NorthernGrid

Enrolled Parties and States Committee

July 10, 2025

EPSC Agenda July 10, 2025

Review the Timeline for Rollout

Highlight opportunities for this group to engage

Technical Update

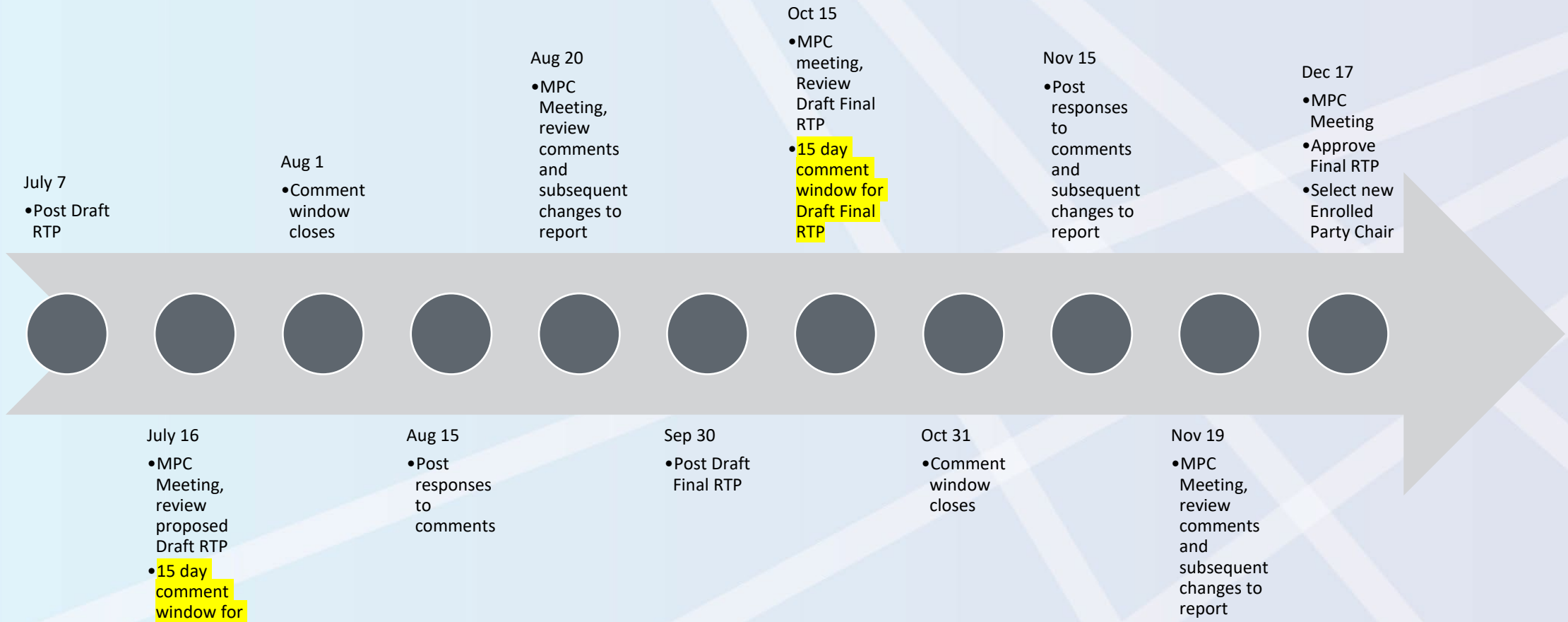
Base Case Process

Initial Results

Open Comment

NorthernGrid

2025 Schedule for rollout of RTP

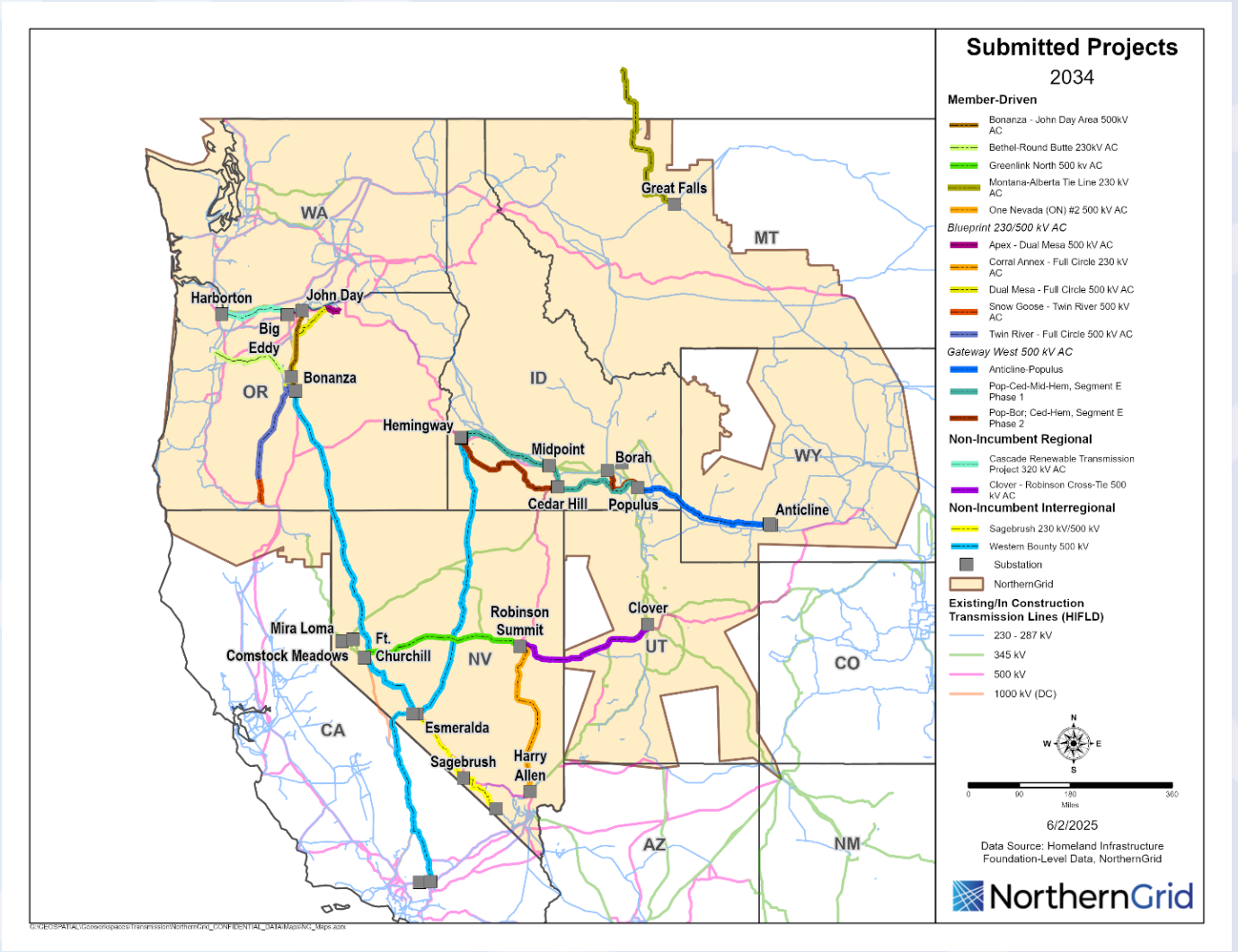


Study Scope Changes

- NG Study Scope 2024 2025 Draft V2.docx
- Summary of NorthernGrid Data Submittals for the 2034 future
  - Updated Load Projection
  - Removal of Greenlink West upon confirmation that it is Committed
- Loads Summary
  - Table1: NorthernGrid Loads updated
  - Description of load increase updated

Study Scope Changes

- Updated Graphic



Study Scope Changes

- Member-Driven Transmission Projects
  - Greenlink North description updated
- Base Case Conditions
  - Stressed hour selection updated
- Appendix B
  - Greenlink West removed
- Appendix C
  - Greenlink description updated

Base Case Process

Selection of Stressed Conditions

Creation of power flow from production cost modeling

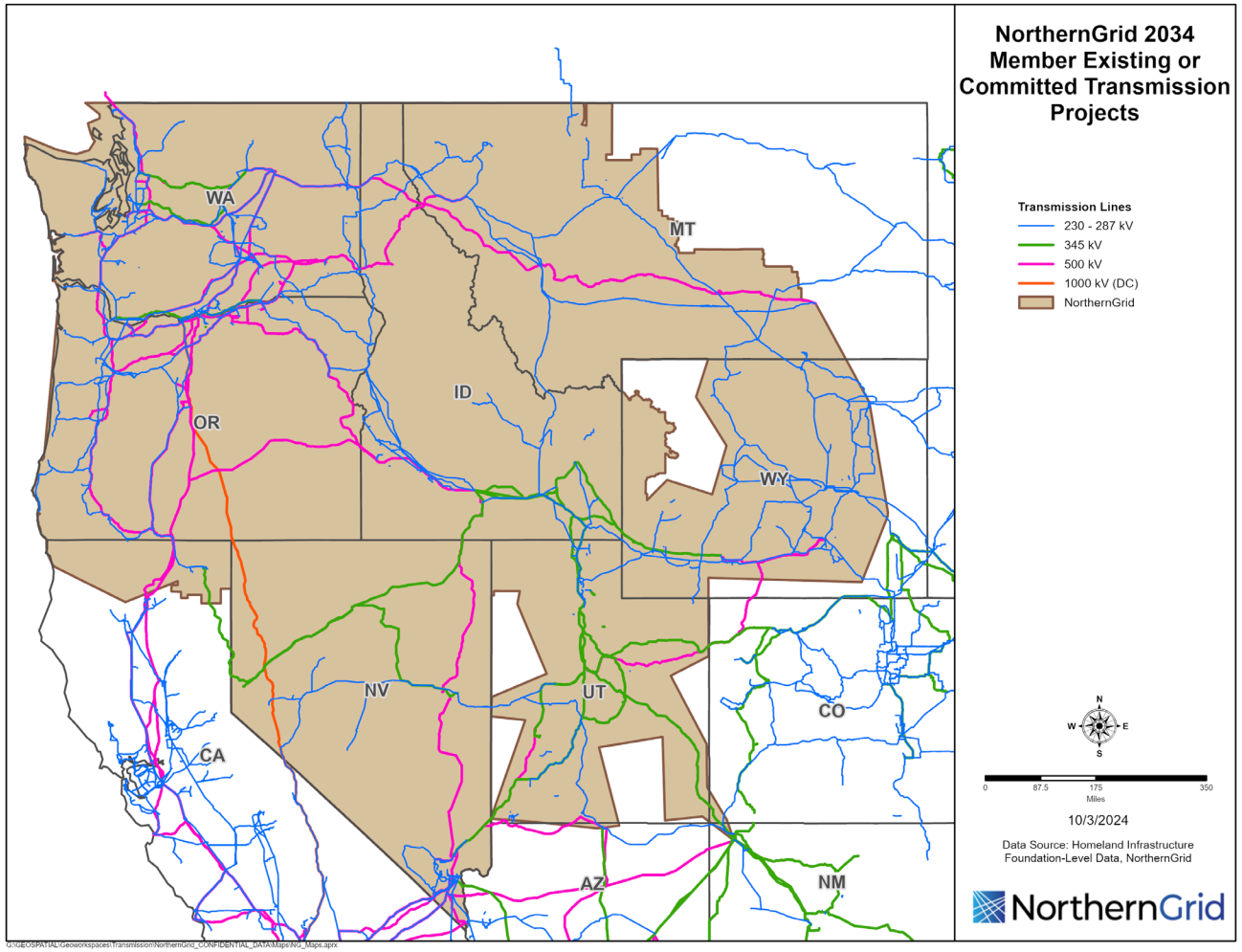
Incorporation of Regional Combinations

Running of Contingency Analysis

Initial Results

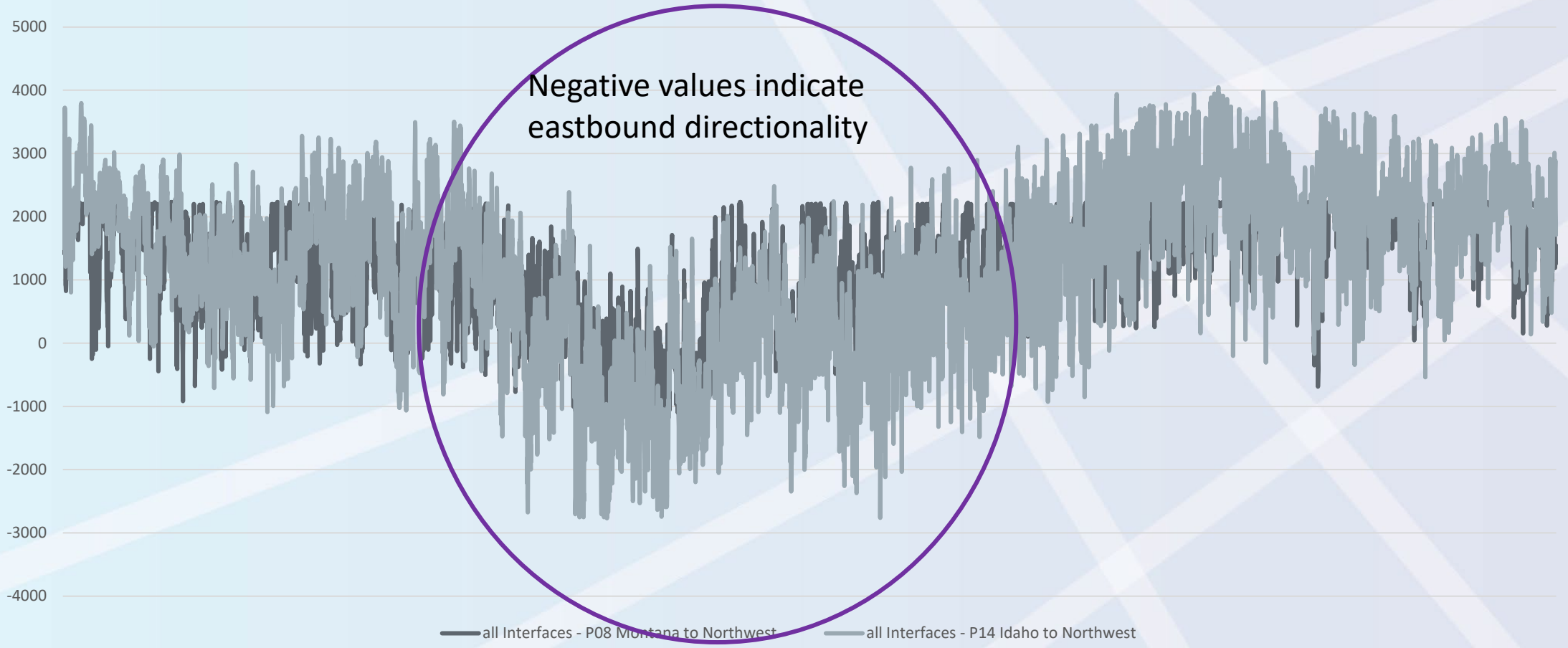
Stressed Conditions

- Heavy System Loading, Lower renewable output
- North to South, East to West
- Low Hydro/End of Summer
- East to West
- West to East
- South to North
- Summer Peak
- Winter Peak
- Westbound West of Cascades North



NorthernGrid

Example: West to East



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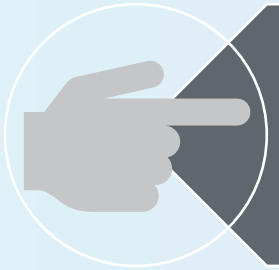
Creation of power flow from production cost modeling



Export the hour from Production Cost Model

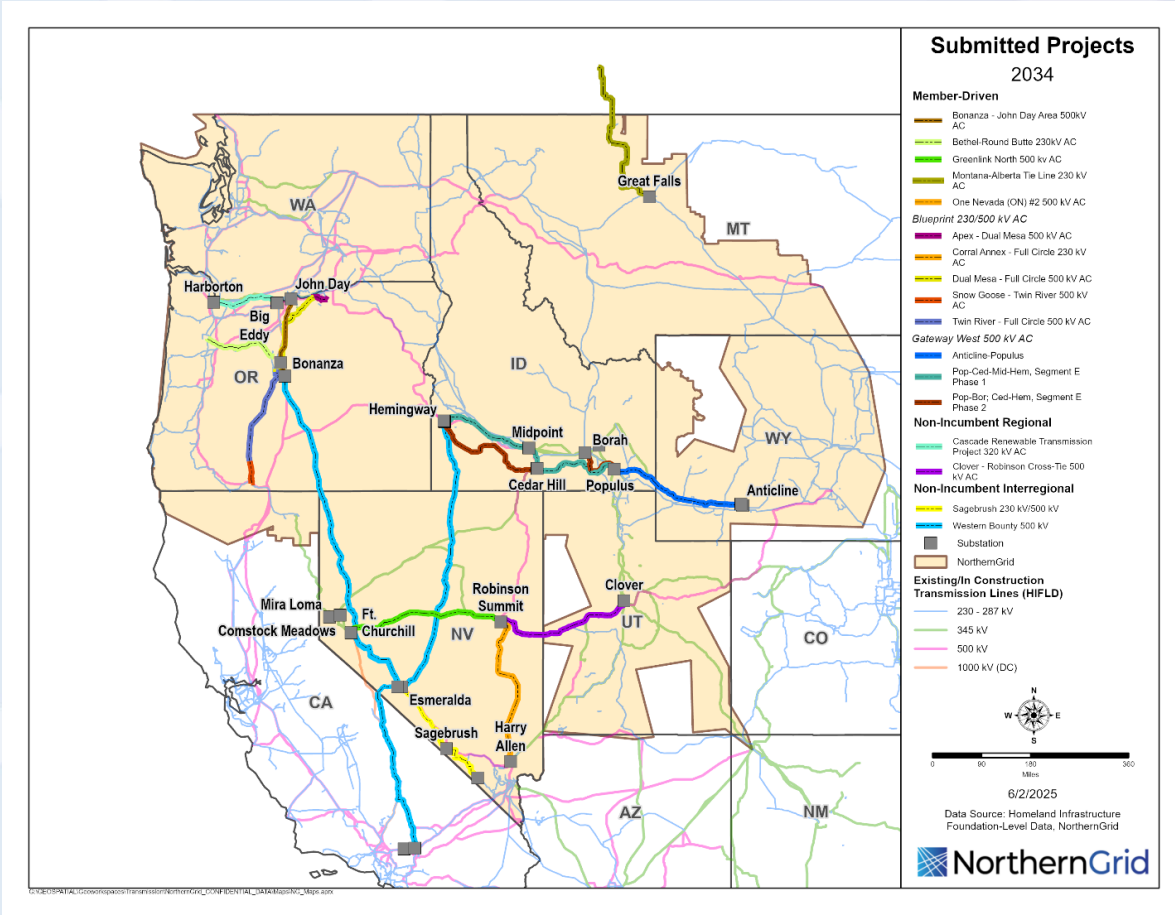
Run through transformation process

Fine Tune Power Flow

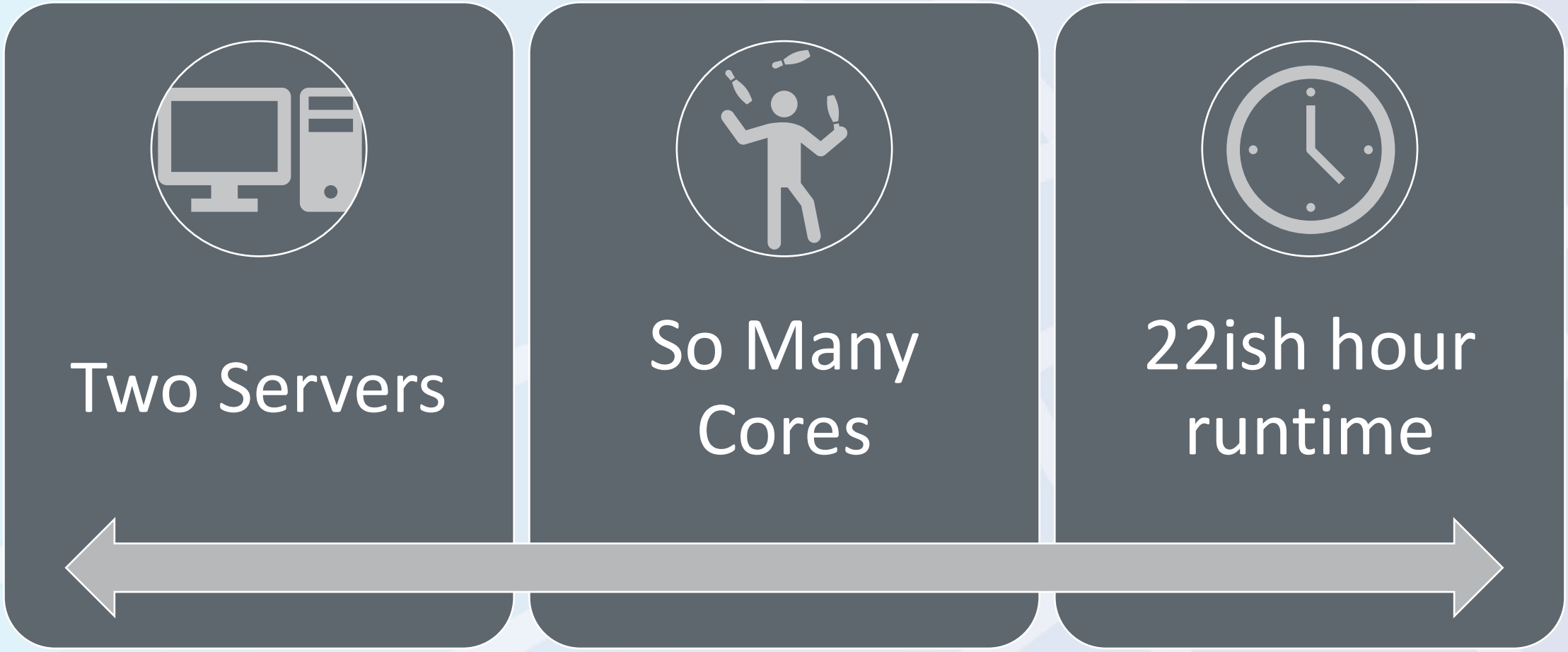
Incorporation of Regional Combinations

Regional Combination	All Greenlink Projects	MATL	One Nevada #2	Gateway West, Anticline-Populus	Gateway West, Populus-Cedar Hill-Midpoint-	Gateway West, Populus Borah, Cedar Hill-	Cascade Renewable Transmission System	Clover-Robinson-Cross Tie	Sagebrush	Western Bounty	Blueprint	Bonanza/John Day to Bonanza	Bethel Round Butte (Lambert Mountain View)
1													
2	x	x	x	x	x	x					x	x	x
3	x	x	x	x	x	x	x	x			x	x	x
4	x	x	x	x	x	x	x	x	x	x	x	x	x
5							x						
6								x					
7	x		x					x					
8	x		x					x	x	x			
9	x		x										
10	x												
11	x							x					
12				x	x								
13				x	x	x							
14				x									
15				x	x	x				x			
16	x		x	x	x	x							
17	x	x	x	x	x	x		x					
18	x	x	x	x	x	x	x						x
19								x					x
20	x	x	x	x	x	x					x		
21	x	x	x	x	x	x						x	
22	x	x	x	x	x	x							x

RC 4: “Bugatti Case” All Projects modeled as In-Service



Running of Contingency Analysis



Ranking

Voltage Level of Results, measured at higher kV side

From	To	Rank
0 kV	50 kV	0
50 kV	100 kV	0
100 kV	200 kV	0.5
200 kV	300 kV	1
300 kV	400 kV	1
400 kV	1000 kV	1

Type of Contingency

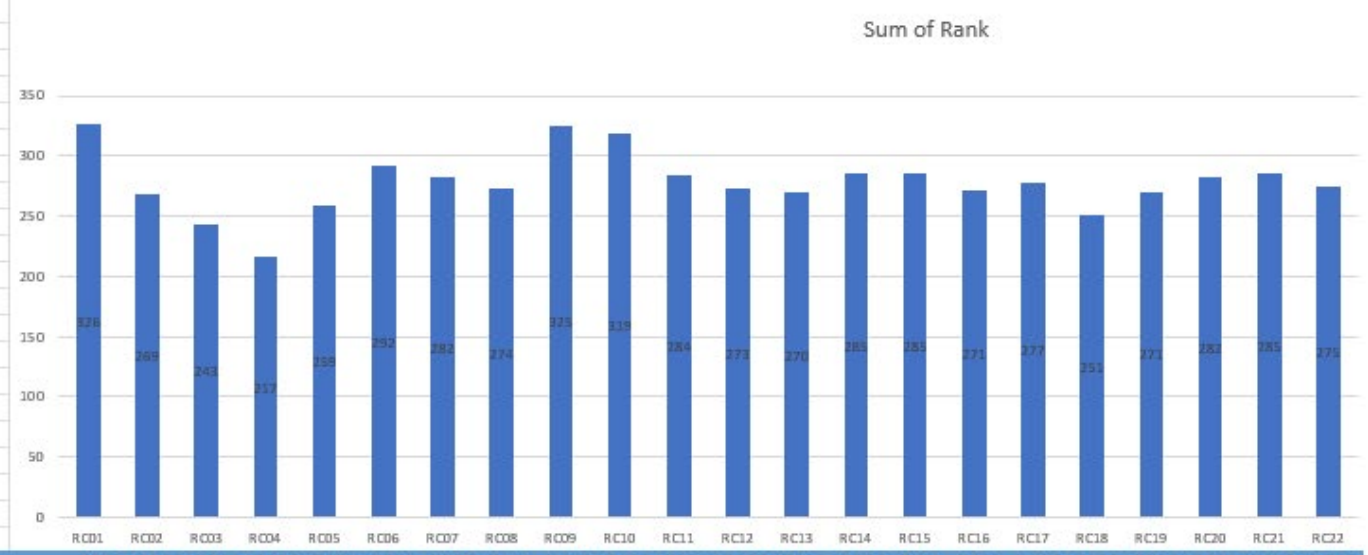
Category	Rank	Description
P0	1	All lines in service
P1	0.8	N-1
P2	0.5	Multiple outages
P4	0.3	Multiple outages
P5	0.3	Multiple outages
P7	0.8	Multiple outages
P3	0.1	N-1-1
P6	0.1	N-1-1
unknown	0.5	

Levels of impact

LV_Type	From	To	Rank	Description
Interface MW	0%	10%	0	Mild overload of path rating.
Interface MW	10%	9999999999999%	0	Heavy overload of path - potential stability problems.
Branch Amp	0%	15%	1	Mild overload of line.
Branch Amp	15%	9999999999999%	1.5	Heavy overload of line. Possibility of automated tripping.
Branch MVA	0%	15%	1	Mild overload.
Branch MVA	15%	9999999999999%	1.5	Heavy overload.
Unsolved	0%	9999999999999%	1	
Bus High Volts	0%	10%	1	
Bus High Volts	10%	9999999999999%	1.5	
Bus Low Volts	0%	10%	1	
Bus Low Volts	10%	9999999999999%	1.5	
Change Bus Low Volts	0%	10%	1	
Change Bus Low Volts	10%	9999999999999%	1.5	
Change Bus High Volts	0%	10%	1	
Change Bus High Volts	10%	9999999999999%	1.5	
WECC TPL CRT WR1.1.2	0%	9999999999999%	1	

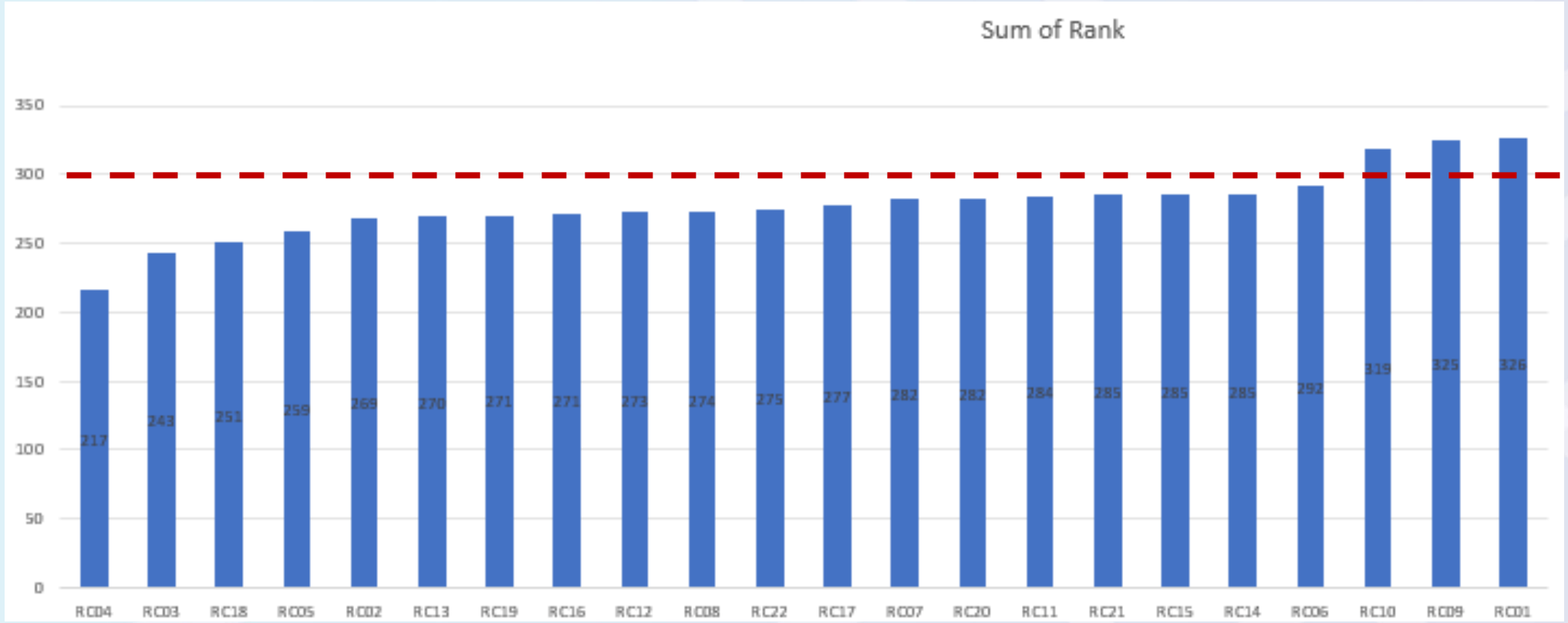
Ranking results for Thermal Overloads and Unsolved Contingencies, NorthernGrid footprint

**There are no unsolved contingencies



Regional Combination	RC01	RC02	RC03	RC04	RC05	RC06	RC07	RC08	RC09	RC10	RC11	RC12	RC13	RC14	RC15	RC16	RC17	RC18	RC19	RC20	RC21	RC22
Greenlink North		x	x	x			x	x	x	x	x					x	x	x	x	x	x	x
MATL		x	x	x													x	x		x	x	x
One Nevada #2		x	x	x			x	x	x							x	x	x		x	x	x
Gateway West, Anticline-Populus		x	x	x								x	x	x	x	x	x	x	x	x	x	x
Gateway West, Populus-Cedar Hill-Midpoint-Hemingway		x	x	x								x	x		x	x	x	x		x	x	x
Gateway West, Populus- Borah-Midpoint, Cedar Hill-Hemingway		x	x	x									x		x	x	x	x		x	x	x
Cascade Renewable Transmission System			x	x	x													x				
Clover-Robinson (Cross-Tie)			x	x		x	x	x			x						x		x			
Sagebrush (Interregional)				x				x														
Western Bounty (Interregional)				x				x							x							
Blueprint		x	x	x																x		
Bonanza/John Day to Bonanza		x	x	x																	x	
Bethel Round Butte (Lambert Mountain View)		x	x	x														x				x
Robinson Phase Shifter			x	x		x	x	x			x						x		x			
One Nevada #1 Series Comp			x	x		x	x	x			x						x		x			

Sorted NorthernGrid footprint Rankings



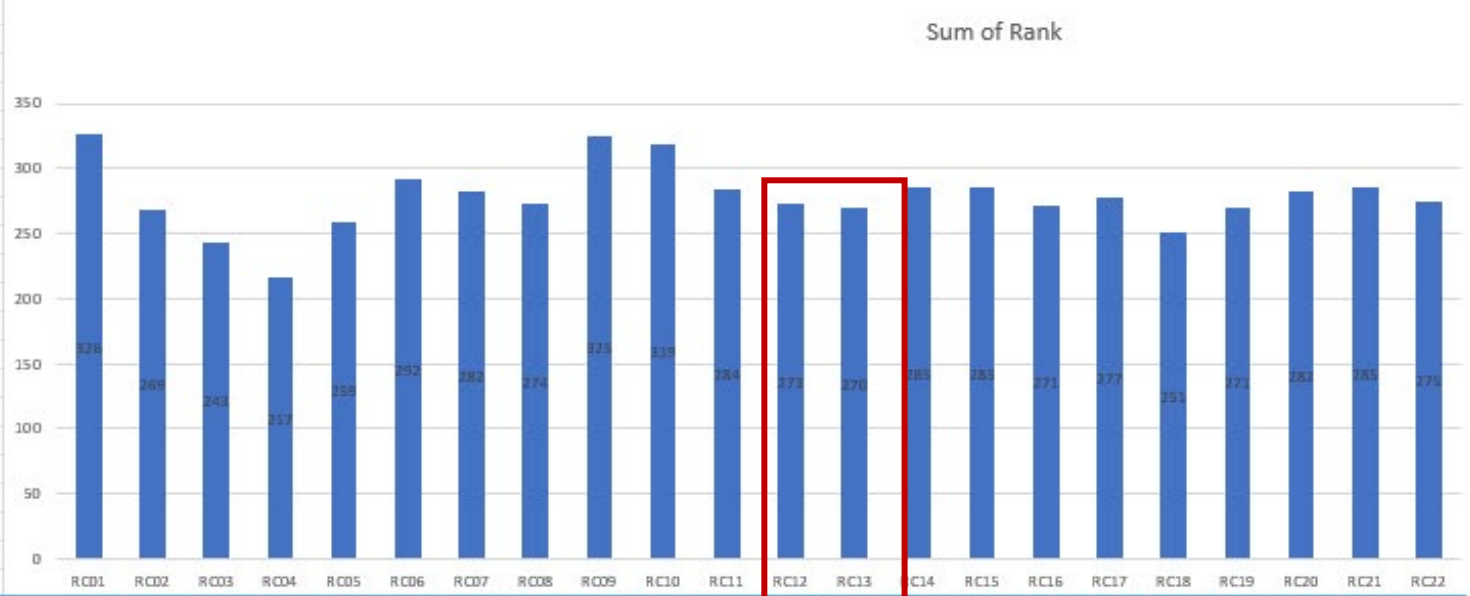
Count of Thermal overloads for 200+ kV equipment for NorthernGrid footprint

	Fal_EW	Spr_SN	Spr_WE	Sum_HLoad	Sum_LHydro	Sum_WOCN	Win_HLoad	Win_HLoad_LRen	Win_NS_EW
RC01	64	49	28	128	88	60	82	91	70
RC02	64	52	30	127	85	59	80	90	55
RC03	64	51	27	141	89	61	85	93	58
RC04	70	51	28	105	93	60	95	93	59
RC05	62	47	28	129	90	51	79	96	70
RC06	68	46	25	130	90	61	84	94	72
RC07	68	45	28	121	91	63	88	94	74
RC08	68	48	26	111	94	64	87	98	73
RC09	64	50	30	130	89	62	85	95	74
RC10	70	49	28	128	87	61	80	91	70
RC11	67	43	25	126	88	62	81	92	70
RC12	69	57	27	133	88	60	84	92	59
RC13	66	57	27	131	88	58	83	92	58
RC14	63	42	28	132	86	62	82	88	59
RC15	66	59	27	137	89	57	94	102	59
RC16	69	61	29	133	92	59	86	91	59
RC17	64	50	28	136	91	63	92	96	67
RC18	70	48	32	133	90	60	77	93	57
RC19	72	39	25	134	86	64	82	88	62
RC20	62	57	38	133	93	63	91	94	62
RC21	66	54	30	136	91	59	83	94	62
RC22	71	49	32	127	86	62	76	88	57

3 Case examples: Maximum contingency loading for NorthernGrid footprint

	Fal_EW		Spr_SN		Spr_WE	
	Count	Max	Count	Max	Count	Max
RC01	64	13.0%	49	21.7%	28	51.9%
RC02	64	12.8%	52	14.2%	30	51.8%
RC03	64	12.8%	51	14.5%	27	51.8%
RC04	70	12.8%	51	14.6%	28	51.8%
RC05	62	13.0%	47	21.8%	28	51.8%
RC06	68	13.0%	46	21.4%	25	51.9%
RC07	68	13.1%	45	22.3%	28	51.9%
RC08	68	13.5%	48	22.4%	26	51.9%
RC09	64	13.0%	50	22.4%	30	51.9%
RC10	70	13.7%	49	22.0%	28	51.9%
RC11	67	13.7%	43	21.7%	25	51.9%
RC12	69	13.7%	57	14.3%	27	51.9%
RC13	66	13.6%	57	13.8%	27	51.9%
RC14	63	13.0%	42	16.1%	28	51.9%
RC15	66	13.2%	59	13.9%	27	51.9%
RC16	69	13.6%	61	14.3%	29	51.9%
RC17	64	13.7%	50	14.0%	28	51.9%
RC18	70	12.8%	48	13.8%	32	51.8%
RC19	72	13.7%	39	16.3%	25	51.9%
RC20	62	12.8%	57	14.0%	38	51.9%
RC21	66	12.9%	54	13.9%	30	51.9%
RC22	71	12.8%	49	13.8%	32	51.8%

- The MATL project tended to benefit the Montana area and has negligible impact on the rest of the NorthernGrid footprint.
- Greenlink North, One Nevada #2, and the One Nevada #1 Series Comp project primarily benefited the Nevada portion of the NorthernGrid footprint.
- The CRTP primarily benefited the Portland area.
- The Cross-Tie project primarily resolves an N-2 contingency which was deemed to have minimal regional impact.
- The Bethel Round Butte project resolves local area issues.
- The Blueprint project resolves local area issues.
- The Bonanza project adds to the overall cost but does not commensurately contribute to the reduction of the overall ranking scores. The RCs with Bonanza also have in common both paths through Gateway, MATL, and the One Nevada #2 line.

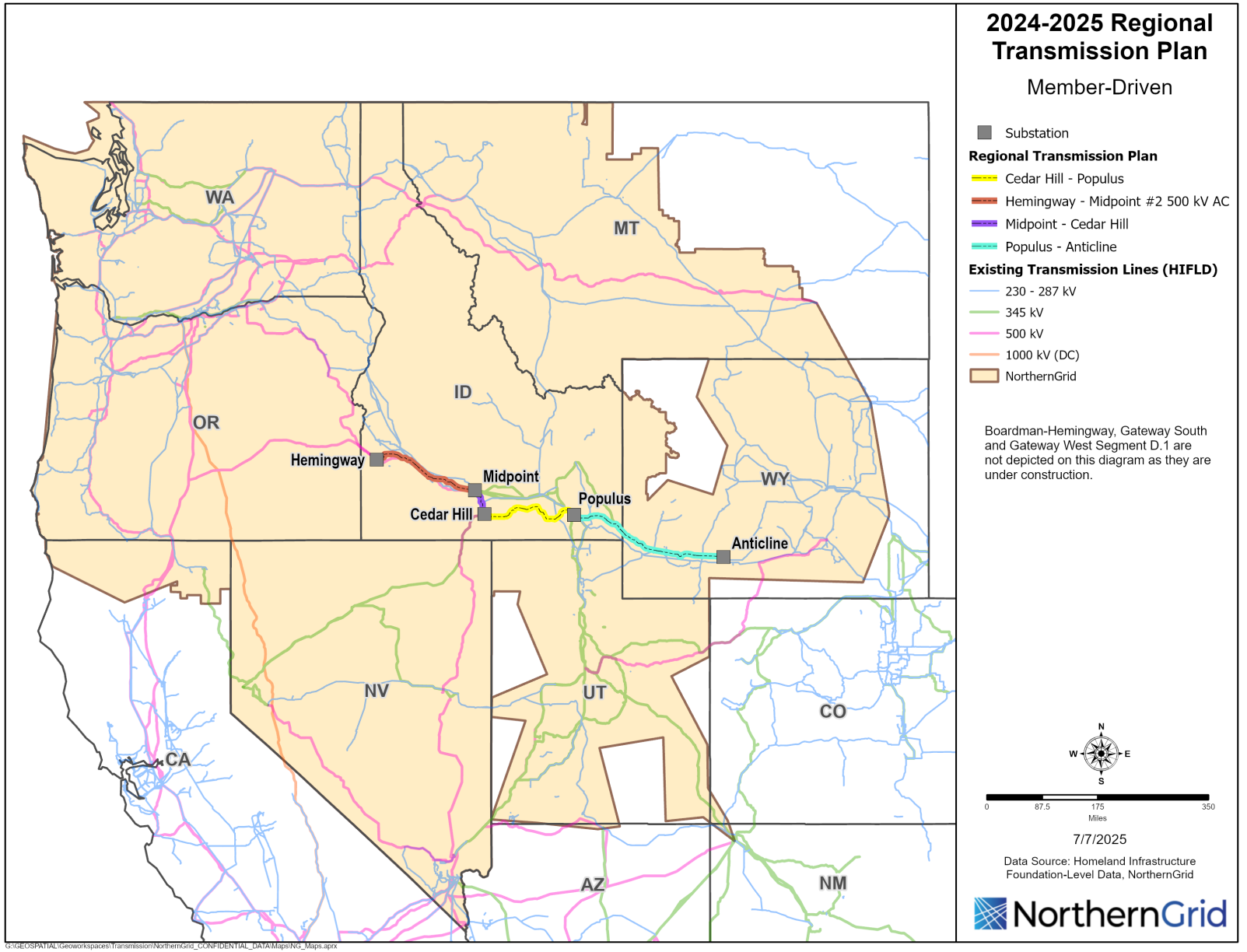


Regional Combination	RC01	RC02	RC03	RC04	RC05	RC06	RC07	RC08	RC09	RC10	RC11	RC12	RC13	RC14	RC15	RC16	RC17	RC18	RC19	RC20	RC21	RC22
Greenlink North		x	x	x			x	x	x	x	x					x	x	x	x	x	x	x
MATL		x	x	x													x	x		x	x	x
One Nevada #2		x	x	x			x	x	x							x	x	x		x	x	x
Gateway West, Anticline-Populus		x	x	x								x	x	x	x	x	x	x	x	x	x	x
Gateway West, Populus-Cedar Hill-Midpoint-Hemingway		x	x	x								x	x		x	x	x	x		x	x	x
Gateway West, Populus- Borah-Midpoint, Cedar Hill-Hemingway		x	x	x									x		x	x	x	x		x	x	x
Cascade Renewable Transmission System			x	x	x													x				
Clover-Robinson (Cross-Tie)			x	x		x	x	x			x						x		x			
Sagebrush (Interregional)				x				x														
Western Bounty (Interregional)				x				x							x							
Blueprint		x	x	x																x		
Bonanza/John Day to Bonanza		x	x	x																	x	
Bethel Round Butte (Lambert Mountain View)		x	x	x														x				x
Robinson Phase Shifter			x	x		x	x	x			x						x		x			
One Nevada #1 Series Comp			x	x		x	x	x			x						x		x			

NorthernGrid

	Fal_EW-RC12		Fal_EW-RC13		Spr_SN-RC12		Spr_SN-RC13		Sum_LHydro-RC12		Sum_LHydro-RC13	
	Count	Max	Count	Max	Count	Max	Count	Max	Count	Max	Count	Max
Branch MVA	7	13.0%	1	13.0%	7	84.1%	7	84.0%	9	71.8%	9	71.3%
Branch Amp												
P1					16	42.4%	16	40.6%	20	40.9%	20	40.5%
P2	7	40.0%	3	40.0%	8	31.1%	8	31.1%	3	20.6%	3	20.4%
P7									3	32.6%	3	32.7%
unknown	3	3.3%	3	3.3%	9	24.8%	10	25.1%	4	12.6%	4	12.9%

2024-2025 Draft RTP



NorthernGrid

Open Comment

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Thank you!!

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