{di}		X'_{qi}	
Subtransient-saturated	X''_{dv}		X''_{qv}	
Subtransient-unsaturated	X''_{di}		X''_{qi}	
Negative Sequence-saturated	$X2_v$			
Negative Sequence-unsaturated	$X2_i$			
Zero Sequence-saturated	$X0_v$			
Zero Sequence-unsaturated	$X0_i$			
Leakage Resistance	X_{lm}			

2.2 Field Time Constants (seconds)
(Manufacturer's Data Sheet Must be Provided)

Item	**D-axis**	Included (√)	**Q-Axis**	Included (√)
Open Circuit	T''do		T'qo	
Three-Phase Short Circuit Transient	T'd3		T'q	
Line to Line Short Circuit Transient	T'd2			
Line to Neutral Short Circuit Transient	T'd1			
Short Circuit Subtransient	T''d		T''q	
Open Circuit Subtransient	T''do		T''qo	

2.3 Armature Data
(Manufacturer's Data Sheet Must be Provided)

Item	**Parameter**	Included (√)
Line to Neutral Short Circuit Time Constants (sec)	Ta_1	
Line to Line Short Circuit Time Constants (sec)	Ta_2	
Three Phase Short Circuit Time Constants (sec)	Ta_3	
Positive Sequence Armature Winding Resistance (per unit)	R_1	
Negative Sequence Armature Winding Resistance (per unit)	R_2	
Zero Sequence Armature Winding Resistance (per unit)	R_0	
Rotor Short Time Thermal Capacity	$I2_{2t}$	
Field Current at Rated kVA, Armature Voltage and PF (amps)	I_{fd} rated	
Field Current at Rated kVA, Armature Voltage and 0 PF (amps)	I_{fd} nominal	
Three Phase Armature Winding Capacitance (microfarad)	C_{rotor}	
Field Winding Resistance (per phase) at 100°C (ohms)	Rfd_2	

3. Generator Curves

Please attach the following curves, and check off below which curves are attached with your completed information request.

_____ Saturation Curve
_____ Voltage Response Curve (also known as V-curve)
_____ Reactive Capability Curve
_____ Capacity Temperature Correction curves. (Designate normal and emergency Hydrogen Pressure operating range for multiple curves.)

4. Excitation System Data

Provide an IEEE[2] model block diagram of the excitation system and the applicable data parameters. (Please refer to IEEE standard 421.5 on "recommended practice for excitation system models for power system stability studies" for additional information).

If the generator is equipped with a power system stabilizer ("PSS"), please attach a block diagram with applicable parameters for the PSS for computer representation in power system stability simulations.

5. Governor System Data

Provide an appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.

II Transformer Information
(Please Provide Final Manufacturer's Data Sheets)

1. Individual Transformers (for Wind Farms Only)

(More Entry Sheets are available if needed)

Rated Capacities (MVA)			
Percent Impedance on Transformers Own Base (%Z)			
Low Side Voltage:	Delta:	Wye:	Taps:
High Side Voltage:	Delta :	Wye:	Taps:
Per-unit Values on a 100 MVA Base			
Positive Sequence Resistance, R_1:		Reactance, X_1:	

2. Grounding Transformers

Rated Capacity (MVA)	
Percent Impedance on Transformers Own Base (%Z)	
Per-unit Values on a 100 MVA Base	
Positive Sequence Resistance, R_1:	Reactance, X_1:

[2] IEEE - Institute of Electrical and Electronics Engineers

3. Generator Step up Transformer to Transmission Voltage

Single-Phase ____ (Y/ N) Quantity: ____ Three-Phase ____ (Y/N) Quantity: ____			
Rated Capacities (MVA)			
Percent Impedance on Transformers Own Base (%Z)			
Low Side Voltage:	Wye:	Delta:	Taps:
High Side Voltage:	Delta:	Wye:	Taps:
Per-unit Values on a 100 MVA Base			
Positive Sequence Resistance, R_1:		Reactance, X_1:	
Zero Sequence Resistance, R_0:		Reactance, $X_{0:}$	

III Transmission Line Conductors

Please Provide Data for ALL Segments (more pages available if needed)

Line Addition / Modification Form

Line from:	To:

New Addition(Y/N)	Modification (Y/N):	Division(PP/RMP):	State:
kV Built:	KV Operated:	Line ID:	In Service Date:

	Segment 1	Segment 2	Segment 3	Segment 4
From:				
To:				
Pole Miles:				
Conductor Type:				
Bundle Count[1]:				
Summer AMPS[2]: (NORM/EMER)				
Winter AMPS[2]: (NORM/EMER)				
Bundle Spacing[1]:				
Stranding:				
SAG Chart:				
Shield Type:				
SAG Chart:				
2nd Shield Type[3]:				
SAG Chart[3]:				
Structure Type:				
Number Wood:				
Number Steel:				
Ruling Span:				
Parallel to Transmission Line: (use map code)				
Plan & Profile Drawing				

Per-unit Values on a 100 MVA Base	
Positive Sequence Resistance, R_1:	Reactance, X_1:
Zero Sequence Resistance, R_0:	Reactance, X_0:

Comments:

IV Collector Station Interconnection Cables

Please Provide Data for ALL Segments (more pages available if needed)

Line Addition / Modification Form

Line from:	To:

New Addition(Y/N)	Modification (Y/N):	Division(PP/RMP):	State:
kV Built:	KV Operated:	Line ID:	In Service Date:

	Segment 1	Segment 2	Segment 3	Segment 4
From:				
To:				
Miles:				
Conductor Type:				
Bundle Count[1]:				
Summer AMPS[2]: (NORM/EMER)				
Winter AMPS[2]: (NORM/EMER)				
Bundle Spacing[1]:				
Stranding:				

Per-unit Values on a 100 MVA Base	
Positive Sequence Resistance, R_1:	Reactance, X_1:
Zero Sequence Resistance, R_0:	Reactance, X_0:

Comments:

Collector Station Interconnection

Underground Cables Y___ N___ or Overhead Circuits Y___ N___ or BOTH _____	
Lengths (miles):	
Size:	
Type: Cu: AI:	
Insulator Type: EPR: XLP: Other (specify):	
Per-unit Values on a 100 MVA Base	
Positive Sequence Resistance, R_1:	Reactance, X_1:
Zero Sequence Resistance, R_0:	Reactance, X_0:

Line Pjt.Sponsor / Engr:	Date:

[1] If the conductor is bundled
[2] Enter an appropriate line MVA capacity rating based on the following:

* Transmission Line Rating Standard (TD-101) for new construction after 1997. Enter the Steady State (normal) AMPS as NORM and the Clearance Warning AMPS as EMER.
* Prior to 1997 consult Network Planning or Transmission Planning for the existing transmission line ratings. Note: Enter the legacy SPOL AMPS value as the Winter NORM AMPS – DO NOT enter the SPOL AMPS rating as the Summer EMER AMPS

[3] Complete fields if second shield wire is installed.

IV. Requirements for Customer Built Projects

Please see attached worksheet of actual cost information in PacifiCorp provided Work Breakdown Structure (WBS) and detailed cost types for asset accounting purposes.

V. Final Checklist

Documents Included

General Information	Included (√)
Copies of any and all test data	
Copies of the design data that was used in the creation of the generator model	
Schematic of Wind Generator Cable Network	
Customer Substation One Line Diagrams	
Transformer Test Reports	
Transformer Nameplate	
Generator Step up Transformer Nameplate (if separate from substation transformer)	
ASPEN model of new generation and transmission using data from this sheet (if customer has ASPEN software)	
Proposed Transmission Line Protection Settings Calculations (21P & 67N elements, timing, relay curves, etc.) that meet the NERC requirement for coordination between interconnection entities at Transmission voltages at or above 200 kV **(only needed if customer is owning and maintaining the line equipment).**	
If the customer is building the project the (WBS) worksheet for actual cost information	

VI. Contact Information

Please provide a contact person responsible for all Protection and Control of the wind farm and Interconnection Transmission Line:

Contact Person	
Position	
E-mail	
Phone Number	
Fax Number	
Address	

Please provide a contact person for any follow-up information requests:

Contact Person	
Position	
E-mail	
Phone Number	
Fax Number	
Address	