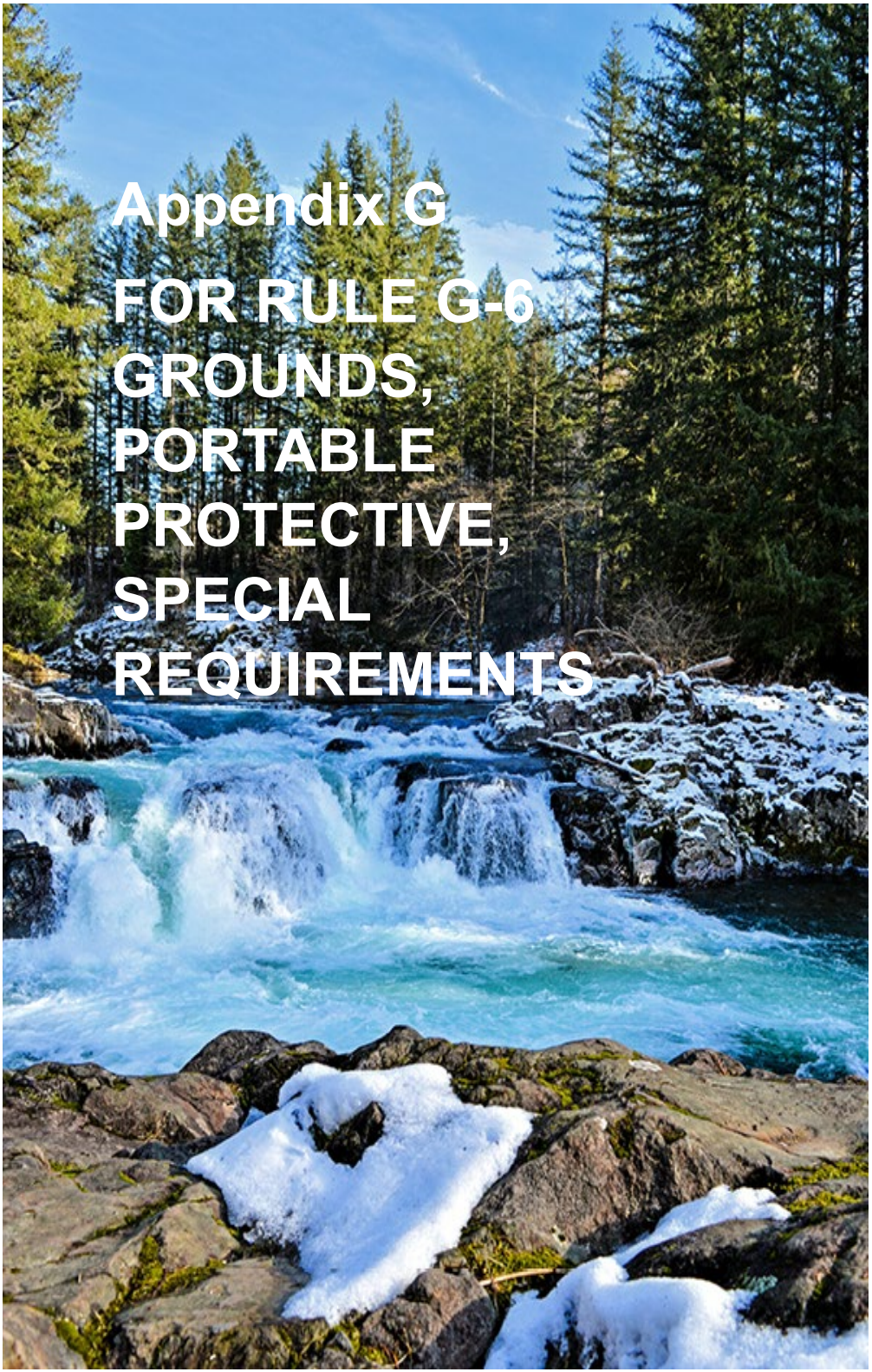
Appendix G
FOR RULE G-6
GROUNDS,
PORTABLE
PROTECTIVE,
SPECIAL
REQUIREMENTS

APPENDIX G.1 – SUBSTATIONS WHICH REQUIRE MULTIPLE 2/0 PROTECTIVE GROUNDS

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Aberdeen	13.2	3	Transformer #4, 13.2 kV Bus	2, 3, 5
	13.8	3	Transformer #5, 13.8 kV Bus	2, 3, 5
Albany	13.8	2	Transformer #1, 13.8 kV Bus	2, 3
Alcoa	34.5	2	Transformer #8, 34.5 kV Bus	2, 3, 5
	115	2	115 kV Bus	1
Allston	34.5	3	Transformer #1, 34.5 kV Bus	2, 3, 4, 5
	230	2	230 kV Bus	1
Alvey	13.2	4	Transformer #3, 13.2 kV Bus	2, 3, 4, 5
	34.5	2	Transformer #5, 34.5 kV Bus	2, 3, 4, 5
	115	2	115 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Ashe	500	2	500 kV Bus	1
Bell	13.8	2	Transformer #6, 13.8 kV Bus	2,3
	230	2	230 kV Bus	1
Bellingham	13.2	2	Transformer #2, 13.2 kV Bus	2, 3, 4, 5
Big Eddy	34.5	2	Transformer #2, 34.5 kV Bus	2, 3,4,5
	115	2	Transformer #1, 115 kV Bus	1
	115	2	Transformer #7, 115 kV Bus	1
	115	2	Transformer #8, 115 kV Bus	1
	115	2	115 kV Bus	1
	230	2	230 kV Bus	1
	500	2	500 kV Bus	1
Boardman	7.2	2	Transformer #1, 7.2 kV Bus	2, 3, 5
Boundary	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 5
Celilo	500	2	500 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Central Ferry	34.5	2	Transformer #1, 34.5 kV Bus	3, 5
Chemawa	13.2	3	Transformer #2, 13.2 kV Bus	2, 3, 5
Chenoweth	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 5
Chief Joseph	13.2	2	Transformer #1, 13.2 kV Bus	3, 4, 5
	230	2	230 kV Bus	1
	345	2	Transformer #1, 345 kV Bus	1
	345	2	Transformer #2, 345 kV Bus	1
Columbia	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 4, 5
	13.8	2	Transformer #2, 13.8 kV Bus	2, 3, 4, 5
	115	2	Transformer #3, 115 kV Bus	1, 2, 3, 5
Conkelley	13.8	2	Transformer #4, 13.8 kV Bus	2, 5

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Covington	34.5	2	Transformer #4, 34.5 kV Bus	2, 3, 4, 5
	34.5	2	Transformer #5, 34.5 kV Bus	2, 3, 4, 5
	230	2	230 kV Bus	1
Custer	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 4, 5
	34.5	2	Transformer #2, 34.5 kV Bus	2, 3, 4, 5
	230	2	230 kV Bus	1
Fairview	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 4, 5
Franklin	13.2	4	Transformer #4, 13.2 kV Bus	2, 3, 5
Grand Coulee	11.95	2	11.95 Bus	2, 3
	230	3	230 kV Bus	1
	287	3	Transformer KX17A, 287 kV Bus	1
	500	2	500 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Hanford	500	2	500 kV Bus	1
Hatwai	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
Horse Heaven	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 5
Hot Springs	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 4, 5
Intalco	13.8	3	Transformer #1, 13.8 kV Bus	2, 4
	13.8	3	Transformer #2, 13.8 kV Bus	2, 4
	13.8	3	Transformer #3, 13.8 kV Bus	2, 4
	13.8	3	Transformer #4, 13.8 kV Bus	2, 4
	13.8	3	Transformer #5, 13.8 kV Bus	2, 4
	13.8	3	Transformer #6, 13.8 kV Bus	2, 4
	13.8	3	Transformer #7, 13.8 kV Bus	2, 4

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
John Day	34.5	2	Transformer #1, 34.5 kV Bus	2
	500	2	500 kV Bus	1
Keeler	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 4, 5
	20	4	Transformer #4-SVC, 20 kV Bus	2, 3
	115	2	Transformer #1, 115 kV Bus	1
	115	2	Transformer #3, 115 kV Bus	1
	115	2	115 kV Bus	1
	230	2	230 kV Bus	1
Lexington	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 5
Longview	13.8	3	Transformer #1, 13.8 kV Bus	2, 3, 5
	69	2	Transformer #1, 69 kV Bus	2, 3, 5
	115	2	115 kV Bus	1
	230	2	230 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Maple Valley	20	4	Transformer #3-SVC, 20 kV Bus	2, 3
	34.5	2	Transformer #2, 34.5 kV Bus	2, 3, 4, 5
	230	2	230 kV Bus	1
	345	2	Transformer #1, 345 kV Bus	1
McNary	115	2	115 kV Bus	1
	230	2	230 kV Bus	1
	345	2	Transformer #8, 345 kV Bus	1
Midway	13.8	3	Transformer #3, 13.8 kV Bus	2, 3, 4, 5
Monroe	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 4, 5
Murray	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 5

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Olympia	13.2	4	Transformer #1, 13.2 kV Bus	2, 3, 4, 5
	13.8	2	Transformer #2, 13.8 kV Bus	2, 3, 4, 5
	115	2	115 kV Bus	1
Ostrander	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
Paul D.	0.35	4	0.35 kV Bus	2, 3
Pearl	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
	230	2	230 kV Bus	1
Port Angeles	7.2	2	V212 Grounding Bank	2, 3
Raver	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
	230	2	Transformer #1, 230 kV Bus	1
Rock Creek	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
Rocky Reach	230	2	Transformer #1, 230 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Ross	115	2	115 kV Bus	1
Santiam	34.5	2	Transformer #4, 34.5 kV Bus	2, 3, 5
Schultz	500	2	500 kV Bus 1, 6	1, 6
Shelton	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 5
Sickler	230	2	Transformer #1, 230 kV Bus	1
Sifton	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 5
	13.8	2	Transformer #2, 13.8 kV Bus	2, 3, 5
Slatt	34.5	2	Transformer #1, 34.5 kV Bus	2, 3, 5
	500	2	500 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Sno-King	13.2	2	Transformer #1, 13.2 kV Bus	2, 3
	115	2	115 kV Bus	1
	230	2	230 kV Bus	1
Snohomish	13.2	2	Transformer #2, 13.2 kV Bus	2, 3, 4, 5
	13.2	2	Transformer #3, 13.2 kV Bus	2, 3, 4, 5
	115	2	115 kV Bus	1
	230	2	230 kV Bus	1
	345	2	Transformer #5, 345 kV Bus	1
	345	2	Transformer #6, 345 kV Bus	1
St. Johns	13.2	2	Transformer #1, 13.2 kV Bus	2, 3, 4, 5
Tacoma	34.5	2	Transformer #5, 34.5 kV Bus	2, 3, 5
	230	2	230 kV Bus	1

Substation	kV	# of 2/0 Grounds	Terminal/Bus	Notes
Trentwood	6.9	2	Transformer #1, 6.9 kV Bus	2
	6.9	2	Transformer #2, 6.9 kV Bus	2
	6.9	2	Transformer #3, 6.9 kV Bus	2
Valhalla	13.8	2	Transformer #1, 13.8 kV Bus	2
	13.8	2	Transformer #2, 13.8 kV Bus	2
	115	2	115 kV Bus	1
Vantage	230	2	230 kV Bus	1
Wautoma	500	2	500 kV Bus	1
White Bluffs	13.8	2	Transformer #1, 13.8 kV Bus	2, 3, 5

NOTES:

1. Fifteen (15) cycle cable fusing time is used. If maximum fault current exceeds 56,000 amps, three 2/0 copper portable grounds are required. If maximum fault current exceeds 31,000 amps, two 2/0 copper portable grounds are required.
2. Thirty (30) cycle cable fusing time is used. If maximum fault current exceeds 62,000 amps, four 2/0 copper portable grounds are required. If maximum fault current exceeds 43,000 amps, three 2/0 copper portable grounds are required. If maximum fault current exceeds 23,700 amps, two 2/0 copper portable grounds are required.
3. If this transformer bank is de-energized and all of the windings are grounded according to the APM requirements and this transformer bus has no other possible sources of energization that require multiple grounds, for example another transformer tertiary, then only one 2/0 ground cable per phase is required on this bus.
4. Only a single set of portable protective ground cables is required on the load side of air core reactors which are used for station service to limit fault magnitudes. The reactors limit the fault current to below the 23,700 ampere 30 cycle fusing rating of a portable protective ground cable. This shall be verified by the System Protection and Control District Engineer every three years when this Standard is upgraded.

NOTES (cont.)**:**

5. This tertiary bus is an ungrounded delta. A single set of 2/0 copper portable protective ground cables is required for any one of the following conditions:
    - Work is performed on the load side of current limiting fuses which limits the available fault current to less than the 2/0 copper fusing ampacity rating.
    - Work is performed on the load side of a switch whose line side is a section of conductor equal to or smaller than 1/0 copper, which has 80% of the 2/0 copper rating.
    - If a permanently installed three-phase ground switch is available, use the ground switch instead of using multiple sets of portable grounds.
6. The grounding requirements for a series capacitor installation are the same as those for the substation bus when the capacitors are located at the substation. For series capacitors in mid line, the grounding requirements are the same as for the transmission line section at the location of the series capacitors.

G.2 Transmission Lines which require multiple 2/0 Protective Grounds

The following Transmission Lines require two or more 2/0 copper portable protective grounds from the listed substation to the listed structure or from the listed structure to the listed structure. Line sections beyond that point do not require multiple grounds.

These grounding requirements apply to all lines terminating at the listed substations and operating voltages, including lines owned and operated by foreign utilities.

Fifteen (15) cycle fusing time is used. Three 2/0 copper portable grounds are required if the maximum fault current exceeds 56,000 amps. Two 2/0 copper portable grounds are required if the maximum fault current exceeds 31,000 amps.

Appendix G.2 – Transmission Lines Which Require Multiple 2/0 Protective Grounds

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Alcoa						
	115	Alcoa - Felida 1	2	Alcoa	Str 2/1	
	115	Alcoa - River Road 1	2	Alcoa	Entire Line	
	115	Bonneville PH - Alcoa 1 & 2	2	Alcoa	Str 40/7	
	115	Ross - Alcoa 2	2	Alcoa	Str 4/2	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Allston						
	230	Allston - Clatsop 1	2	Allston	Str 2/9	
	230	Allston - Driscoll 1	2	Allston	Str 3/1	
	230	Longview - Allston 1	2	Allston	Str 3/1	
	230	Longview - Allston 2	2	Allston	Str 3/1	
	230	Longview - Allston 3	2	Allston	Str 3/1	
	230	Trojan - Allston 1	2	Allston	Str 8/4	
	230	Trojan - Allston 2	2	Allston	Str 8/4	
Alvey						
	115	Eugene - Alvey 2	2	Alvey	Str 12/6	
	115	Hawkins - Alvey 1	2	Alvey	Str 7/6	
	115	Lookout Point - Alvey 1	2	Alvey	Str 15/9	
	115	Lookout Point - Alvey 2	2	Alvey	Str 15/11	
	115	Capacitor Tie 1	2	Alvey	Entire Line	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Ashe						
	500	Ashe - Hanford 1	2	Ashe	Str 2/2	
	500	Ashe - Marion 2	2	Ashe	Str 1/6	
	500	Ashe - Slatt 1	2	Ashe	Str 1/6	
	500	Lower Monumental - Ashe 1	2	Ashe	Str 39/5	
	500	CGS - Ashe 1	2	Ashe	Entire Line	
Bell						
	230	Bell - Boundary 3	2	Bell	Str 2/5	
	230	Bell - Lancaster 1	2	Bell	Str 2/3	
	230	Bell - Usk 1	2	Bell	Str 2/2	
	230	Grand Coulee - Bell 3	2	Bell	Str 84/1	
	230	Grand Coulee - Bell 5	2	Bell	Str 84/1	
	230	Sacheen -Bell 1	2	Bell	Str 33/1	
	230	Westside - Bell 1	2	Bell	Str 10/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Big Eddy						
	115	The Dalles PH - Big Eddy #1	2	Big Eddy	Entire Line	
	115	The Dalles PH - Big Eddy #2	2	Big Eddy	Entire Line	
	115	Big Eddy - DeMoss 1	2	Big Eddy	Str 2/1	
	115	Big Eddy - Transformer 1, Tie 1	2	Big Eddy	Entire Line	
	230	Big Eddy - Quenette Creek 1	2	Big Eddy	Str 2/2	
	230	Big Eddy - Quenette Creek 2	2	Big Eddy	Str 3/5	
	230	Big Eddy - Chemawa 1	2	Big Eddy	Str 2/4	
	230	Big Eddy - McLoughlin 1 (PGE)	2	Big Eddy	Str 2/4	
	230	Big Eddy – Spring Creek	2	Big Eddy	Str 3/2	
	230	Big Eddy – Maupin 1	2	Big Eddy	Str 3/5	7
	230	Big Eddy – Troutdale 1	2	Big Eddy	Str 2/4	
	230	Harvalum - Big Eddy 1	2	Big Eddy	Str 22/5	
	230	The Dalles PH - Big Eddy 3	2	Big Eddy	Entire Line	
	230	The Dalles PH - Big Eddy 4	2	Big Eddy	Entire Line	
	230	The Dalles PH - Big Eddy 5	2	Big Eddy	Entire Line	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Big Eddy (cont.)						
	230	The Dalles PH - Big Eddy 6	2	Big Eddy	Entire Line	
	500	Big Eddy - Celilo 1	2	Big Eddy	Entire Line	
	500	Big Eddy - Celilo 2	2	Big Eddy	Entire Line	
	500	Big Eddy - Transformer 2, Tie 1	2	Big Eddy	Entire Line	
	500	Big Eddy - Transformer 5, Tie 2	2	Big Eddy	Entire Line	
	500	Big Eddy - Ostrander 1	2	Big Eddy	Str 2/4	
	500	Big Eddy - Knight 1	2	Big Eddy	Str 3/1	
	500	John Day - Big Eddy 1	2	Big Eddy	Str 17/5	
	500	John Day - Big Eddy 2	2	Big Eddy	Str 17/5	
Celilo						
	500	Big Eddy - Celilo 1	2	Celilo	Entire Line	
	500	Big Eddy - Celilo 2	2	Celilo	Entire Line	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Chief Joseph (Joe)						
	230	Chief Joe PH - Chief Joe 1	2	Chief Joe	Entire Line	
	230	Chief Joe PH - Chief Joe 2	2	Chief Joe	Entire Line	
	230	Chief Joe PH - Chief Joe 3	2	Chief Joe	Entire Line	
	230	Chief Joe PH - Chief Joe 4	2	Chief Joe	Entire Line	
	230	Chief Joe - East Omak 1	2	Chief Joe	Str 3/2	
	230	Grand Coulee - Chief Joe 1	2	Chief Joe	Str 31/8	
	230	Grand Coulee - Chief Joe 2	2	Chief Joe	Str 31/8	
	230	Chief Joe - Snohomish 3	2	Chief Joe	Str 3/3	
	230	Chief Joe - Snohomish 4	2	Chief Joe	Str 3/3	
	345	Chief Joe - Snohomish 3	2	Chief Joe	Str 3/3	
	345	Chief Joe - Snohomish 4	2	Chief Joe	Str 3/3	
Columbia						
	115	Columbia - Ellensburg 1	2	Columbia	Str 2/2	
	115	Columbia - Valhalla 1	2	Columbia	Str 2/1	
	115	Columbia - Valhalla 2	2	Columbia	Str 2/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Covington						
	230	Covington - Bettas Rd	2	Covington	Str 4/1	
	230	Covington - Creston 1 (SCL)	2	Covington	Str 4/1	
	230	Covington - Duwamish 1 (SCL)	2	Covington	Str 4/1	
	230	Covington - Maple Valley 2	2	Covington	Str 4/1	
	230	Covington - White River 1&2 (PSE)	2	Covington	Str 4/1	
	230	Covington - Berrydale (PSE)	2	Covington	Entire Line	
	230	Chehalis - Covington 1	2	Covington	Str 67/2	
	230	Tacoma - Covington 2	2	Covington	Str 13/1	
	230	Tacoma - Covington 3	2	Covington	Str 13/1	
	230	Tacoma - Covington 4	2	Covington	Str 13/1	
	230	Raver - Covington 3	2	Covington	Str 6/6	
Custer						
	230	Bellingham - Custer 1	2	Custer	Str 12/3	
	230	Custer - Intalco 1	2	Custer	Str 1/6	
	230	Custer - Intalco 2	2	Custer	Str 1/6	
	230	Murray - Custer 1 (Murray-Custer/Sedro Tap 1)	2	Custer	Str 64/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Grand Coulee						
	230	Columbia - Grand Coulee 1	3	Grand Coulee	Str 73/2	
			2	Str 73/2	Str 71/2	
	230	Columbia - Grand Coulee 3	3	Grand Coulee	Str 73/4	
			2	Str 73/4	Str 71/2	
	230	Grand Coulee - Bell 3	3	Grand Coulee	Str 2/1	
			2	Str 2/1	Str 4/2	
	230	Grand Coulee - Bell 5	3	Grand Coulee	Str 2/1	
			2	Str 2/1	Str 4/2	
	230	Grand Coulee - Chief Joe 1	3	Grand Coulee	Str 2/1	
			2	Str 2/1	Str 4/4	
	230	Grand Coulee - Chief Joe 2	3	Grand Coulee	Str 2/1	
			2	Str 2/1	Str 4/5	
	230	Grand Coulee - Westside 1 (Avista)	3	Grand Coulee	Str 2/1	
			2	Str 2/1	Str 4/2	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Grand Coulee						
	230	Potholes - Grand Coulee 1	3	Grand Coulee	Str 66/3	
			2	Str 66/3	Str 64/6	
	230	Rocky Ford - Grand Coulee 1	3	Grand Coulee	Str 52/3	
			2	Str 52/3	Str 50/6	
	230	Olympia - Grand Coulee 1	3	Grand Coulee	Str 228/4	
			2	Str 228/4	Str 226/2	
	500	Grand Coulee -Grand Coulee PH #19	2	Grand Coulee	Entire Line	
	500	Grand Coulee -Grand Coulee PH #20	2	Grand Coulee	Entire Line	
	500	Grand Coulee -Grand Coulee PH #21	2	Grand Coulee	Entire Line	
	500	Grand Coulee -Grand Coulee PH #22	2	Grand Coulee	Entire Line	
	500	Grand Coulee -Grand Coulee PH #23	2	Grand Coulee	Entire Line	
	500	Grand Coulee -Grand Coulee PH #24	2	Grand Coulee	Entire Line	
	500	Grand Coulee - Grand Coulee 500/230kV Tie 1	2	Grand Coulee	Entire Line	
	500	Grand Coulee - Schultz 1	2	Grand Coulee	Str 6/4	
	500	Grand Coulee - Schultz 2	2	Grand Coulee	Str 6/4	
	500	Grand Coulee - Bell 6	2	Grand Coulee	Str 5/4	
	500	Grand Coulee - Chief Joe 3	2	Grand Coulee	Str 6/3	
	500	Grand Coulee - Hanford 1	2	Grand Coulee	Str 5/5	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Hanford						
	500	Ashe - Hanford 1	2	Hanford	Str 14/3	
	500	Grand Coulee - Hanford 1	2	Hanford	Str 93/3	
	500	Hanford - Wautoma 1	2	Hanford	Str 5/4	
	500	Hanford - Wautoma 2	2	Hanford	Str 5/4	
	500	Vantage - Hanford 1	2	Hanford	Str 21/2	
	500	Lower Monumental - Hanford 1	2	Hanford	Str 50/4	
John Day						
	500	John Day - Big Eddy 1	2	John Day	Str 8/1	
	500	John Day - Big Eddy 2	2	John Day	Str 8/1	
	500	John Day - Grizzly 1	2	John Day	Str 8/1	
	500	John Day - Grizzly 2	2	John Day	Str 8/1	
	500	John Day - Marion 1	2	John Day	Str 8/1	
	500	John Day PH - John Day 1	2	John Day	Entire Line	
	500	John Day PH - John Day 2	2	John Day	Entire Line	
	500	John Day PH - John Day 3	2	John Day	Entire Line	
	500	John Day PH - John Day 4	2	John Day	Entire Line	
	500	Rock Creek - John Day 1	2	John Day	Str 8/1	
	500	Slatt - John Day 1	2	John Day	Str 24/2	
	500	McNary - John Day 2	2	John Day	Str 71/4	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Keeler						
	115	Keeler - 230 kV Transformer 1	2	Keeler	Entire Line	
	115	Keeler - 230 kV Transformer 3	2	Keeler	Entire Line	
	115	Keeler - Oregon City 2	2	Keeler	Str 2/1	
	115	Keeler - Forest Grove 1	2	Keeler	Str 2/2	
	115	Keeler - Forest Grove 2	2	Keeler	Str 2/2	
	115	St. Johns - Keeler 2	2	Keeler	Str 9/7	
	230	Rivergate (PGE) - Keeler 1	2	Keeler	Str 8/3	
Longview						
	115	Longview - Allston 4	2	Longview	Str 2/1	
	115	Mint Farm - Longview 1	2	Longview	Entire Line	
	115	Longview - Washington Way 1	2	Longview	Entire Line	
	115	Lexington -Longview 1	2	Longview	Str 9/1	
	115	Longview Cowlitz	2	Longview	Str 2/1	
	230	Lexington - Longview 2	2	Longview	Str 8/6	
	230	Longview - Allston 1	2	Longview	Str 2/2	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Longview (cont.)						
	230	Longview - Allston 2	2	Longview	Str 2/2	
	230	Longview - Allston 3	2	Longview	Str 2/3	
	230	Longview - Chehalis 1	2	Longview	Str 2/1	
	230	Longview - Cowlitz (Chemical) PUD	2	Longview	Entire Line	
	230	Mint Farm - Longview 1	2	Longview	Entire Line	
Maple Valley						
	230	Covington - Maple Valley 2	2	Maple Valley	Str 15/1	
	230	Maple Valley - Duwamish 1 (SCL)	2	Maple Valley	Entire Line	
	230	Maple Valley - Massachusetts 1 (SCL)	2	Maple Valley	Entire Line	
	230	Sno King - Maple Valley 1 (SCL at Str 25/4)	2	Maple Valley	***	2
	230	Sno King - Maple Valley 2 (SCL at Str 25/3)	2	Maple Valley	***	3
	230	Rocky Reach - Maple Valley 1	2	Maple Valley	Str 127/1	
	345	Rocky Reach - Maple Valley 1	2	Maple Valley	Str 127/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
McNary						
	115	McNary - Badger Canyon 1	2	McNary	Str 1/12	
	115	McNary P.H. - McNary 6	2	McNary	Entire Line	
	230	McNary - 230/115 Tie Line 1	2	McNary	Entire Line	
	230	McNary - Franklin 2	2	McNary	Str 3/3	
	230	McNary - Horse Heaven 1	2	McNary	Str 3/1	
	230	McNary - Morrow Flat 1	2	McNary	Str 3/3	
	230	McNary - Morrow Flat 2	2	McNary	Str 3/4	
	230	McNary - Roundup 1	2	McNary	Str 3/8	
	230	McNary - Ross 1	2	McNary	Str 3/3	
	345	McNary - Ross 1	2	McNary	Str 3/3	
	230	McNary P.H. - McNary 1	2	McNary	Entire Line	
	230	McNary P.H. - McNary 2	2	McNary	Entire Line	
	230	McNary P.H. - McNary 3	2	McNary	Entire Line	
	230	McNary P.H. - McNary 4	2	McNary	Entire Line	
	230	McNary P.H. - McNary 5	2	McNary	Entire Line	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Olympia						
	115	Olympia - Shelton 1	2	Olympia	Str 2/2	
	115	Olympia - Shelton 2	2	Olympia	Str 2/3	
	115	Olympia - South Elma 1	2	Olympia	Str 2/2	
Pearl						
	230	Pearl - Sherwood 1 (PGE)	2	Pearl	Str 2/2	
	230	Pearl - Sherwood 2 (PGE)	2	Pearl	Str 2/2	
Raver						
	230	Raver - Covington 3	2	Raver	Str 3/1	
Rocky Rach (Chelan PUD)						
		Rocky Reach (Chelan PUD) - Columbia 1	2	Rocky Reach (Chelan PUD)	Str 3/1	
Rocky Reach						
	230	Rocky Reach - Maple Valley 1	2	Rocky Reach	Str 3/1	
	345	Rocky Reach - Maple Valley 1	2	Rocky Reach	Str 3/1	
Ross						
	115	Ross - Alcoa 2 (Ross - Alcoa 2 & 4)	2	Ross	Str 2/1	
	115	Ross - Carborundum 1 (Clark PUD)	2	Ross	Str 2/1	
	115	Ross - Vancouver Shipyard (Clark PUD)	2	Ross	Str 2/7	
	115	Sifton - Ross 1	2	Ross	Str 8/4	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Schultz						
	500	Grand Coulee - Schultz 1	2	Schultz	Str 93/6	
	500	Grand Coulee - Schultz 2	2	Schultz	Str 93/6	
	500	Schultz - Echo Lake 1	2	Schultz	Str 5/2	
	500	Schultz - Raver 1	2	Schultz	Str 5/2	
	500	Schultz - Raver 3	2	Schultz	Str 5/3	
	500	Schultz - Raver 4	2	Schultz	Str 5/3	
	500	Schultz - Wautoma 1	2	Schultz	Str 5/1	
	500	Sickler - Schultz 1	2	Schultz	Str 35/1	
	500	Vantage - Schultz 1	2	Schultz	Str 31/4	
Sickler						
	230	Sickler - Douglas Switchyard 1 (Chelan PUD)	2	Sickler	Entire Line	
Slatt						
	500	Slatt - John Day 1	2	Slatt	Str 2/1	
	500	Slatt - Buckley 1	2	Slatt	Str 2/1	
	500	Ashe - Slatt 1	2	Slatt	Str 73/1	
	500	Coyote Springs - Slatt 1	2	Slatt	Str 28/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Sno King						
	230	Sno King - Maple Valley 1 (SCL at Str 1/3)	2	Sno King	***	2
	230	Sno King - Maple Valley 2 (SCL at Str 1/11)	2	Sno King	***	3
	230	Bothel (SCL) - Sno King 1	2	Sno King	Entire Line	
	230	Bothel (SCL) - Sno King 2	2	Sno King	Entire Line	
Snohomish						
	115	Snohomish - Beverly Park 3 (Snohomish PUD)	2	Snohomish	Str 2/1	
	115	Snohomish - Beverly Park 4 (Snohomish PUD)	2	Snohomish	Str 2/1	
	115	Snohomish - Snohomish PUD 3 (Scott)	2	Snohomish	Str 2/1	
	115	Snohomish - Snohomish PUD 8 (Swamp Creek)	2	Snohomish	Str 2/1	
	115	Snohomish - Snohomish PUD 5	2	Snohomish	***	4
	115	Snohomish - Snohomish PUD 6	2	Snohomish	***	4
	230	North Mountain (SCL) - Snohomish 1	2	Snohomish	***	5

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Snohomish (cont.)						
	230	Monroe - Snohomish 1 (includes tap length to Horse Ranch (PSE))	2	Snohomish	Str 11/1	
	230	Monroe - Snohomish 2 (includes tap length to Horse Ranch (PSE))	2	Snohomish	Str 11/1	
	230	Snohomish - Beverly Park 3 (Snohomish PUD)	2	Snohomish	Str 3/1	
	230	Snohomish - Bothell 1 (SCL)	2	Snohomish	Str 3/5	
	230	Snohomish - Bothell 2 (SCL)	2	Snohomish	***	6
	230	Snohomish - Murray 1	2	Snohomish	Str 3/4	
	230	Chief Joseph - Snohomish 3	2	Snohomish	Str 131/1	
	230	Chief Joseph - Snohomish 4	2	Snohomish	Str 131/1	
	345	Chief Joseph - Snohomish 3	2	Snohomish	Str 131/1	
	345	Chief Joseph - Snohomish 4	2	Snohomish	Str 131/1	

Substation	kV	Line Name	# of 2/0 Grounds	From	To	Notes
Tacoma						
	230	Tacoma - Covington 2	2	Tacoma	Str 2/5	
	230	Tacoma - Covington 3	2	Tacoma	Str 2/4	
	230	Tacoma - Covington 4	2	Tacoma	Str 2/4	
Valhalla						
	115	Columbia - Valhalla 1	2	Valhalla	Str 5/1	
	115	Columbia - Valhalla 2	2	Valhalla	Str 5/1	
Vantage						
	230	Midway - Vantage 1	2	Vantage	Str 18/2	
	230	Vantage - Columbia 1	2	Vantage	Str 3/1	
	230	Vantage Bus Tie #1	2	Vantage	Entire Line	
	230	Vantage Bus Tie #2	2	Vantage	Entire Line	
Wautoma						
	500	Hanford - Wautoma 1	2	Wautoma	Str 18/4	
	500	Hanford - Wautoma 2	2	Wautoma	Str 18/4	
	500	Schultz - Wautoma 1	2	Wautoma	Str 61/2	
	500	Wautoma - Knight 1	2	Wautoma	Str 1/7	
	500	Wautoma - Rock Creek 1	2	Wautoma	Str 1/6	

Notes:

1. Distances from Big Eddy assume that the Current Limiting Reactors (CLRs) in the bus sectionalizing positions, are always in service now as part of normal operation. If a CLR is bypassed, the SPC District Engineer needs to be consulted to review the grounding requirements at the station or on connecting lines.
2. BPA line ownership of SNOK-MPVL-1: 0.51 miles, from SNOK terminal to Str 1/3, & 0.17 miles, from Str 25/3 to MPVL terminal. SCL owns majority of line. Contact SCL for tower info corresponding to 2 miles from MPVL.
3. BPA line ownership of SNOK-MPVL-2: 0.54 miles, from SNOK terminal to Str 1/12, & 0.19 miles, from Str 25/3 to MPVL terminal. SCL owns majority of line. Contact SCL for tower info corresponding to 2 miles from MPVL.
4. Line owned by Snohomish PUD. Contact SNPUD for tower info corresponding to 2 miles from SNOH.
5. BPA line ownership of NMTN-SNOH-1: 1.71 miles from Str 76/1 to SNOH terminal. Contact SCL for tower info corresponding to 2 miles from SNOH.
6. BPA line ownership of SNOH-BOTH-2: 1.56 miles from SNOH terminal to Str 2/4. Contact SCL for tower info corresponding to 2 miles from SNOH.
7. BPA 230.kV line BIGE-RDMD-1 is now BIGE-MAUP-1.