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SIERRA CLUB EXHIBIT 11

Gateway West Comprehensive Progress Report

Gateway West

Comprehensive Progress Report

Submitted to

WECC

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Submitted by

Idaho Power Company

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1. Executive Summary

The WECC Phase 1 Rating Study was performed to establish new preliminary OTC ratings for the Gateway West Project from eastern Wyoming to south-west Idaho meeting the WECC Phase 1 guidelines and requirements. This project spans several hundred miles and parallel three WECC rated paths. Thus, this report summarizes the results for each of the five sections: Windstar – Aeolus, Aeolus – Jim Bridger, Jim Bridger – Populus, Populus – Midpoint and Midpoint – Hemingway. The studies demonstrate that the ratings of each of these WECC paths may be reliably increased with the construction of this project.

The project increases the ratings for the existing WECC paths to: TOT 4A – 3435 MW, Bridger West 5200 MW and Borah West 5557 MW. Two additional paths are created with this project: West of Aeolus at 2050 MW and Midpoint West at 5487.

The path transfer capabilities are limited due to NERC/WECC reliability performance requirements. The NERC/WECC "Reliability Criteria" is available at the following link:
http://www.wecc.biz/documents/library/procedures/CriteriaMaster.pdf

2. Introduction

2.1. Project Description

The Gateway West Transmission Project as jointly proposed by Idaho Power and PacifiCorp is a 500 kV and 230 kV transmission project from a new station, Windstar - near the Dave Johnston Generating Plant, to a new substation, Hemingway - in southwest Idaho. Idaho Power is leading the planning effort and managing the WECC rating process for the project.

Idaho Power and PacifiCorp are proposing this transmission project because of service area load growth internal to both companies. Idaho Power forecasts the need for 800 MW of additional power to serve its southern Idaho load by 2017 and PacifiCorp forecasts that its load on the Wasatch Front of Utah will double in the next 20 years. Additionally, both companies have independent obligations, pursuant to their Open Access Transmission Tariffs, to plan for and expand their respective transmission systems based upon the needs of their native load and network customers along with eligible customers that agree to expand the transmission system.

2.1.1. Plan of Service

The new transmission from the Windstar to Hemingway is proposed to consist of parallel 500 kV transmission lines, with interlacing 230 kV transmission facilities, between Windstar and Jim Bridger and parallel 500 kV transmission from Jim Bridger to Hemingway, as shown in Figure 1. The following new stations will be constructed: Windstar, Aeolus, Populus, Cedar Hill, and Hemingway. The purpose of each station follows:

Windstar - integrate new generation resources in the Powder River Basin of Wyoming

Aeolus - integrate new generation resources and connection with the Gateway South Project

Populus – Connection with Path C transmission

Cedar Hill – Connection of Idaho southern route to Midpoint for reliability

The transmission line construction will consist of the following:

2.1.1.1. Wyoming

Windstar – Aeolus Section - Two transmission corridors, one containing one-230 kV and one 500 kV lines (WECC minimum separation distance); and the other containing one-230 kV line.

Aeolus – Jim Bridger Section - One 230 kV transmission line will be constructed to serve projected load growth in southern Wyoming. Additionally, one or two 500 kV lines will be constructed based on resource and reliability considerations.

Jim Bridger – Populus Section - Construction of two new 500 kV circuits from Jim Bridger to Populus

2.1.1.2. Idaho

- Populus – Midpoint Section
- Construction of the Populus – Borah 500 kV and Borah – Midpoint 500 kV lines. These line sections will be built by conversion of the operating voltage of the existing Borah to Midpoint 345 kV line to 500 kV, and addition of a new 500 kV circuit between Populus and Borah
- Populus – Cedar Hill500 kV
- Construction of one new 500 kV circuit from Populus to Cedar Hill.
- Cedar Hill – Hemingway 500 kV
- Construction of one new 500 kV circuit from Cedar Hill to Hemmingway.
- Midpoint – Hemingway Section
- This section of the project will include two-500 kV circuits.
- Midpoint Hemingway 500 kV #1 will be developed by interconnecting the existing Midpoint – Summer Lake 500 kV line into the Hemingway Station
- Midpoint – Hemingway 500 kV #2 will be a one new 500 kV circuit from Midpoint to Hemmingway.
- Cedar Hill – Midpoint 500 kV
- Construction of one new 500 kV circuit from Cedar Hill to Midpoint. This line will connect the Idaho southern route to Midpoint for improved reliability.

2.1.1.3. Geographic System Configuration

The following diagrams depict the project and adjacent paths.

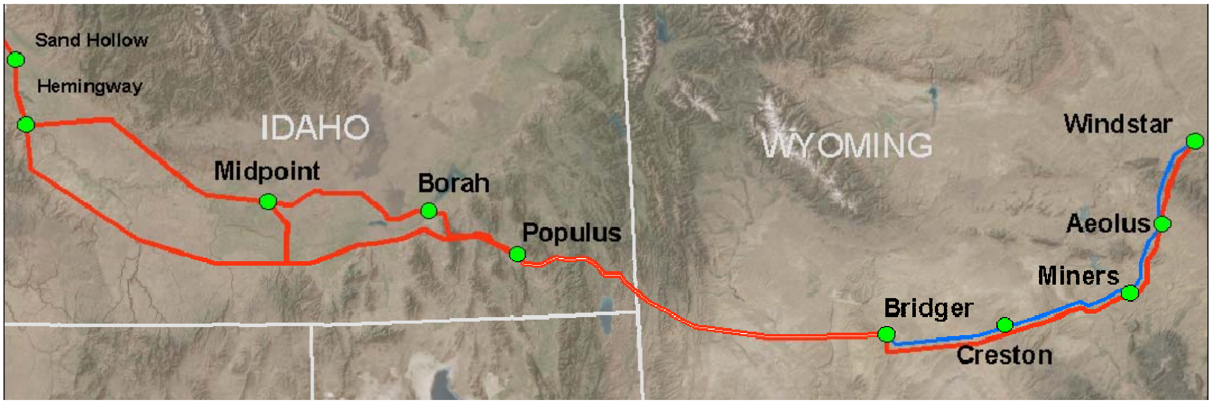

Figure 1

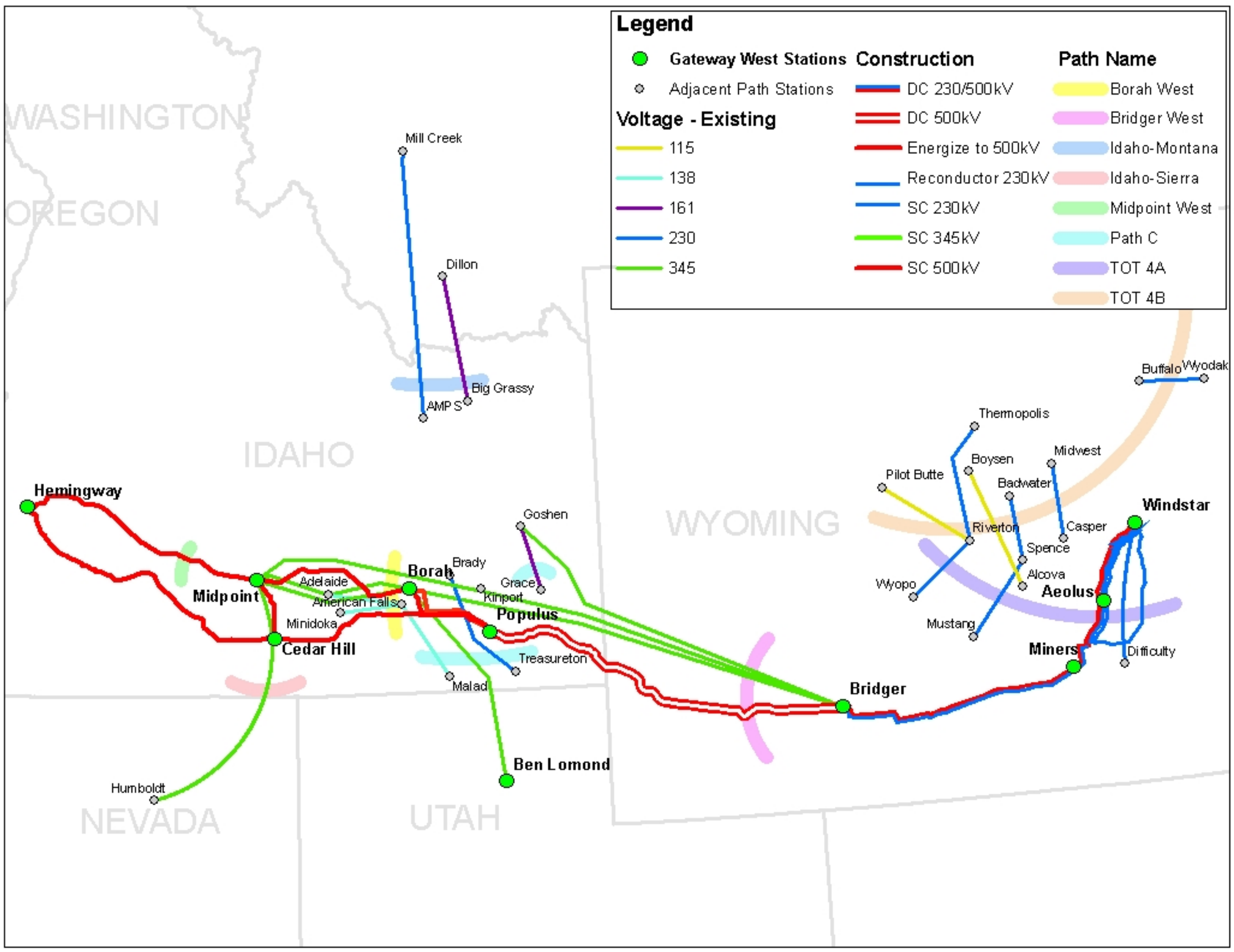

Figure 2. Project with adjacent paths

2.2. Planned Operating Date

The Gateway West schedule currently identifies the following in-service dates for key portions of the transmission project:

- Windstar – Aeolus December 2014
- Aeolus – Jim Bridger December 2014
- Jim Bridger - Populus December 2014

- Populus – Cedar Hill December 2015
- Cedar Hill – Hemmingway December 2015
- Populus – Borah – Midpoint December 2015
- Cedar Hill – Midpoint December 2015
- Midpoint – Hemmingway December 2015

3. Transfer Capability

The transfer capabilities vary along the project and are detailed in Table 1

Project Section	Existing Path	Existing Rating (MW)	Increase (MW)	New Rating (MW)
Windstar - Aeolus	TOT 4A	820	2615	3435
Aeolus - Jim Bridger			2050	2050
Jim Bridger-Populus	Bridger West	2200	3000	5200
Populus – Midpoint	Borah West	2557	3000	5557
Midpoint – Hemingway	Midpoint West	2487	3000	5487

Table 1 – Gateway West Transmission Segments and Proposed Transfer Levels

The above listed Project Sections were studied separately. The study parameters and results for each Project Section will be presented in the following sections. Due to the simultaneous interactions between the Gateway West project, east of Bridger, and Gateway South project, portions of this analysis will be included in both the Gateway West and Gateway South comprehensive progress reports. As such, Appendix WA-C thru WA-G are identical in the two reports.

4. Windstar – Aeolus (TOT 4A)

4.1. Path Description

The current TOT 4A path (#37) is comprised of the following three 230 kV transmission facilities:

Dave Johnston (*) – Difficulty 230 kV
Riverton (*) – Wyopo 230 kV
Spence (*) – Mustang 230 kV

The existing nonsimultaneous path rating is 820 MW east to west with no established rating west to east. The proposed plan of service adds the Windstar-Aeolus 230 kV #1 and #2 transmission lines on separate corridors, as well as the Windstar-Aeolus 500 kV #1 line, which results n the proposed TOT 4A path as follows:

Dave Johnston – Difficulty 230 kV
Riverton – Wyopo 230 kV
Spence – Mustang 230 kV
Windstar – Aeolus 500 kV #1 [Gateway West facility]
Windstar – Aeolus 230 kV #1 and #2 [Gateway West facility]

The proposed nonsimultaneous path rating for the new TOT 4A path is 3435 MW.

Figure 3 is a one-line drawing detailing the transmission lines that make up the transfer path.

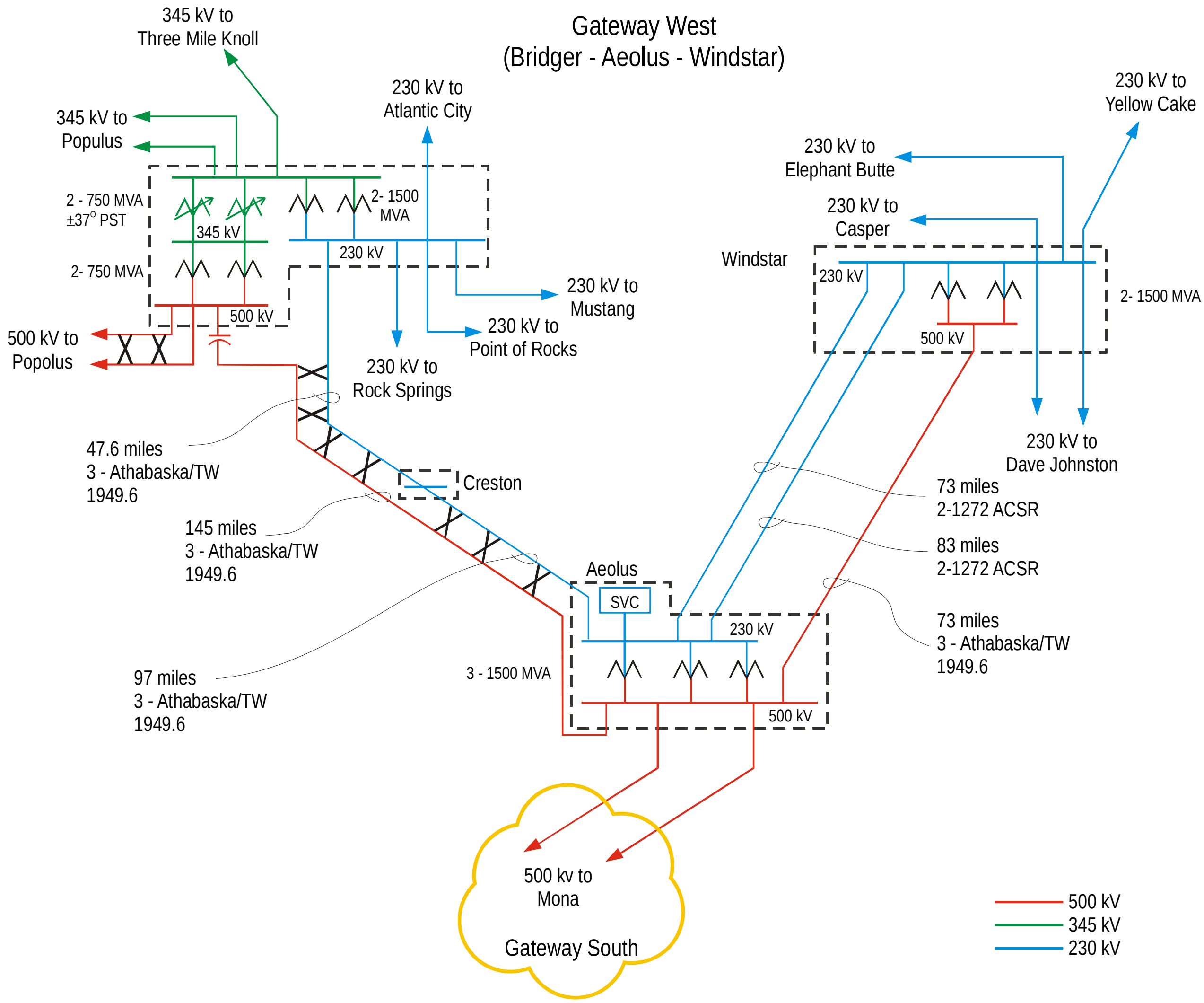

Figure 3 Bridger – Aeolus – Windstar Single-Line Diagram

4.2. Study Cases

Three different study cases (1a – high thermal, 1b – high wind and 1c – reduced Wyoming generation) were developed to establish a new rating for the TOT 4A and West of Aeolus paths. (Base case summaries are included in Appendix WA-C.) These cases were based on the WECC 15hs1 case which was approved for general use in April, 2007. The case was populated with the anticipated Gateway West facilities (and other transmission/resource facilities expected to support the new ratings). Between the three base cases, resources were adjusted to achieve stressed but reasonable flows on the paths under study.

4.3. Post-Transient

Per the Gateway West study plan, post-transient analysis was performed on all three cases (1a, 1b and 1c) for the TOT 4A path. The Gateway South study plan contains a list of the critical N-1 and N-2 outages. Appendix WA-D of this report contains all the Tables and Figures associated with the post-transient study results.

Post-transient study results within this portion of system indicates:

- For all single contingency (N-1) disturbances, there were no bus voltage or line loading violations. The most critical single contingency (N-1) outage on this path was loss of the Aeolus – Windstar 500 kV line under maximum path flow conditions. Figure 4 illustrates line flows under this outage condition and demonstrates that all 230 kV line loadings are within the SPOL ratings of the remaining lines.
- There are no credible N-2 contingencies associated with this path.

4.4. Reactive Margin

Voltage stability analysis was performed on the Case 1a, 1b and 1c base case for the TOT 4A path. Appendix WA-E contains all the Tables associated with the reactive margin (Q/V) study results. Table E-2 demonstrates that for flow conditions 105% of the new path rating, the N-1 outage of the Aeolus – Windstar 500 kV line will have the most significant impact on the TOT 4A path reactive margin, with Difficulty 230 kV having 257 MVAr of reactive margin. Per the WECC reactive margin requirements, the 5% case showed acceptable reactive margins for the n-1.

4.5. Transient Stability

Transient stability analysis was performed on the Case 1a, 1b and 1c base case for the Tot 4A path. Appendix WA-F contains all the Dynamic Performance Tables while Appendix WA-G contains stability simulation plots associated with the transient stability study results.

Stability study results indicate:

- All disturbances simulated resulted in damped and stable performance, and met NERC/WECC planning standard requirement.

- The rating of this path is limited during high transfer conditions (Case 1a) by the single line (N-1) outage of the Aeolus – Windstar 500 kV line causing the dynamic voltage dip at Difficulty 230 kV dipping by 26.5% to .753 pu (below 20% voltage deviation for 26.5 cycles).
- Upon replacing the Dave Johnston – Difficulty – Aeolus 230 kV proposed line conductor (1-1272 ACCC) with 2-1272 ACSR conductor and repeating the disturbance, the dynamic voltage dip at Difficulty 230 kV dipping by 22.8% to .792 pu (below 20% voltage deviation for 15 cycles). This performance meets the NERC/WECC transient voltage criteria.
- There are no credible N-2 contingencies associated with this path.
- In reviewed the Case 1b (N-1) dynamic stability study findings vs. Case 1a, the following results were noted:
- It is evident from the voltage swings that reducing thermal generation at Bridger and Windstar while increasing wind generation at Aeolus and on the 230 kV system in Wyoming will reduce the system impacts of the Aeolus - Windstar 500 kV outage. (Change in voltage swing on 230 kV system south of DJ reduced.)

Table F-1, F-2 and F-3 provide the results of the transient stability analysis for both N-1 and N-2 outages for Case 1a, 1b and 1c, respectively. Appendix WA-G shows graphical transient results for each of the disturbance simulated. Plot Set “1a-Aeolus-Windstar” (access via the Bookmarks Tab) depicts the voltage performance of the N-1 Aeolus – Windstar 500 kV line for Case 1a.

4.6. Critical Outages

Currently, the TOT 4A path is limited by N-1 of a 230 kV line west of Dave Johnston. (The specific outage changes based on year, load level, etc) With the addition of the Gateway West facilities, the critical outage on the TOT 4A path will be the N-1 of the Aeolus – Windstar 500 kV line. The outage of this line under maximum transfer conditions was fully vetted in this analysis.

4.7. Risk Assessment Outages

No risk assessment outages were evaluated for the TOT 4A path.

4.8. Study Conclusions / Recommendations

Based on technical findings of this report, the transmission facilities proposed between Aeolus and Windstar will support increasing the nonsimultaneous TOT 4A path rating from 820 MW to 3435 MW. The limiting outage on this path is the N-1 of the Aeolus – Windstar 500 kV line. Interactions between the TOT 4A path and other transmission paths will be evaluated during the Phase 2 (simultaneous) technical study review.

To withstand a single circuit 500 kV outage, the Dave Johnston – Difficulty – Aeolus 230 kV line must be rebuilt to 2-1272 ACSR conductor/phase. Additionally, the Aeolus – Windstar 230 kV #1 and #2 line must be constructed with 2-1272 ACSR conductor/phase.

Voltage stability analysis was performed on the Case 1a, 1b and 1c base case for the TOT 4A path. All reactive margin evaluated met WECC requirements.

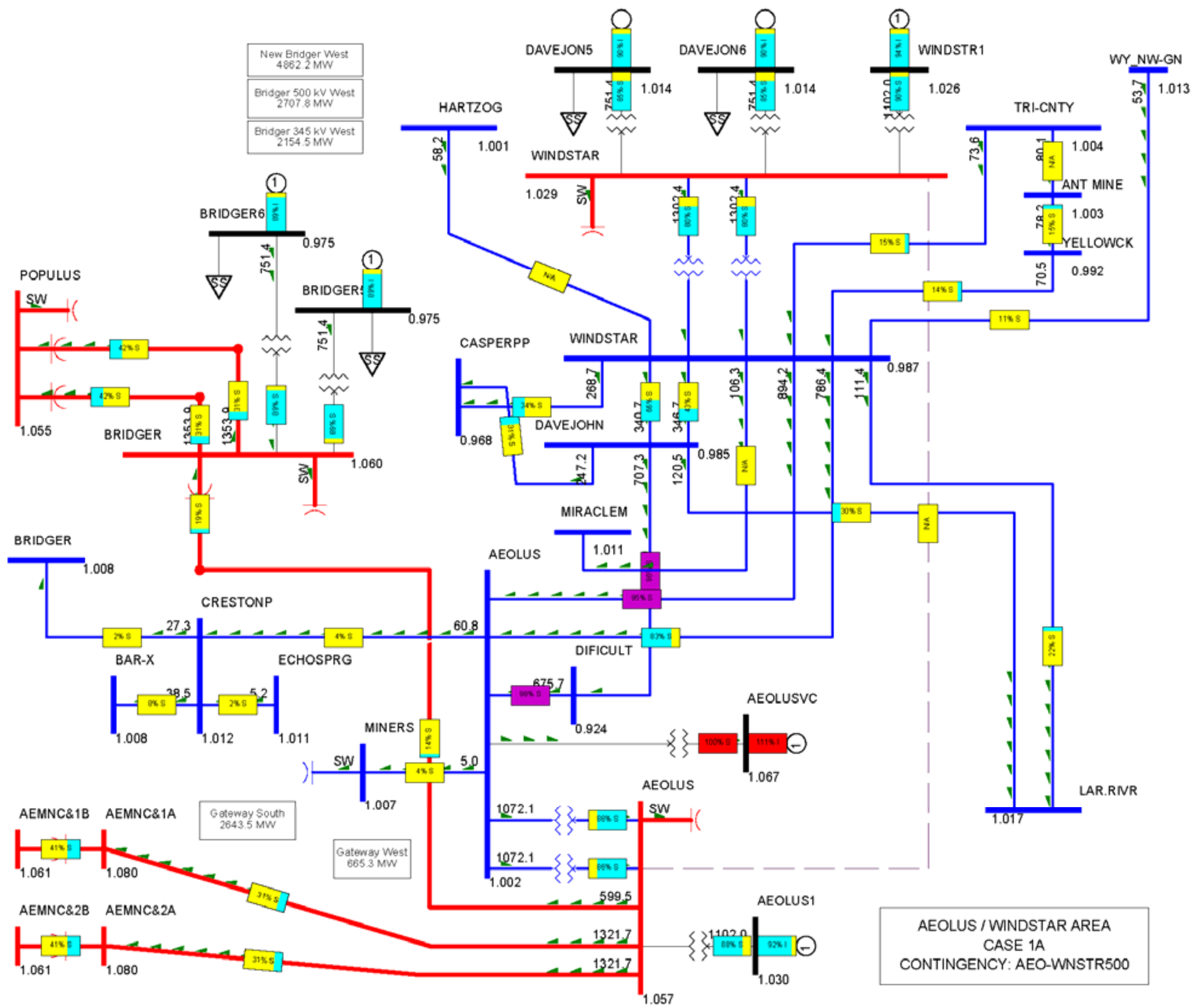

Figure 4
(Case 1a) TOT 4A Path – Loss of the Aeolus – Windstar 500 kV

5. West of Aeolus

5.1. Path Description

While there are existing 230 kV transmission lines that move power from east to west across Wyoming, between Aeolus (Miners) and Bridger, no transfer capability has previously been established for this path. With the addition of Gateway West transmission facilities between Aeolus and Bridger a new transmission path will be defined. This transmission path, recently defined as the West of Aeolus path, will include the following transmission lines:

Aeolus – Bridger 500 kV [Gateway West facility]
Aeolus – Creston 230 kV [Gateway West facility]
Platte – Latham (Echo Springs) 230 kV
Mustang – Bridger 230 kV
Mustang – Wind River 230 kV

The proposed nonsimultaneous path rating for the West of Aeolus path is 2050 MW.

Figure 3 is a one-line drawing detailing the transmission lines that make up the transfer path.

5.2. Study Cases

Three different study cases (1a – high thermal, 1b – high wind and 1c – reduced Wyoming generation) were developed to establish a new rating for the TOT 4A and West of Aeolus paths. (Base case summaries are included in Appendix WA-C.) These cases were based on the WECC 15hs1 case which was approved for general use in April, 2007. The case was populated with the anticipated Gateway West facilities (and other transmission/resource facilities expected to support the new ratings). Between the three base cases, resources were adjusted to achieve stressed but reasonable flows on the paths under study.

5.3. Post-Transient

Per the Gateway West study plan, post-transient analysis was performed on all three cases (1a, 1b and 1c) for the TOT 4A path. The Gateway West study plan contains a list of the critical N-1 and N-2 outages. Appendix WA-D of this report contains all the Tables and Figures associated with the post-transient study results.

Post-transient study results within this portion of the system indicates:

- For all single contingency (N-1) disturbances, there were no bus voltage or line loading violations. The most critical single contingency (N-1) disturbance is loss the Aeolus – Bridger 500 kV line.
- For the double contingency (N-2) disturbances, the N-2 outage of the Aeolus – Bridger 500 kV and the Aeolus – Creston 230 kV line or the Creston – Bridger 230 kV line was a critical outage. Additionally, double contingency (N-2) of the Bridger – Populus 500 kV #1 and #2 lines is also a critical outage. (This second outage is critical to the West of Aeolus path rating because the Bridger – Populus path is effectively in series with the West of Aeolus path.) The results of these two outages for each of the three cases (1a, 1b and 1c) are

provide on Table D-18 and summarized on the table below:

Case 1a (High Thermal)	Case 1b (High Wind)	Case 1c (High So. Utah S-N)
No single contingency (N-1) bus voltage or line loading violations were evident for this portion of the base case.	No single contingency (N-1) bus voltage or line loading violations were evident for this portion of the base case.	No single contingency (N-1) bus voltage or line loading violations were evident for this portion of the base case.
		No double contingency (N-2) bus voltage or line loading violations were evident for this portion of the base case.
	Following the (N-2) outage of the Aeolus - Bridger 500 kV #1 and the Aeolus – Creston 230 kV lines the post transient solution would not solve. Upon tripping 1100 MW of generation at Aeolus, the system would solve and there were no bus voltage or line loading violations.	
	Following the (N-2) outage of the Aeolus - Bridger 500 kV #1 and the Creston - Bridger 230 kV lines the post transient solution would not solve. Upon tripping 1100 MW of generation at Aeolus, the system would solve and there were no bus voltage or line loading violations.	
Following the (N-2) outage of the Jim Bridger – Populus 500 kV #1 and #2 lines the post transient solution would not solve. Upon tripping 750 MW of generation at Jim Bridger, the system would solve and there were no bus voltage or line loading violations.	Following the (N-2) outage of the Jim Bridger – Populus 500 kV #1 and #2 lines the post transient solution would not solve. Upon tripping 1100 MW of generation at Aeolus, the system would solve and there were no bus voltage or line loading violations. Higher levels of generation tripping was required due to resource levels moved from Bridger to Aeolus.	

Based on these two critical outages, the following conclusions were reached:

- For the double line (N-2) outage of the Aeolus – Bridger 500 kV line and the Aeolus – Creston 230 kV line or the Creston – Bridger 230 kV line:
  - Under light or moderate flow conditions (Case 1a and 1c) on the West of Aeolus Path (<1300 MW), for this N-2 contingency, there were no bus voltage or line loading violations.
  - However, under high flow conditions (Case 1b) on the West of Aeolus path (>2050 MW), for this N-2 contingency, 1100 MW of generator tripping will be required at Aeolus to prevent voltage collapse (none converged solution). After generator tripping, the case solved and there were no bus voltage or line loading violations.
- For the double line (N-2) outage of the Bridger – Populus 500 kV #1 and #2 lines:
  - Under light flow conditions (Case 1c) on the West of Aeolus path (<975 MW) and Bridger West path (<3345 MW), for this N-2 contingency, there were no bus voltage or line loading violations.
  - Under moderate flow conditions (Case 1a) on the West of Aeolus path (<1300 MW) and high flow condition on Bridger West Path (5200 MW), for this N-2 contingency, generator tripping will be required at Bridger (750 MW) to prevent voltage collapse (none converged solution). After generator tripping, the case solved and there were no bus voltage or line loading violations.

- However, under high flow conditions (Case 1b) on the West of Aeolus path (>2050 MW) and maximum flow condition on Bridger West path (5200 MW), for this N-2 contingency, generator tripping will be required at Aeolus (1100 MW) to prevent voltage collapse (none converged solution). After generator tripping, the case solved and there were no bus voltage or line loading violations.

Flow diagrams for the West of Aeolus and West of Bridger N-2 contingencies for the 1b case are provided in Figure 5 and Figure 6.

5.4. Reactive Margin

Voltage stability analysis was performed on the Case 1a, 1b and 1c base case for the West of Aeolus path. Appendix WA-E contains all the Tables associated with the reactive margin (Q/V) study results. Table E-6 demonstrates that for flow conditions 105% of the proposed path rating, the N-1 outage of the Aeolus - Bridger 500 kV line will have the most significant impact on the West of Aeolus path reactive margin, with Aeolus 230 kV having 168 MVAr of reactive margin. Additionally, Table E-8 demonstrates that for flow conditions 102.5% of the proposed path rating, the N-2 outage of the Aeolus - Bridger 500 kV and the Aeolus – Creston 230 kV lines will have the most significant impact on the West of Aeolus path reactive margin, with Difficulty 230 kV having 825 MVAr of reactive margin. Per the WECC reactive margin requirements, the 5% case showed acceptable reactive margins for the n-1 outages while the 2.5% case showed acceptable reactive margin for the n-2 outages.

5.5. Transient Stability

Transient stability analysis was performed on the Case 1a, 1b and 1c base case for the West of Aeolus path. Appendix WA-F contains all the Dynamic Performance Tables while Appendix WA-G contains stability simulation plots associated with the transient stability study results.
Stability study results indicate:

- All disturbances simulated resulted in damped and stable performance, and met NERC/WECC planning standard requirement.
- (The NERC/WECC "Reliability Criteria" is available at the following link: http://www.wecc.biz/documents/library/procedures/CriteriaMaster.pdf)
- A summary of the N-1 and N-2 technical study results provided on Tables F1 thru F4 is provided on the table below:

Case 1a (High Thermal)	Case 1b (High Wind)	Case 1c (High So. Utah S-N)
(N-1) Aeolus - Bridger 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Aeolus (Category B), resulted in the bus voltage at FT CRK 1 34.5 kV dipping by by 19.5% to .833 p.u.. This performance meets the NERC/WECC transient voltage criteria.	(N-1) Aeolus - Bridger 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Aeolus (Category B), resulted in the bus voltage at FT CRK 1 34.5 kV dipping by by 25.2% to .774 p.u.. (below 20% voltage deviation for 5.4 cycles). This performance meets the NERC/WECC transient voltage criteria.	(N-1) Aeolus - Bridger 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Aeolus (Category B), resulted in the bus voltage at AEOLUSVC 25.0 kV and FT CRK 1 34.5 kV dipping by by 7.7% to .91 p.u. This performance meets the NERC/WECC transient voltage criteria.
(N-1) Bridger - Populus 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Bridger (Category B), resulted in the bus voltage at BRIDGER5 22.0 kV dipping by by 12.7% to .848 p.u.. This performance meets the NERC/WECC transient voltage criteria.	(N-1) Bridger - Populus 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Bridger (Category B), resulted in the bus voltage at FIFTEEN 44.0 kV and MADIS WY 115 kV dipping by by 10.5% to .874 p.u.. This performance meets the NERC/WECC transient voltage criteria.	(N-1) Bridger - Populus 500 kV line outage, 3-Phase fault w/normal clearing (3 cycle), fault near Bridger (Category B), resulted in the bus voltage at aeolusvc 25.0 kV and MADIS WY 115 kV dipping by by 7.3% to .904 p.u.. This performance meets the NERC/WECC transient voltage criteria.

Case 1a (High Thermal)	Case 1b (High Wind)	Case 1c (High So. Utah S-N)
(N-2) Aeolus - JB 500 kV and Aeolus - Creston 230 kV line outages, 3-Phase (3 cycle) fault w/normal clearing near Aeolus (Category C), resulted in the bus voltage at Ft. Ck1 34.5 kV bus dipping by by 19.8% to .829 p.u. This performance meets the NERC/WECC transient voltage criteria.	(N-2) Aeolus - JB 500 kV and Aeolus - Creston 230 kV line outages, 3-Phase (3 cycle) fault w/normal clearing near Aeolus (Category C), resulted in the bus voltage at Ft. Ck1 34.5 kV bus dipping by by 25.2% to .775 p.u. (below 20% voltage deviation for 6.4 cycles). This performance meets the NERC/WECC transient voltage criteria.	(N-2) Aeolus - JB 500 kV and Aeolus - Creston 230 kV line outages, 3-Phase (3 cycle) fault w/normal clearing near Aeolus (Category C), resulted in the bus voltage at AEOLUSVC 25.0 kV bus dipping by by 7.6% to .909 p.u. This performance meets the NERC/WECC transient voltage criteria.
(N-2) Bridger - Populus 500 kV (two circuits) line outage, 3-Phase (3 cycle) fault w/normal clearing near Bridger (Category C) resulted in the bus voltage at AGRIUM 138 kV and CARIBO 1 24.0 dipping by by between 20.9% and 21.4% to .8 p.u. (below 20% voltage deviation for 10.6 cycles and 13.2 cycles, respectively). This performance meets the NERC/WECC transient voltage criteria. This level of performance was achieved without generator tripping.	(N-2) Bridger - Populus 500 kV (two circuits) line outage, 3-Phase (3 cycle) fault w/normal clearing near Bridger (Category C) resulted in the bus voltage at AGRIUM 138 kV and CARIBO 1 24.0 kV dipping by by 16.2% to .845 p.u. This performance meets the NERC/WECC transient voltage criteria. This level of performance was achieved without generator tripping.	(N-2) Bridger - Populus 500 kV (two circuits) line outage, 3-Phase (3 cycle) fault w/normal clearing near Bridger (Category C) resulted in the bus voltage at AEOLUSVC 25.0 kV dipping by 8.1% to .904 p.u. This performance meets the NERC/WECC transient voltage criteria. This level of performance was achieved without generator tripping.

- In reviewed the Case 1b (N-1 and N-2) dynamic stability study findings vs. Case 1a, the following results were noted:

  It is evident from the voltage swings that reducing thermal generation at Bridger and Windstar while increasing wind generation at Aeolus and on the 230 kV system in Wyoming will:

  - increased the system impacts of the Aeolus -Bridger 500 kV (N-1 and N-2) disturbances. (Change in voltage swings in southern Wyoming)
  - reduce the system impacts of the Bridger - Populus 500 kV (N-1 and N-2) disturbances. (Change in voltage swings at Caribou and other locations significantly reduced.)

5.6. Critical Outages

With the addition of Gateway West transmission facilities critical outages are N-2 of the double circuit 500 kV/230 kV lines west of Aeolus and N-2 of the double circuit 500 kV lines west of Bridger. Generation will need to be tripped either at Aeolus/Windstar or at Bridger for these double line outages depending on path flow levels and resource mix/location will need to be addressed in follow-on analysis

5.7. Risk Assessment Outages

As part of the evaluation with the Gateway South project, detailed analysis was performed evaluating interactions between the West of Aeolus path and the South of Aeolus path under maximum flow conditions. Gateway South analysis has indicated that both paths can be operated simultaneously at their path limits (2050 MW for West of Aeolus and 3000 MW for South of Aeolus), depending on levels of generating tripping and resource mix/location. Please refer to the Gateway South Comprehensive Progress Report for further details.

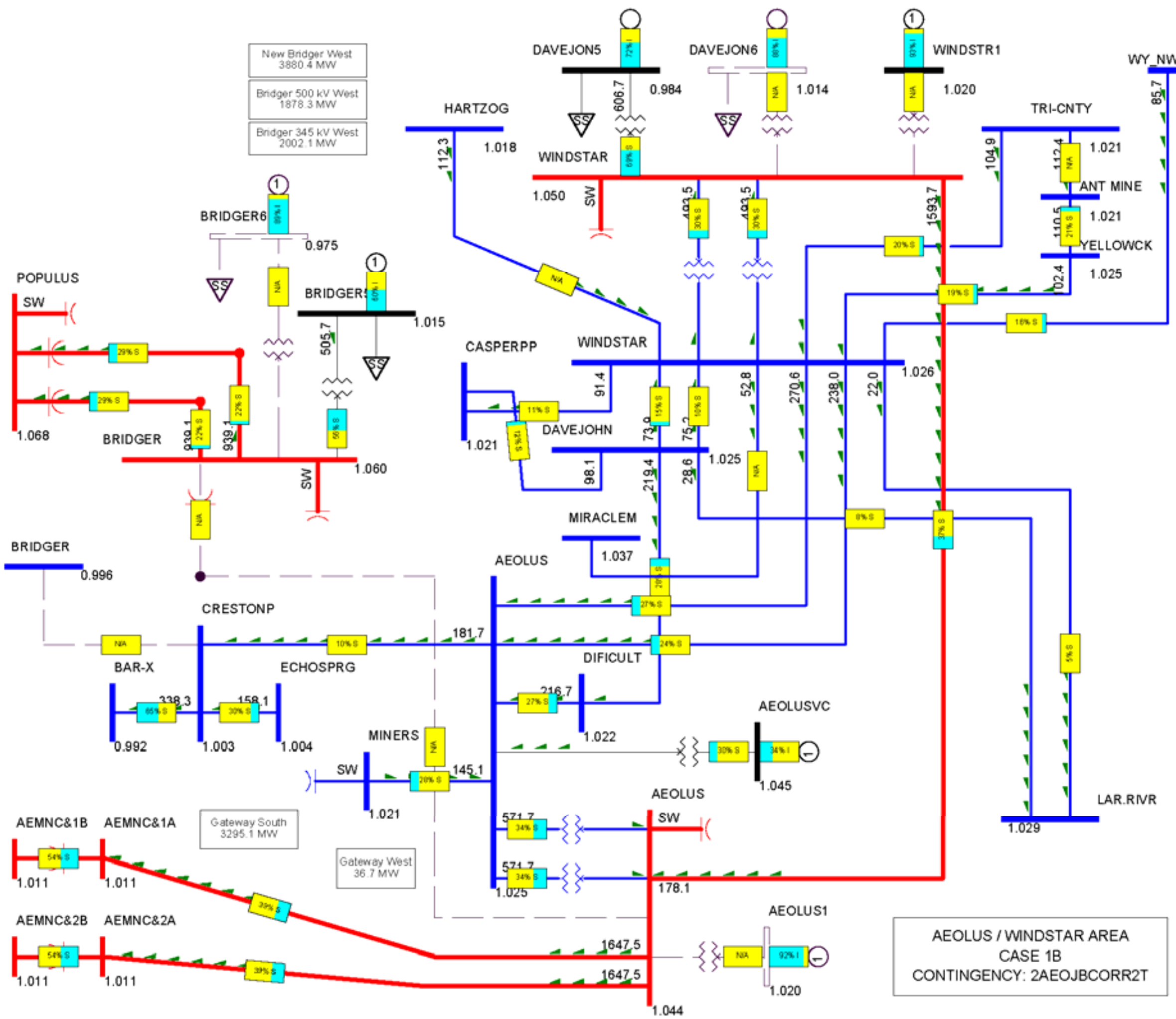

Figure 5
(Case 1b) West of Aeolus Path – N-2 Loss of the Aeolus – Bridger 500 kV and Aeolus – Creston 230 kV

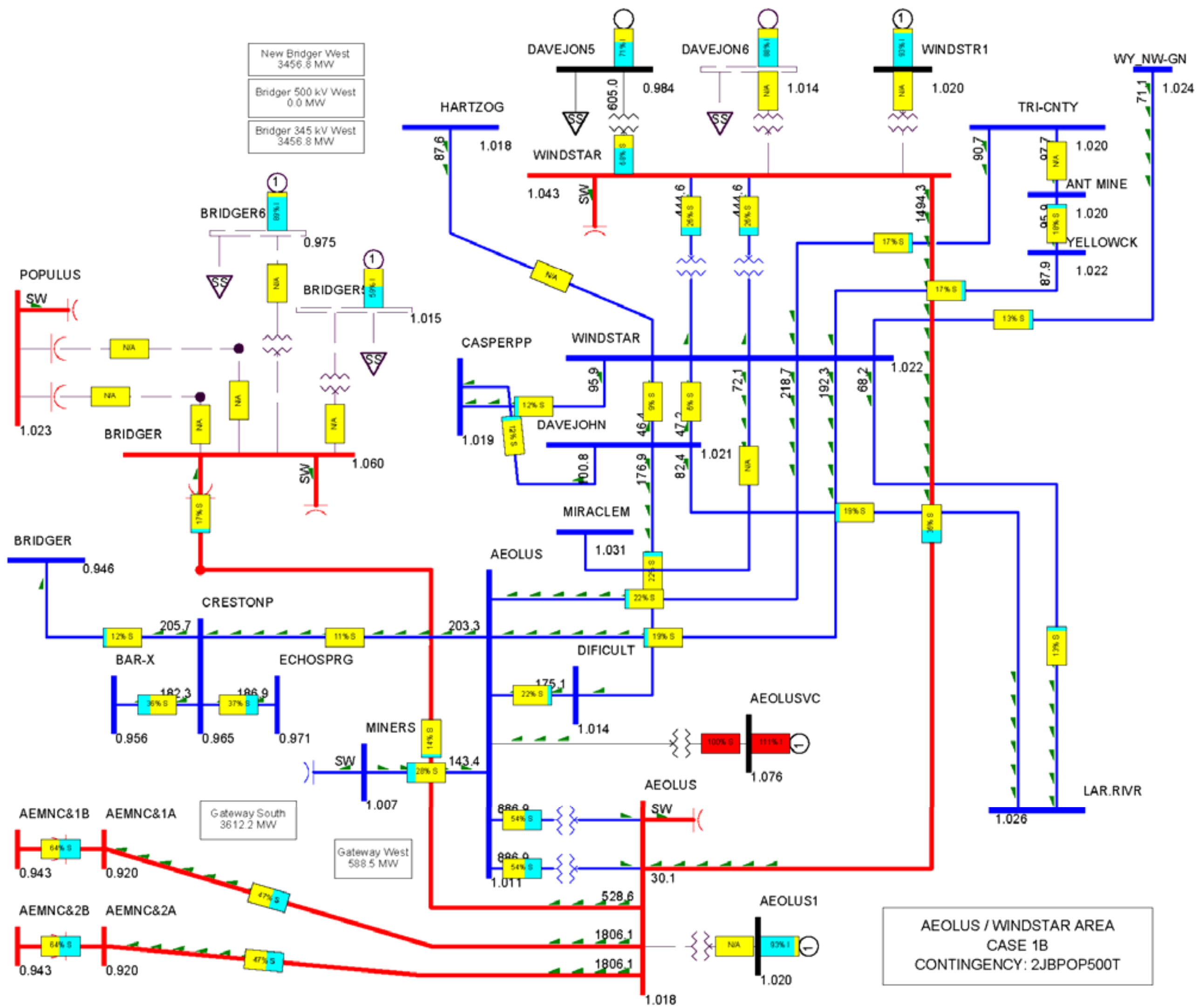

Figure 6
(Case 1b) West of Aeolus Path – N-2 Loss of the Bridger – Populus 500 kV #1 and #2

5.8. Study Conclusions / Recommendations

Based on technical findings of this report, the facilities proposed between Jim Bridger and Aeolus will support a path rating of 2050 MW (simultaneous with South of Aeolus flows of 3000 MW). The West of Aeolus path rating is limited by the double line outage (N-2) outage of the Aeolus – Bridger 500 kV line and the Aeolus – Creston 230 kV or the Creston – Bridger 230 kV lines and how much generation at Aeolus and Windstar that can be tripped for specific system conditions.

While the requirement for generator tripping at Jim Bridger (for outages west of Bridger), Aeolus or Windstar has been identified within the report, specific levels of Wyoming generator tripping vs. path flow levels and resource mix/location will need to be addressed in follow-on analysis.

If the 230 kV line west of Aeolus (constructed 500 kV, energized 230 kV) was converted to 500 kV operation, transfers on the West of Aeolus path could be increased and generator tripping levels could be greatly reduced.

Interactions between the West of Aeolus path and other transmission paths will be evaluated further during the Phase 2 (simultaneous) technical study review.

6. Jim Bridger – Populus

6.1. Bridger West

The current Bridger West path (#19) is comprised of the following three 345 kV Bridger lines:

Bridger-Borah 345 kV
Bridger-Kinport 345 kV
Bridger-Goshen 345 kV

The current path rating is 2200 MW east to west with no established rating west to east. The proposed plan of service adds the Populus 500 kV & 345 kV buses, the 3 Mile Knoll 345 kV bus and two Bridger-Populus 500 kV transmission lines which results in the proposed Bridger West path as follows:

Bridger-3 Mile Knoll 345 kV
Bridger-Populus #1 345 kV
Bridger-Populus #2 345 kV
Bridger-Populus #1 500 kV
Bridger-Populus #2 500 kV

A path rating of 5200 MW for the new Bridger West path will be demonstrated. This path is flow limited in that the path is limited by the available resources from the East. No attempt was made to find this path's reliability limits since resources were not available to maximize flows.

Figure 2 is a one-line drawing detailing the transmission lines that make up the transfer path.

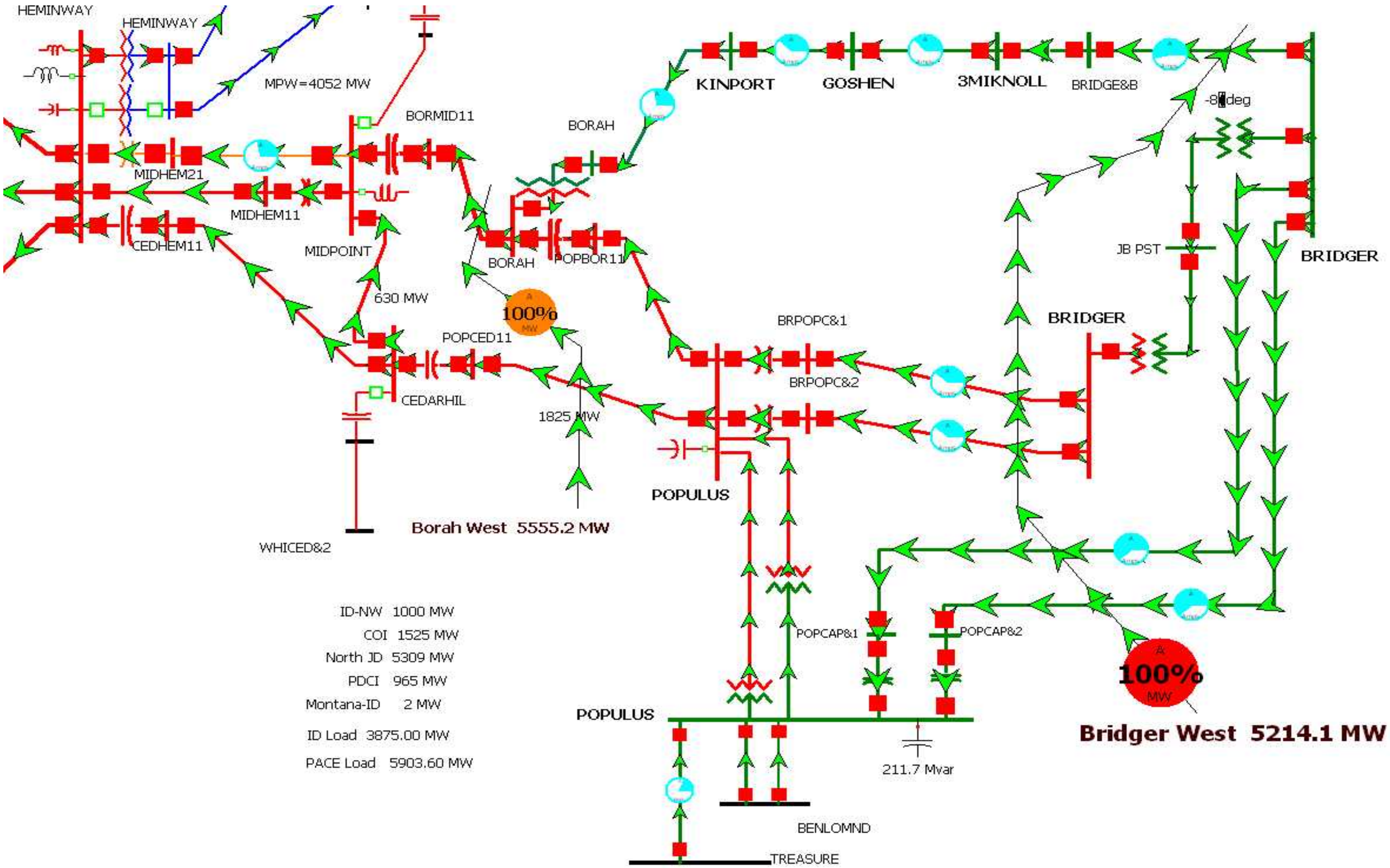

Figure 2. Map of Bridger West Path

6.2. Study Cases

The WECC 2015 heavy summer base case (15hs1sa1) was selected to represent the WECC system in 2015 system. The 2015 WECC base case was created in April of 2007. During the base case development process, each utility in the WECC estimated the heavy summer load that they will see in the particular year under study, inserts new transmission facilities, and coordinates with neighboring utilities to determine generation import and export requirements. General characteristics of the 15hs1sa1 case are heavy hydro generation in Idaho and the Northwest, heavy load forecast for the year under study, and most thermal gas and coal generation in the system online.

In order to achieve the desired flows on the Bridger West & Borah West transmission paths, the following modifications were made to the 2015 base case:

- The case was populated with the Gateway West 500 kV project, the Gateway South 500 kV project, the Populus – Terminal project, the Hemingway – Boardman 500 kV project, and the Hemingway – Captain Jack 500 kV project
- Load across the WECC was decreased to represent a more lightly loaded system
- Projected wind and coal generation was added in Wyoming
- Surplus IPCo/PACE generation was scheduled to the Northwest and PG&E displacing generation in those areas

In the end, the 15hs1sa1 case was left with stressed but reasonable flows on the Bridger West & Borah West transmission paths. This case was named 15hs1sa_jbw5200_bw5557 (AKA 15hsbrwbow). The 15hs1sa_jbw5200_bw5557 case was stressed to 5200 MW on the new Bridger West path and 5557 MW on the new Borah West transmission path. Those stressed values represent the non-simultaneous ratings for the paths under study.

Load, resource and path flow conditions simulated in the case are summarized in Table _ and Table _.
Loads and Resources

Case	Bridger Generation (MW)	Hells Canyon Complex Generation (MW)	Idaho Area Load+Losses (MW)	PACE Area Load+Losses (MW)
15hsbrwbow	3670	679	4229	6448
15hsbrwbow + 5%	4011	384	4276	6460

Table _ –Loads and Resources

Path Flows

Case	TOT 4A (MW)	Bridger West (MW)	Monument-Naughton (MW)	Borah West (MW)	Path C (MW)	Midpoint West (MW)	Idaho-Montana (MW)	Montana NW (MW)
Path Capability								
15hsmpw	244	5214	11	5555	680	4051	-2	1179
15hsmpw + 5%	229	5510	15	5836	708	4320	-18	1196

Table _ – Path Flows

The base case was stressed to 5,214 MW on Bridger West and 5,555 MW on Borah West using an Idaho area load of 4,229 MW (includes losses). A one-line diagram for this case is shown in Figure 4. One companion case was developed with 5% additional transfers across both paths by adjusting generation levels at Brownlee and Hells Canyon (case: 15hs_jbw5510_bw5836_5%_stress; AKA 15hsbrwbow + 5%). This case is used to estimate the reactive margin at several buses under critical contingencies. Figure 5 is a one-line drawing of the 5% case.

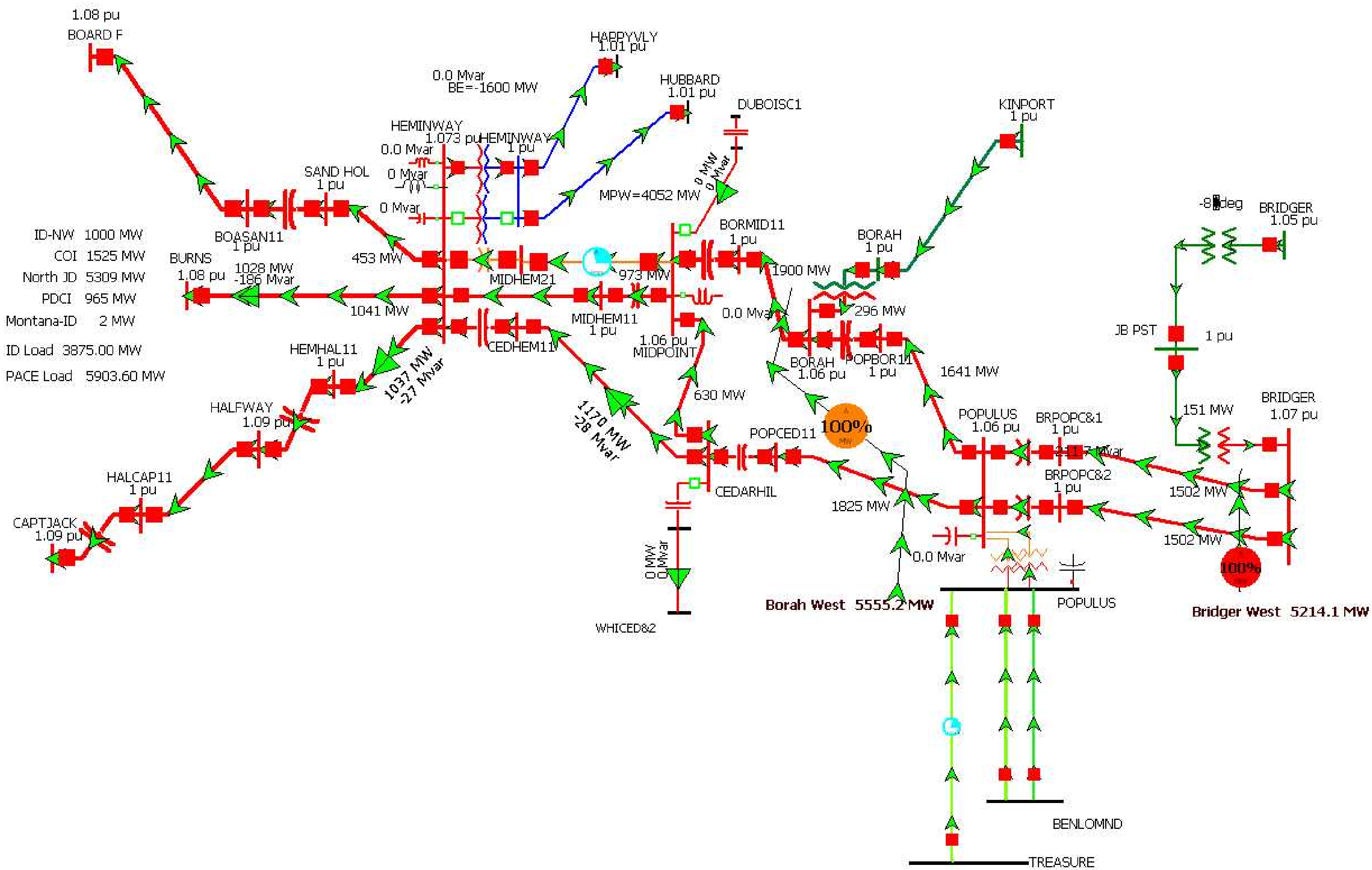

Figure 4 – 15hs1sa_jbw5200_bw5557

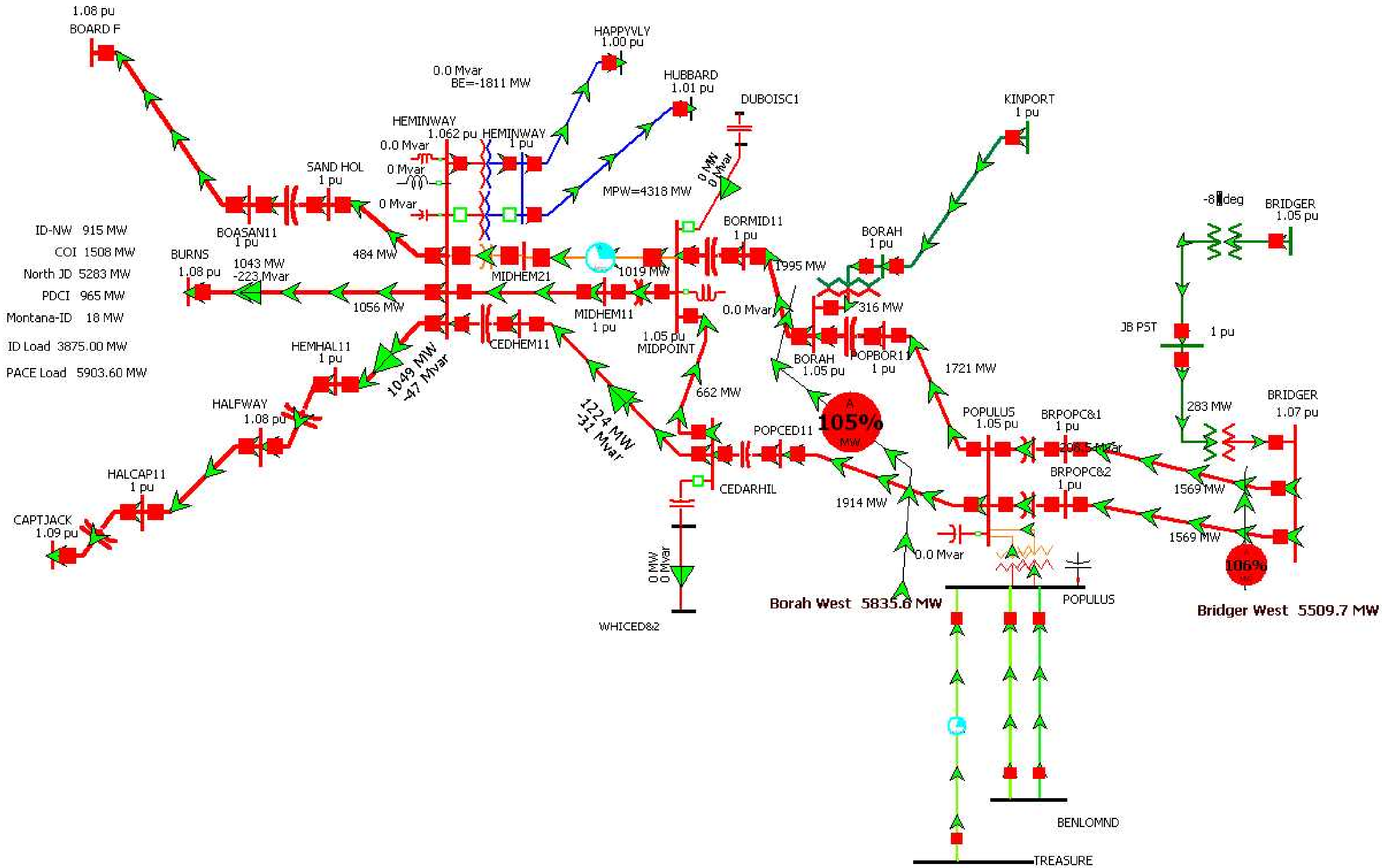

Figure 5 – 15hs_jbw5510_bw5836_5%_stress

6.3. Post-Transient

The 15hs1sa_jbw5200_bw5557 base case was the basis for all post-disturbance results in conjunction with the study of the Bridger West and Borah West paths. Appendix A contains a list of the critical N-1 and N-2 outages. Appendix B contains all the Tables and Figures associated with the post-transient study results. Any element in the study that exceeded 100% of its continuous rating as a result of a contingency is listed in Appendix B. If the element did not exceed post transient loadings greater than 100%, it is not shown in this table. Remedial Action Schemes (RAS) were only used to mitigate for N-2 outages that resulted in exceeding the emergency rating on an element.

The worst four n-1 outages with Bridger West at 5,214 MW and Borah West at 5,555 MW are as follows:

- Outage #20, Borah – Midpoint 500 kV Line
  - Results in a 133% overload to the series capacitor at Cedar Hill (see Figure B1)
- Outage #15, Populus – Cedar hill 500 kV Line
  - Results in a 130% overload to the series capacitor at Borah (parallel 500 kV line to the line opened in contingency) (see Figure B2)
- Outage #42, Midpoint 230/138 kV Transformer
  - Results in a 117% overload to the Hayburn Junction – Paul 138 kV line (see Figure B3)
- Outage #61, Midpoint – Humbolt 345 kV Line
  - Results in a 113% overload to the Ft. Sage phase shifting transformer (see Figure B4)

Post-disturbance contingency results for n-1 studied outages are included in Table B1.

The worst four n-2 outages with Bridger West at 5,214 MW and Borah West at 5,555 MW are as follows (prior to addition of remedial actions):

- Outage #1, Bridger – Populus #1,2 500 kV Lines
  - Outage would not converge (the case converged after remedial actions were applied)
- Outage #7, Borah – Adelaide #2 + Borah-Adelaide-Midpoint #1 345 kV line
  - Results in a 148% overload to the American Falls to Pleasant Valley 138 kV line (see Figure B5)
- Outage #25, Borah – Adelaide #2 345 kV + Borah – Midpoint 500 kV lines
  - Results in a 146% overload to the series capacitor at Cedar Hill (see Figure B6)
  - Results in a 144% overload to the Borah to Adelaide Tap (see Figure B7)
- Outage # 29, Populus – Borah 500 kV + Borah – Midpoint 500 kV + trip Borah 500/345kV transformer (note this contingency is considered a credible outage because of the proposed 500 kV bus arrangement at Borah Substation) [maybe we should fix this configuration to avoid this outage]
  - Results in a 136% overload to the series capacitor at Cedar Hill (see Figure B8)

Post-disturbance contingency results for n-2 studied outages are included in Table B2. The results included in Table B2 are after remedial actions have been applied.

The posted line loadings shown in Tables B1 through B3 correspond to the conductor nominal rating under summer conditions (40 deg C, ambient). Generally emergency ratings for the summer conditions are about 15% higher for lines, 10 to 20% higher for transformers and 35% higher for series capacitors than the nominal continuous rating for the summer time (40 deg C, ambient).

6.4. Reactive Margin

The 15hs1sa_jbw5200_bw5557 base case was the basis for all reactive margin results in conjunction with the study of the Bridger West and Borah West paths. Appendix C contains all the Tables associated with the reactive margin (Q/V) study results.

All of the n-1 outages met Idaho Power's reactive margin requirements of 250 MVAr for 230 kV and 345 kV and 500 MVAr for 500 kV (see Table C1) as well as all of the n-2 outages which met Idaho Power's reactive margin requirements of 200 MVAr for 230 kV and 345 kV and 400 MVAr for 500 kV (see Table C2).

The 5% case similarly showed acceptable reactive margins for the n-1 & n-2 cases. The Risk Assessment outages did not exhibit cascading failures. These results can be found in Tables C3, C4 and C5 respectively.

6.5. Transient Stability

The 15hsbrwbow base case was the basis for all transient stability results in conjunction with the study of the Bridger West and Borah West paths. Appendix D contains all the Tables and Figures associated with the transient stability study results.

All of the N-1 outages resulted in damped and stable performance. The worst recorded N-1 transient voltage dip resulted from the Populus-Cedar Hill 500 kV line outage wherein the Heyburn 138 kV bus and the Adelaide 345 kV bus saw transient voltage dips of 13.8% and 13.7% respectively below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Cedar Hill 500 kV line outage wherein the Milford 46 kV bus saw the frequency dip down to 59.835 Hz. There were no transient voltage dips greater than 20% for the N-1 outages taken. There were no transient frequency dips below 59.6 Hz for the N-1 outages taken.

All of the N-2 outages resulted in damped and stable performance. The worst recorded N-2 transient voltage dip resulted from the Bridger-Populus 500 kV double-line outage wherein the Wolverine Creek 34.5 kV buses saw transient voltage dips as much as 19.88% below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Ben Lomond 345 kV double-line outage wherein the Milford 46 kV bus saw the frequency dip down to 59.834 Hz. There were no transient voltage dips greater than 20% for the N-2 outages taken. There were no transient frequency dips below 59.6 Hz for the N-2 outages taken.

There were no Special Protection Schemes (SPS) employed to achieve damped and stable performance for any of the N-1 outages. There was an assumed SPS for one of the N-2 scenarios - the Bridger-Populus 500 kV double-line outage. In this instance, a 775 MW Bridger #5 unit was tripped to provide the recorded response. While it is clear that the assumed SPS provided a reasonable response to this outage, it is not meant to suggest that this SPS is the only SPS that could be employed to provide a reasonable response. It does suggest, however, that some kind of protection scheme is required to provide damped and stable performance for this outage. Any capacitor/reactor/line switching implemented to achieve improved post-transient results (i.e., improved final voltage and/or thermal results) as part of a special protection scheme in the post-transient analysis was not necessarily implemented in the transient analysis unless required to achieve acceptable dynamic response for the outage under study.

Table D1 and Table D2 provide the results of the transient stability analysis for N-1 and N-2 outages, respectively. Figures D1 through D25 show graphical transient results for the first two largest percentage bus voltage decreases for each outage.

6.6. Critical Outages

Appendix A lists the critical N-1 and N-2 outages.

6.7. Risk Assessment Outages

Risk assessment (marked RA in the listing above) outages were studied to non-cascading operation under failure of the associated remedial action schemes.

6.7.1. Post-Disturbance

Six n-2 outages were studies as part of a Risk Assessment exercise. The post-disturbance results along with their associated failed remedial actions are shown in Table B3.

Study results in Table B3 do not exhibit cascading failures for the six n-2 outages categorized under Risk Assessment.

6.8. Expected Simultaneous Path Interactions

It is expected that there will be simultaneous interactions with surrounding paths that will have to be evaluated during the Phase 2 rating process. The expected paths that may interact with the Bridger West path are:

Path 20, Existing Path C

Gateway South Transmission Project

Path 18, Idaho – Montana

6.9. Study Conclusions / Recommendations

The WECC Phase 1 Rating Study was performed to establish a new preliminary OTC [TTC?] rating for the Bridger West path in Wyoming and eastern Idaho meeting the WECC Phase 1 guidelines and requirements. The study results indicate that the 5200 MW capability can be achieved under the conditions studied for Bridger West. This path is flow limited in that the path is limited by the available resources from the East. No attempt was made to find this path's reliability limits since resources were not available to maximize flows.

7. Populus – Midpoint

7.1. Borah West

The current Borah West path (#17) is comprised of the following transmission lines:

Kinport-Midpoint 345 kV
Borah-Adelaide-Midpoint #1 345 kV
Borah-Adelaide-Midpoint #2 345 kV
Borah-Hunt 230 kV
American Falls-Pleasant Valley 138 kV

The current path rating is 2557 MW east to west with no established rating west to east. The proposed plan of service converts part of the Kinport-Midpoint 345 kV line to 500 kV to yield a Midpoint-Borah 500 kV line and a Borah-Kinport 345 kV line. A Borah-Populus 500 kV line is added to complete the 500 kV link from Populus to Midpoint. In addition, the new Cedar Hill Substation is added with 500 kV lines to Populus, Midpoint and the new Hemingway Substation. The proposed new Borah West path then becomes:

Borah-Adelaide-Midpoint #1 345 kV
Borah-Adelaide-Midpoint #2 345 kV
Borah-Hunt 230 kV
American Falls-Pleasant Valley 138 kV
Populus-Cedar Hill 500 kV
Borah-Midpoint 500 kV

A path rating of 5557 MW for the new Borah West path will be demonstrated. This path is flow limited in that the path is limited by the available resources from the East. No attempt was made to find this path's reliability limits since resources were not available to maximize flows.

Figure 3 is a one-line drawing detailing the transmission lines that make up the transfer path.

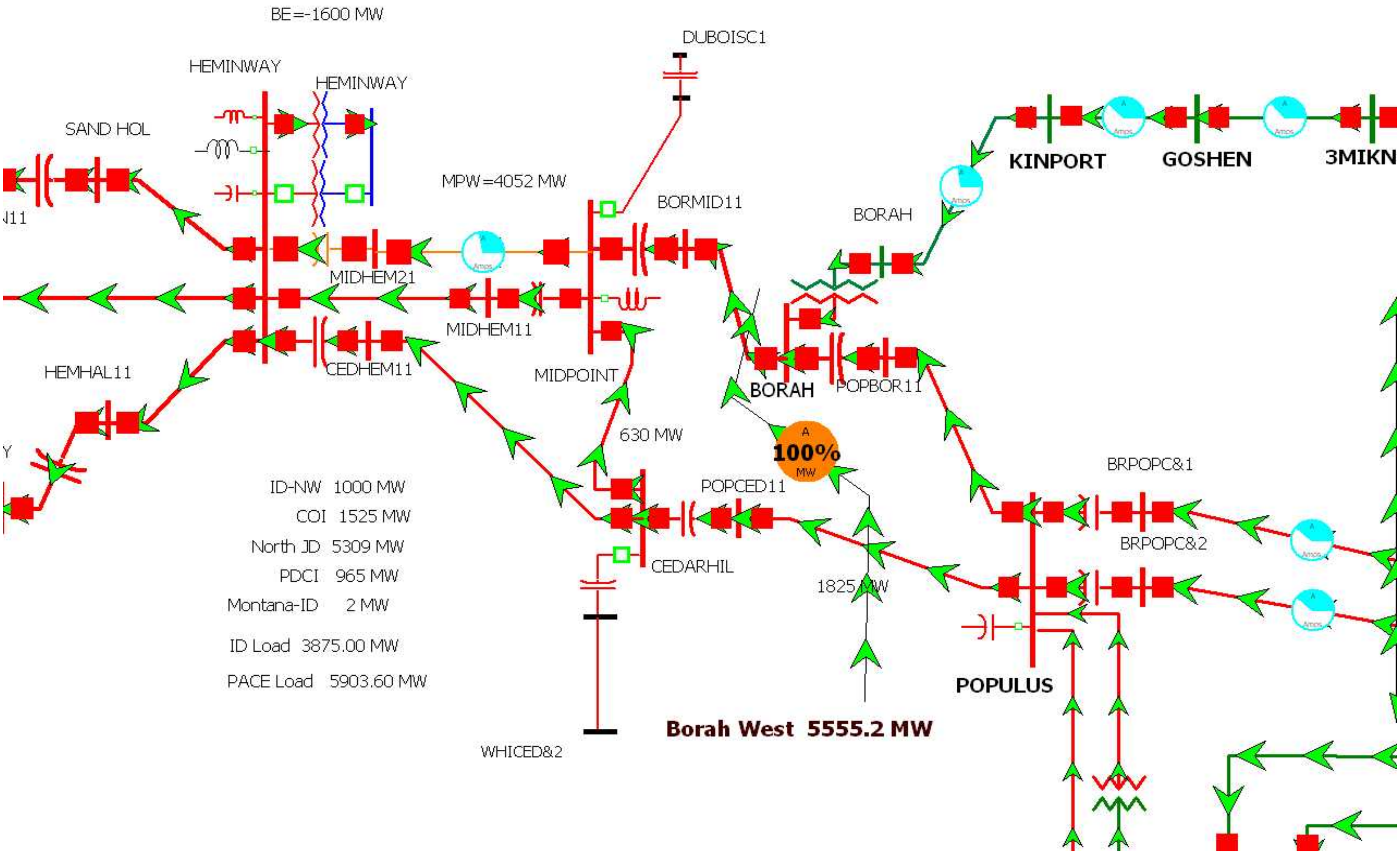

Figure 3. Map of Borah West Path

7.2. Study Cases

The Populus – Midpoint transmission path studies used the same base case developed for the Jim Bridger – Populus transmission study, 15hs1sa_jbw5200_bw5557 (AKA 15hsbrwbow). See Jim Bridger – Populus Study Cases section for base case development description.

Load, resource and path flow conditions simulated in the case are summarized in Table _ and Table _.
Loads and Resources

Case	Bridger Generation (MW)	Hells Canyon Complex Generation (MW)	Idaho Area Load+Losses (MW)	PACE Area Load+Losses (MW)
15hsbrwbow	3670	679	4229	6448
15hsbrwbow + 5%	4011	384	4276	6460

Table _ –Loads and Resources

Path Flows

Case	TOT 4A (MW)	Bridger West (MW)	Monument-Naughton (MW)	Borah West (MW)	Path C (MW)	Midpoint West (MW)	Idaho-Montana (MW)	Montana NW (MW)
Path Capability								
15hsmpw	244	5214	11	5555	680	4051	-2	1179
15hsmpw + 5%	229	5510	15	5836	708	4320	-18	1196

Table _ – Path Flows

The base case was stressed to 5,214 MW on Bridger West and 5,555 MW on Borah West using an Idaho area load of 4,229 MW (includes losses). A one-line diagram for this case is shown in Figure 4. One companion case was developed with 5% additional transfers across both paths by adjusting generation levels at Brownlee and Hells Canyon (case: 15hs_jbw5510_bw5836_5%_stress; AKA 15hsbrwbow + 5%). This case is used to estimate the reactive margin at several buses under critical contingencies. Figure 5 is a one-line drawing of the 5% case.

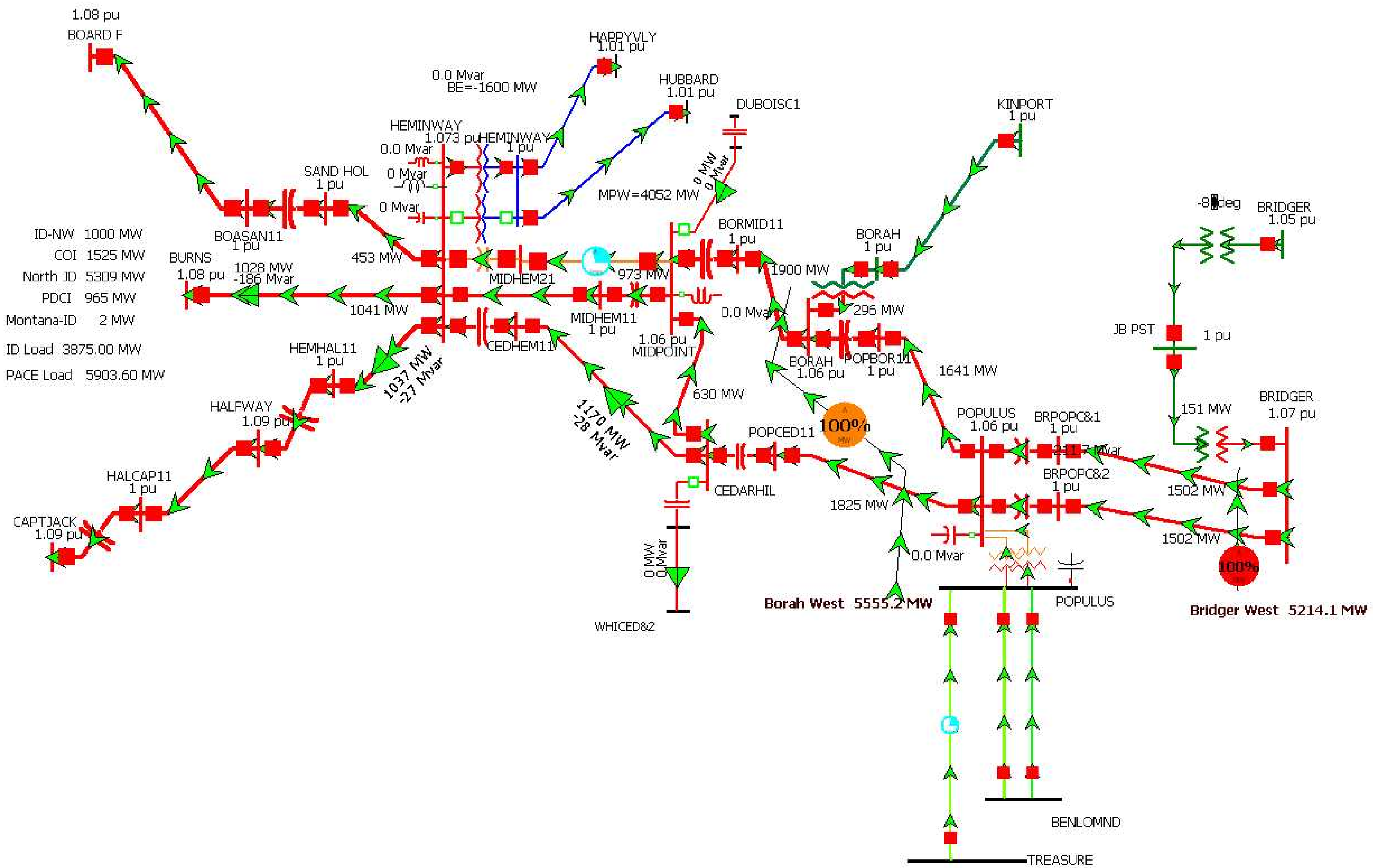

Figure 4 – 15hs1sa_jbw5200_bw5557

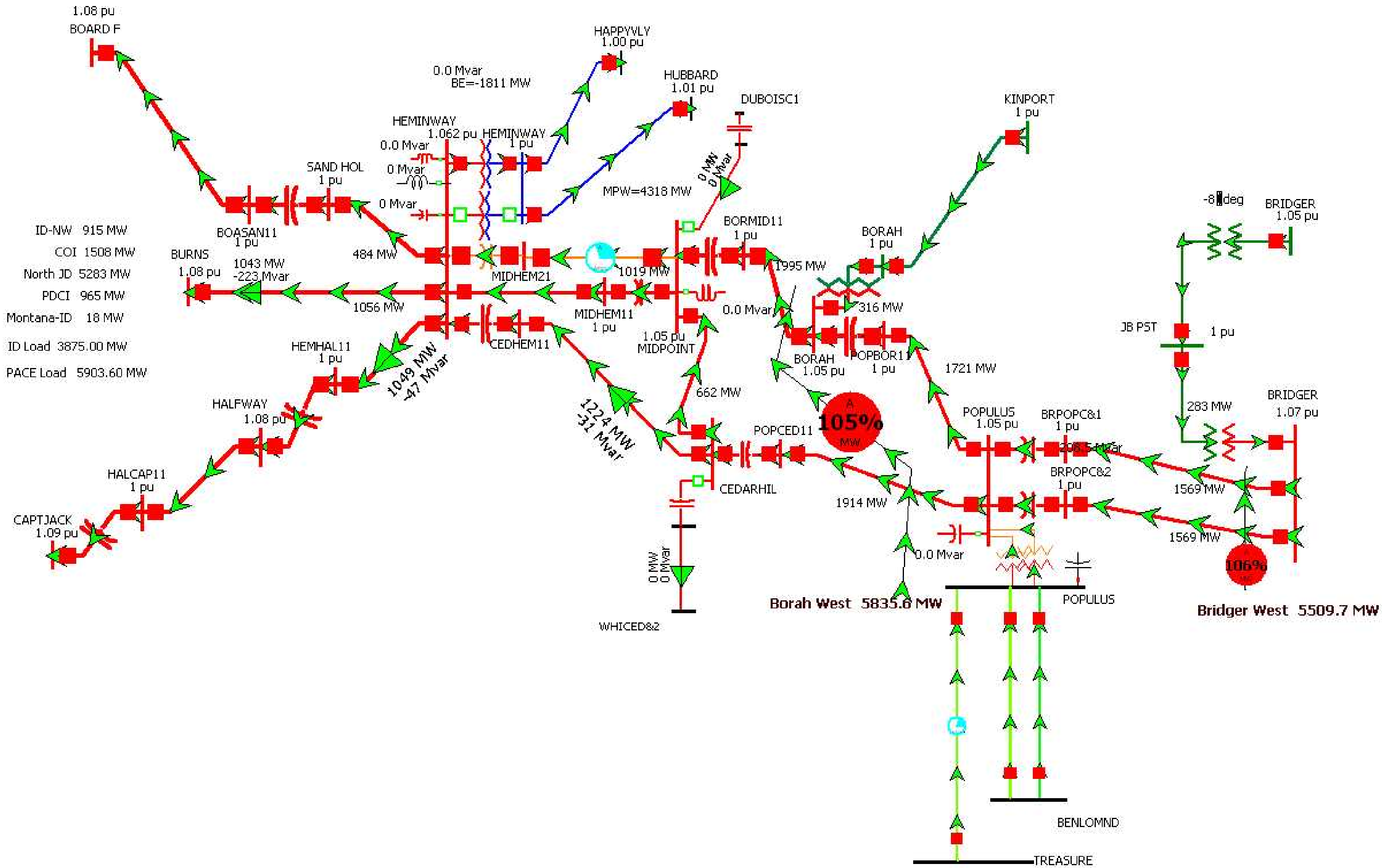

Figure 5 – 15hs_jbw5510_bw5836_5%_stress

7.3. Post-Transient

The 15hs1sa_jbw5200_bw5557 base case was the basis for all post-disturbance results in conjunction with the study of the Bridger West and Borah West paths. Appendix A contains a list of the critical N-1 and N-2 outages. Appendix B contains all the Tables and Figures associated with the post-transient study results. Any element in the study that exceeded 100% of its continuous rating as a result of a contingency is listed in Appendix B. If the element did not exceed post transient loadings greater than 100%, it is not shown in this table. Remedial Action Schemes (RAS) were only used to mitigate for N-2 outages that resulted in exceeding the emergency rating on an element.

The worst four n-1 outages with Bridger West at 5,214 MW and Borah West at 5,555 MW are as follows:

- Outage #20, Borah – Midpoint 500 kV Line
  - Results in a 133% overload to the series capacitor at Cedar Hill (see Figure B1)
- Outage #15, Populus – Cedar hill 500 kV Line
  - Results in a 130% overload to the series capacitor at Borah (parallel 500 kV line to the line opened in contingency) (see Figure B2)
- Outage #42, Midpoint 230/138 kV Transformer
  - Results in a 117% overload to the Hayburn Junction – Paul 138 kV line (see Figure B3)
- Outage #61, Midpoint – Humbolt 345 kV Line
  - Results in a 113% overload to the Ft. Sage phase shifting transformer (see Figure B4)

Post-disturbance contingency results for n-1 studied outages are included in Table B1.

The worst four n-2 outages with Bridger West at 5,214 MW and Borah West at 5,555 MW are as follows (prior to addition of remedial actions):

- Outage #1, Bridger – Populus #1,2 500 kV Lines
  - Outage would not converge (the case converged after remedial actions were applied)
- Outage #7, Borah – Adelaide #2 + Borah-Adelaide-Midpoint #1 345 kV line
  - Results in a 148% overload to the American Falls to Pleasant Valley 138 kV line (see Figure B5)
- Outage #25, Borah – Adelaide #2 345 kV + Borah – Midpoint 500 kV lines
  - Results in a 146% overload to the series capacitor at Cedar Hill (see Figure B6)
  - Results in a 144% overload to the Borah to Adelaide Tap (see Figure B7)
- Outage # 29, Populus – Borah 500 kV + Borah – Midpoint 500 kV + trip Borah 500/345kV transformer (note this contingency is considered a credible outage because of the proposed 500 kV bus arrangement at Borah Substation) [maybe we should fix this configuration to avoid this outage]
  - Results in a 136% overload to the series capacitor at Cedar Hill (see Figure B8)

Post-disturbance contingency results for n-2 studied outages are included in Table B2. The results included in Table B2 are after remedial actions have been applied.

The posted line loadings shown in Tables B1 through B3 correspond to the conductor nominal rating under summer conditions (40 deg C, ambient). Generally emergency ratings for the summer conditions are about 15% higher for lines, 10 to 20% higher for transformers and 35% higher for series capacitors than the nominal continuous rating for the summer time (40 deg C, ambient).

7.4. Reactive Margin

The 15hs1sa_jbw5200_bw5557 base case was the basis for all reactive margin results in conjunction with the study of the Bridger West and Borah West paths. Appendix C contains all the Tables associated with the reactive margin (Q/V) study results.

All of the n-1 outages met Idaho Power's reactive margin requirements of 250 MVAr for 230 kV and 345 kV and 500 MVAr for 500 kV (see Table C1) as well as all of the n-2 outages which met Idaho Power's reactive margin requirements of 200 MVAr for 230 kV and 345 kV and 400 MVAr for 500 kV (see Table C2).

The 5% case similarly showed acceptable reactive margins for the n-1 & n-2 cases. The Risk Assessment outages did not exhibit cascading failures. These results can be found in Tables C3, C4 & C5 respectively.

7.5. Transient Stability

The 15hsbrwbow base case was the basis for all transient stability results in conjunction with the study of the Bridger West and Borah West paths. Appendix D contains all the Tables and Figures associated with the transient stability study results.

All of the N-1 outages resulted in damped and stable performance. The worst recorded N-1 transient voltage dip resulted from the Populus-Cedar Hill 500 kV line outage wherein the Heyburn 138 kV bus and the Adelaide 345 kV bus saw transient voltage dips of 13.8% and 13.7% respectively below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Cedar Hill 500 kV line outage wherein the Milford 46 kV bus saw the frequency dip down to 59.835 Hz. There were no transient voltage dips greater than 20% for the N-1 outages taken. There were no transient frequency dips below 59.6 Hz for the N-1 outages taken.

All of the N-2 outages resulted in damped and stable performance. The worst recorded N-2 transient voltage dip resulted from the Bridger-Populus 500 kV double-line outage wherein the Wolverine Creek 34.5 kV buses saw transient voltage dips as much as 19.88% below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Ben Lomond 345 kV double-line outage wherein the Milford 46 kV bus saw the frequency dip down to 59.834 Hz. There were no transient voltage dips greater than 20% for the N-2 outages taken. There were no transient frequency dips below 59.6 Hz for the N-2 outages taken.

There were no Special Protection Schemes (SPS) employed to achieve damped and stable performance for any of the N-1 outages. There was an assumed SPS for one of the N-2 scenarios - the Bridger-Populus 500 kV double-line outage. In this instance, a 775 MW Bridger #5 unit was tripped to provide the recorded response. While it is clear that the assumed SPS provided a reasonable response to this outage, it is not meant to suggest that this SPS is the only SPS that could be employed to provide a reasonable response. It does suggest, however, that some kind of protection scheme is required to provide damped and stable performance for this outage. Any capacitor/reactor/line switching implemented to achieve improved post-transient results (i.e., improved final voltage and/or thermal results) as part of a special protection scheme in the post-transient analysis was not necessarily implemented in the transient analysis unless required to achieve acceptable dynamic response for the outage under study.

Table D1 and Table D2 provide the results of the transient stability analysis for N-1 and N-2 outages, respectively. Figures D1 through D25 show graphical transient results for the first two largest percentage bus voltage decreases for each outage.

7.6. Critical Outages

Appendix A lists the critical N-1 and N-2 outages.

7.7. Risk Assessment Outages

Risk assessment (marked RA in the listing above) outages were studied to non-cascading operation under failure of the associated remedial action schemes.

7.7.1. Post-Disturbance

Six n-2 outages were studies as part of a Risk Assessment exercise. The post-disturbance results along with their associated failed remedial actions are shown in Table B3.

Study results in Table B3 do not exhibit cascading failures for the six n-2 outages categorized under Risk Assessment.

7.8. Expected Simultaneous Path Interactions

It is expected that there will be simultaneous interactions with surrounding paths that will have to be evaluated during the Phase 2 rating process. The expected paths that may interact with the Borah West path are:

Existing Path C (Path 20)

Gateway South Transmission Project

Path 18, Idaho – Montana

7.9. Study Conclusions / Recommendations

The WECC Phase 1 Rating Study was performed to establish a new preliminary OTC [TTC?] rating for the Borah West path in south central Idaho meeting the WECC Phase 1 guidelines and requirements. The study results indicate that the 5557 MW capability can be achieved under the conditions studied for Borah West. This path is flow limited in that the path is limited by the available resources from the East. No attempt was made to find this path's reliability limits since resources were not available to maximize flows.

8. Midpoint – Hemingway

8.1. Path Description

The existing Idaho Power internally monitored Midpoint West path is comprised of the three 230 kV lines west of Midpoint and the 500 kV line from Midpoint to Burns/Summer Lake and could be listed as follows:

Midpoint-King 230 kV
Midpoint-Rattlesnake 230 kV
Midpoint-Boise Bench 230 kV
Midpoint-Burns-Summer Lake 500 kV
Lower Malad-Mountain Home Junction 138 kV
Upper Salmon- Mountain. Home Junction 138 kV

The current Midpoint West path does not have a published rating, but has a capability of 2487 MW east to west with no rating in the west to east direction.

The proposed plan of service loops the existing Midpoint-Summer Lake 500 kV line through the new Hemingway Substation to yield a Midpoint-Hemingway 500 kV line and a Hemingway-Summer Lake 500 kV line. A second Midpoint-Hemingway 500 kV will be constructed. Additionally, a Cedar Hill - Hemingway 500 kV line is constructed to yield the following proposed path description:

Midpoint-King 230 kV
Midpoint-Rattlesnake 230 kV
Midpoint-Boise Bench 230 kV
Midpoint-Hemingway #1 & #2 500 kV
Cedar Hill-Hemingway 500 kV
Lower Malad-Mountain Home Junction 138 kV
Upper Salmon-Mountain Home Junction 138 kV

A path rating of 5487 MW for the new Midpoint West path will be demonstrated.

8.2. Study Cases

The Midpoint – Hemingway transmission path studies started with the same base case developed for the Jim Bridger – Populus transmission study, 15hs1sa_jbw5200_bw5557 (AKA 15hsbrwbow). See Jim Bridger – Populus Study Cases section for base case development description. The 15hs1sa_jbw5200_bw5557 case was modified by scheduling resources from Sierra and displacing additional generation in the Northwest in order to increase flow across the Midpoint – Hemingway transmission path.

After modification, the 15hs1sa_jbw5200_bw5557 case was left with stressed but reasonable flows on the Midpoint - Hemingway transmission path. This case was named 15hs_mpw_5487a1 (AKA 15hsmpw). The 15hs_mpw_5487a1 case was stressed to 5487 MW on the new Midpoint – Hemingway transmission path. 5487 MW on the Midpoint – Hemingway transmission path represents the non-simultaneous rating for the path.

Load, resource and path flow conditions simulated in the case are summarized in Table _ and Table _.
Loads and Resources

Case	Bridger Generation (MW)	Hells Canyon Complex Generation (MW)	Idaho Area Load+Losses (MW)	PACE Area Load+Losses (MW)
15hsmpw	2120	744	3254	5861
15hsmpw + 2.5%	2120	744	3388	5645
15hsmpw + 5%	2120	744	3190	5547

Table _ –Loads and Resources

Path Flows

Case	TOT 4A (MW)	Bridger West (MW)	Monument-Naughton (MW)	Borah West (MW)	Path C (MW)	Midpoint West (MW)	Idaho-Montana (MW)	Montana NW (MW)
Path Capability								
15hsmpw	180	5176	-15	5335	593	5487	-101	1346
15hsmpw + 2.5%	123	5139	-15	5606	891	5624	-90	1569
15hsmpw + 5%	91	5186	-14	5623	877	5761	-101	1578

Table _ – Path Flows

The 15hs_mpw_5487a1 case has ~3254 MW of load (area load + losses) in Idaho. The one-line diagram for this case is shown in Figure _. The two companion cases with 2.5% and 5% additional transfers on Midpoint West were developed by further increasing the flows beyond the proposed path rating on Midpoint West which are used to estimate reactive margin at several buses under critical contingencies. One-line diagrams for these two cases are presented in Figures _ and _.

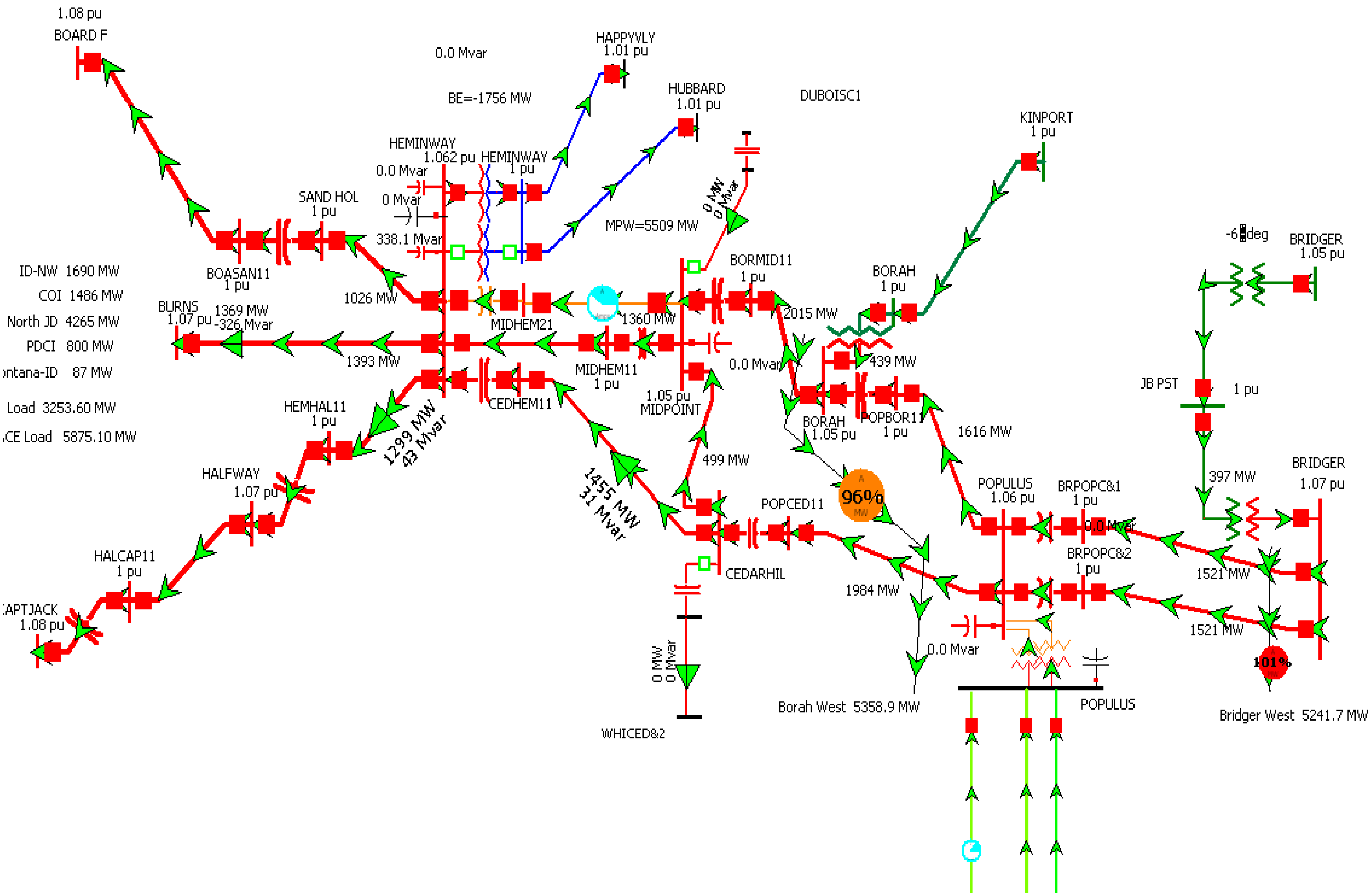

Figure _ 15hs_mpw_5487a1 case

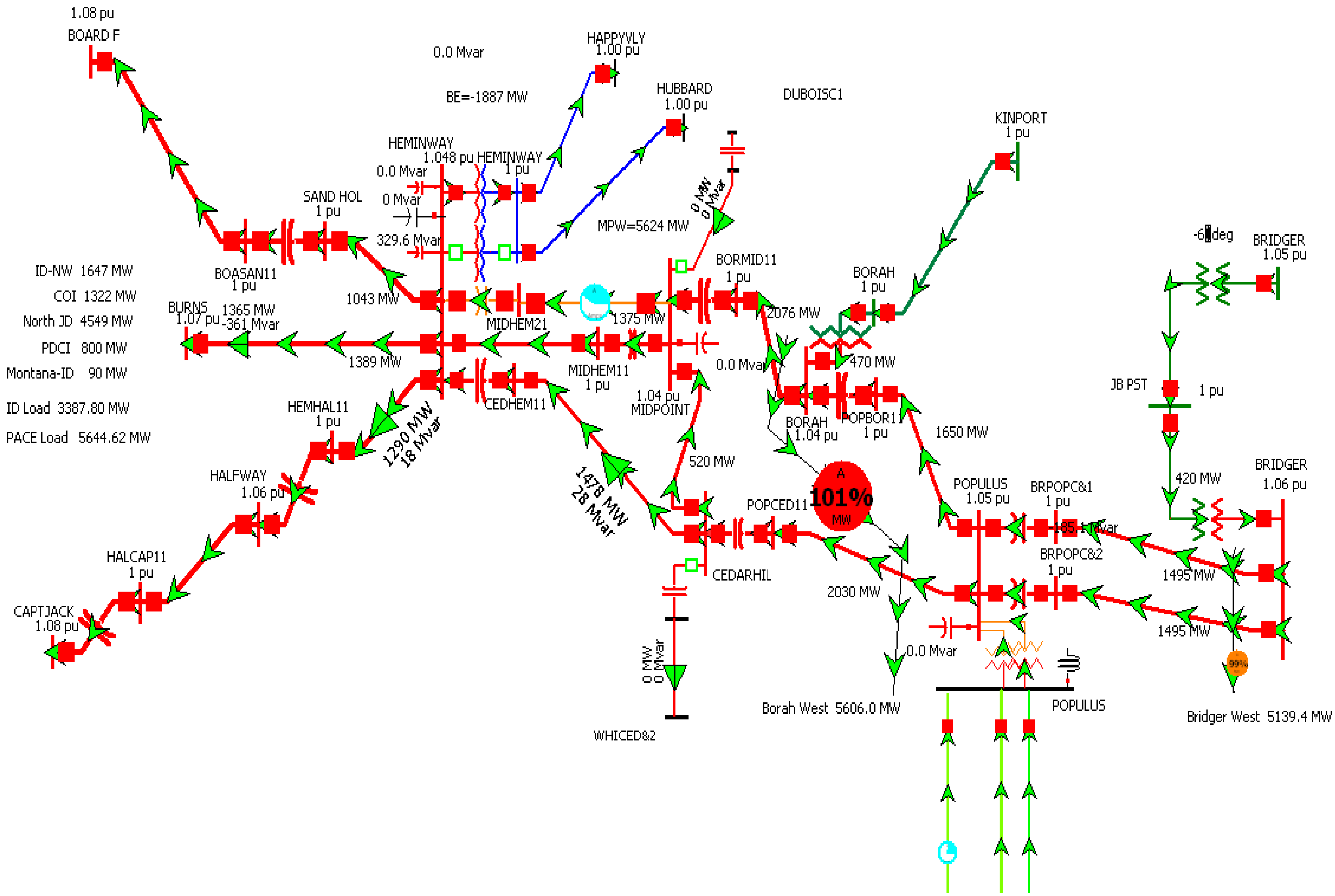

Figure _ 15hs_mpw_5487a1+2.5% case

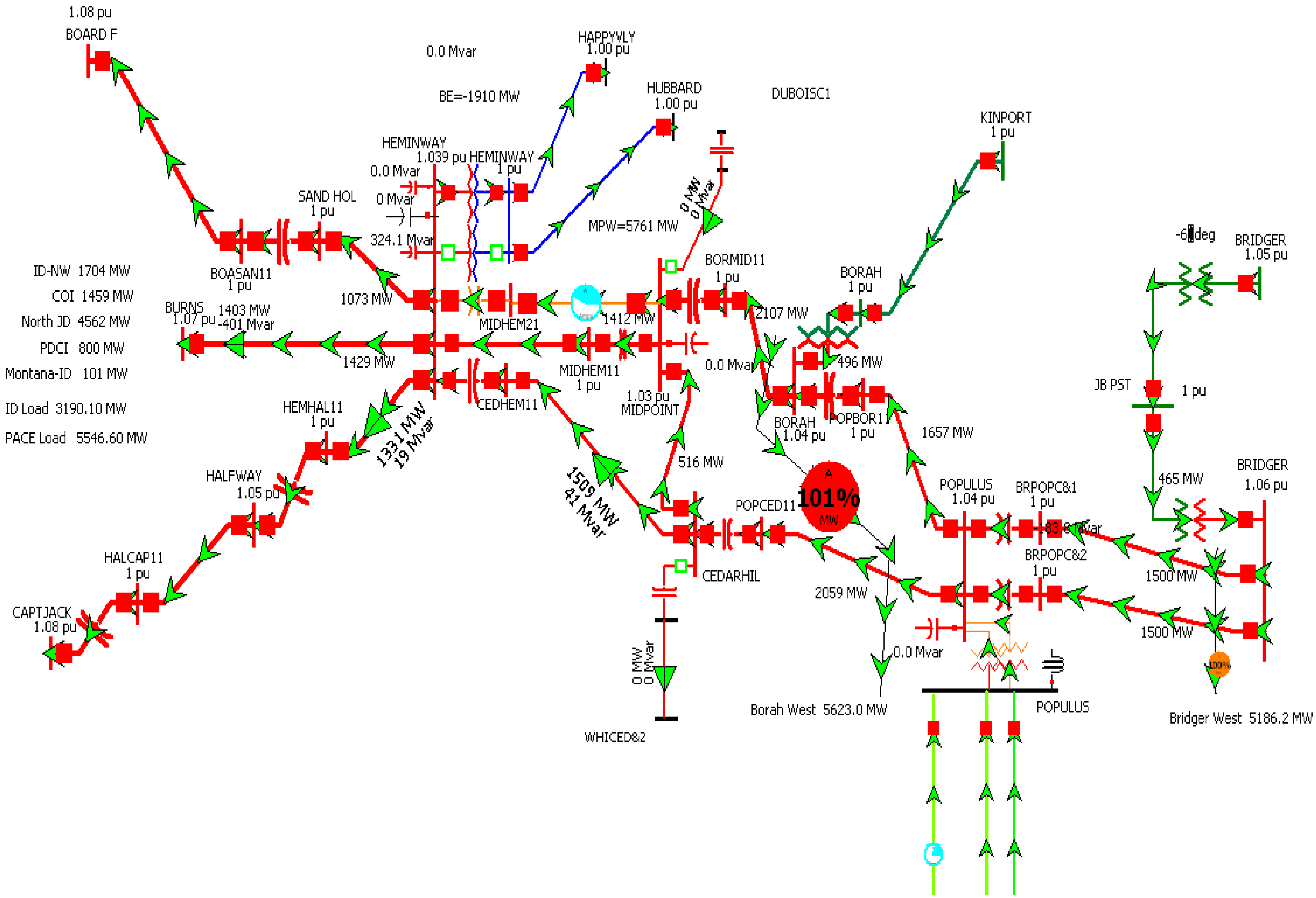

Figure _ 15hs_mpw_5487a1+5% case

8.3. Post-Transient

The 15hs_mpw_5487a1 base case was the basis for all post-disturbance results in conjunction with the study of the Midpoint West path. Appendix A contains a list of the critical N-1 and N-2 outages. Appendix B contains all the Tables and Figures associated with the post-transient study results.

The worst four N-1 outages at the 5487 MW level are the loss of the Borah – Midpoint 500 kV line, Populus – Cedar Hill 500 kV line, Populus – Borah 500 kV line, and 500/230 transformer at Hemigway (outages #20, #15, #12 and #33). Outage #20 results in ~ 135% loading on the series capacitor on parallel Populus – Cedar Hill 500 kV line, see Figure B1. Outage #15 results in ~ 134% loading on the series capacitor on parallel Populus – Borah 500 kV line, see Figure B2. Outage #12 results in ~ 120% loading on the series capacitor on parallel Populus – Cedar Hill 500 kV line, see Figure B3. Outage #33 results in ~124% loading on the series capacitor on 230 kV line Midpoint-Rattlesnake, see Figure B4. Post disturbance contingency results for N-1 studied outages are presented in Table B1.

The limiting N-2 outages are the simultaneous loss of the Borah – Adelaide #2 345kV and Borah – Midpoint 500 kV lines (outage #25) and Bridger – Populus #1,2 500 kV lines (outage #1). Both outages #1 and #25 require tripping a single #5 unit at Bridger as part of remedial actions. Post disturbance contingency results for outage #25 with applying RAS are given in Table B2. Table B2 presents post-disturbance contingency results for all critical N-2 outages.

Notice that the posted line loadings shown in the Excel tables correspond to the conductor nominal rating under summer conditions (40 deg C, ambient). Generally emergency ratings for the summer conditions are about 15% higher for lines, 10% higher for transformers and 35% higher for series capacitors than the nominal continuous rating for the Summer time (40 deg C, ambient).

This is supported [what is supported] by the results presented in the Table B2 and one-line diagrams on Figures B5 and B6. Double Lines Outage (DLO) Midpoint –Borah 500 kV and Midpoint-Adelaide #2 345 kV lines (Outage #25) results in 133% loading on the series capacitor on Populus – Cedar Hill 500 kV line and 115% loading on Borah-Adelaide Tap 345 kV line, see Figure B5. DLO Bridger-Populus #1,2 500 kV Lines (Outage #1) results in 115% loading on the series capacitors on Populus – Borah and Bridger - 3Miknoll 345 kV lines, see Figure B6.

The Risk Assessment outages did not exhibit cascading failures. These results can be found in Appendix _ Table _.

8.4. Reactive Margin

The 15hs_mpw_5487a1 base case was the basis for all reactive margin results in conjunction with the study of the Midpoint West path. Appendix C contains all the Tables associated with the reactive margin (Q/V) study results.

All of the n-1 outages met Idaho Power's reactive margin requirements of 250 MVAr for 230 kV and 345 kV and 500 MVAr for 500 kV (see Table C1) as well as all of the n-2 outages which met Idaho Power's reactive margin requirements of 200 MVAr for 230 kV and 345 kV and 400 MVAr for 500 kV (see Table C2).

The 5% case 15hs_mpw_5487a1+5%) showed positive margin demonstrated for all of the listed N-1s outages (Table C3). The 2.5% case (15hs_mpw_5487a1+2.5%) showed positive margin demonstrated for all of the listed N-2s outages (Table C4).

The Risk Assessment outages did not exhibit cascading failures. These results can be found in Table C5.

8.5. Transient Stability

The 15hs_mpw_5487a1 base case was the basis for all transient stability results in conjunction with the study of the Midpoint West path. Appendix D contains all the Tables and Figures associated with the transient stability study results.

All of the N-1 outages resulted in damped and stable performance. The worst recorded N-1 transient voltage dip resulted from the Populus-Cedar Hill 500 kV line outage wherein the Midpoint 500 kV bus and the Midpoint 34.5 kV bus saw transient voltage dips a bit over 14% below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Kinport 345 kV line outage wherein the Palisade 115 kV bus saw the frequency dip down to 59.850 Hz. There were no transient voltage dips greater than 20% for the N-1 outages taken. There were no transient frequency dips below 59.6 Hz for the N-1 outages taken.

All of the N-2 outages resulted in damped and stable performance. The worst recorded N-2 transient voltage dip resulted from the Bridger-Populus 500 kV double-line outage wherein the Wolverine Creek 34.5 kV buses saw transient voltage dips as much as 18.5% below pre-contingency bus voltages. The worst recorded transient frequency dip resulted from the Populus-Ben Lomond 345 kV double-line outage wherein the Allegheny 138 kV bus saw the frequency dip down to 59.841 Hz. There were no transient voltage dips greater than 20% for the N-2 outages taken. There were no transient frequency dips below 59.6 Hz for the N-2 outages taken.

There were no Special Protection Schemes (SPS) employed to achieve damped and stable performance for any of the N-1 outages. There was an assumed SPS for one of the N-2 scenarios - the Bridger-Populus 500 kV double-line outage. In this instance, a 775 MW Bridger #5 unit was tripped to provide the recorded response. While it is clear that the assumed SPS provided a reasonable response to this outage, it is not meant to suggest that this SPS is the only SPS that could be employed to provide a reasonable response. It does suggest, however, that some kind of protection scheme is required to provide damped and stable performance for this outage. Any capacitor/reactor/line switching implemented to achieve improved post-transient results (i.e., improved final voltage and/or thermal results) as part of a special protection scheme in the post-transient analysis was not necessarily implemented in the transient analysis unless required to achieve acceptable dynamic response for the outage under study.

Table D1 and Table D2 provide the results of the transient stability analysis for N-1 and N-2 outages, respectively. Figures D1 through D25 show graphical transient results for the first two largest percentage bus voltage decreases for each outage.

8.6. Critical Outages

Appendix A lists the critical N-1 and N-2 outages.

8.7. Risk Assessment Outages

Risk assessment (marked RA in the listing above) outages were studied to non-cascading operation under failure of the associated remedial action schemes.

8.7.1. Post-Disturbance

Outages were studies as part of a Risk Assessment exercise. The post-disturbance results along with their associated failed remedial actions are shown in Table B3.

Study results in Table B3 do not exhibit cascading failures for outages categorized under Risk Assessment.

8.8. Expected Simultaneous Path Interactions

It is expected that there will be simultaneous interactions with surrounding paths that will have to be evaluated during the Phase 2 rating process. The expected path that may interact with the Midpoint West path is:

Path 16. Idaho - Sierra

8.9. Study Conclusions / Recommendations

The WECC Phase 1 Rating Study was performed to establish a preliminary OTC [TTC?] rating for the Midpoint West path in south central Idaho meeting the WECC Phase 1 guidelines and requirements. The study results indicate that the 5487 MW capability can be achieved under the conditions studied.