



To: Midpoint-Summer Lake Phase II Review Group Participants

Subject: Completion of Additional Phase II Studies

At the October 31, 2008 PCC meeting, PacifiCorp presented study results for a new nomogram line, with Midpoint-Summer Lake at 550 MW eastbound, on the North of J. Day vs. COI+NW/Sierra or PDCI operating nomogram. Also, in order to be able to operate at higher COI, PDCI, and North of John Day flow levels, equivalent to the Midpoint-Summer Lake 400 MW nomogram line, PacifiCorp agreed to provide, as mitigation, a new 200 MVAR capacitor at the Meridian 500 kV bus for additional reactive margin.

Although study results published and presented in October, 2008 satisfied the requirements of the original Phase II study plan, PacifiCorp was asked, and agreed to with PCC meeting participants on October 31, to do a complete study analysis of three additional simultaneous flow points. These points were: -- 1) Case 1: PDCI flow = 3100 MW, MPSL eastbound flow= 550 MW, and COI flow at a reasonable reduced level; 2) Case 2: COI flow = 4800 MW, MPSL eastbound flow = 550 MW, and PDCI flow at a reasonable reduced level; 3) Case 3: COI flow = 4800 MW, MPSL eastbound flow = 400 MW, and PDCI flow at a reasonable reduced level.

Since October, PacifiCorp spent considerable time making updates to the existing Phase II study model and base cases to achieve the agreed upon flow levels listed above for the three new cases. These new base cases were then sent to the study group in December, providing notice to the group as to the flows and parameters to be used for each case and requesting any comments. Changes were implemented to the base cases and the outage studies commenced in January. This study work has continued over the past two months.

PacifiCorp has completed this study analysis which is summarized in the Phase II Rating Addendum Study Report below. The results of these studies demonstrate that Case 1 and Case 3 meet all of the requirements with the proposed 200 MVAR capacitor at Meridian. However, Case 2 may require some additional mitigation which will be discussed with Bonneville Power Administration. First, the North of John Day path flow will need to be restricted to approximately 7150 MW in order to have adequate reactive margin for the double Palo Verde outage. Second, either the High Generator Tripping scheme must be implemented for double line outages north of Grizzly, or 1.5 miles of the Grizzly-John Day 500 kV #1 line may need to be re-conducted.

PacifiCorp believes that with the original Phase II study work presented October 31, 2008, and with completion of the additional studies agreed to with PCC membership on October 31, 2008, PacifiCorp has satisfied the requirements for Phase II acceptance.

Included below is an approval form for participants to indicate their approval of the technical studies and to provide their comments. Please review this material and return the attached approval form (ballot) within 30 days. Receiving no response will constitute acceptance of the study results. All approval forms will be provided for PCC review when requesting that the project be granted Phase III status.

Please contact me by email if you have any questions or comments about the addendum report.

Gil Coulam
Transmission Planning Engineer
801-220-2954

**Midpoint – Summer Lake 500 kV
West to East 550 MW Phase 2 Rating Study**

Study Result Ballot

After reviewing the Midpoint – Summer Lake 500 kV Line West to East Phase 2 Rating Study technical report (issued 9-30-2008) and the technical report addendum (3-6-2009), I find the technical studies to be:

- Acceptable

- Unacceptable (Please provide comments below.)

Comments: _____

Signature: _____

Study Group Member: _____

Company: _____

Date: _____

**MIDPOINT-SUMMER LAKE
WEST TO EAST
PHASE II RATING PROCESS
ADDENDUM STUDY REPORT**

Introduction:

At the October 31, 2008 PCC meeting, PacifiCorp presented study results for a new nomogram line, with Midpoint-Summer Lake at 550 MW eastbound, on the North of J. Day vs. COI+NW/Sierra or PDCI operating nomogram. Also, in order to be able to operate at higher COI, PDCI, and North of John Day flow levels, equivalent to the Midpoint-Summer Lake 400 MW nomogram line, PacifiCorp agreed to provide, as mitigation, a new 200 MVAR capacitor at the Meridian 500 kV bus for additional reactive margin.

At the meeting, a request was made by California utilities for some additional studies to be performed at maximum COI flow and maximum PDCI flow. The three specific cases that were agreed upon at the meeting are -- 1) Case 1: PDCI flow = 3100 MW, MPSL eastbound flow = 550 MW, and COI flow at a reasonable reduced level; 2) Case 2: COI flow = 4800 MW, MPSL eastbound flow = 550 MW, and PDCI flow at a reasonable reduced level; 3) Case 3: COI flow = 4800 MW, MPSL eastbound flow = 400 MW, and PDCI flow at a reasonable reduced level. Each of these cases was derived from previous base cases used in the original Midpoint-Summer Lake Phase II studies¹. After these three new base cases were developed, they were then sent out to the Phase II review group for comments prior to doing the outage analysis. Comments from this review were incorporated into the cases. These were fairly minor changes including 230 kV representation changes in the LADWP area, a line reactor on the Maxwell-Tracy 500 line, adjusting the harmonic filters at Celilo (cases 2 and 3), and adjusting the reactive output at several Northwest generators. This report provides a description of these three new cases and a summary of the study results. The same study criteria and outages that were used in the original studies have also been used with the new base cases.

Base Cases:

Case 1 (Maximum PDCI, Maximum MPSL, Lower COI):

PDCI = 3100 MW, MPSL eastbound = 550 MW, NW-ID = 1200 MW, COI = 3554 MW, North of J.Day = 7417 MW.

In this case (labeled as case 701b in the studies), the flow on the Pacific DC bipole was adjusted to increase the flow to 3100 MW. The flow on the California-Oregon Intertie (COI) was reduced in the process, and the flows from the Northwest to Idaho were adjusted to achieve the desired flow levels. A diagram of this case is included in Attachment 1.

Case 2 (Maximum COI, Maximum MPSL, Lower PDCI):

COI = 4800 MW, MPSL eastbound = 550 MW, NW-ID = 1200 MW, PDCI = 1700 MW, North of J.Day = 7411 MW.

¹ Original Midpoint-Summer Lake cases were derived from the WECC 07HS3 base case. For a complete description of the original cases, please refer to the original Phase II report, dated 7/21/2008.

In this case (labeled as case 801b in the studies), the flow on the Pacific DC bipole was adjusted to decrease the flow to 1700 MW. The reduction in the PDCI schedule resulted in a greater flow on the COI path. Some additional re-dispatching was done to get the desired flow levels on the COI, Midpoint-Summer Lake, and NW-ID paths. A diagram of this case is included in Attachment 1.

Case 3 (Maximum COI, Lower MPSL, Lower PDCI):

COI = 4800 MW, MPSL eastbound = 400 MW, NW-ID = 1090 MW, PDCI = 1700 MW, North of J. Day = 7283 MW.

In this case (labeled as case 901b in the studies), the flow on the Pacific DC bipole was again adjusted to decrease the flow to 1700 MW in order to increase flow on the COI path. Some additional re-dispatching was done to get the desired flow levels on the COI, Midpoint-Summer Lake, NW-ID paths. A diagram of this case is included in Attachment 1.

Study Results:

Case 1 (701b) Maximum PDCI, Maximum MPSL, Lower COI:

Post-Transient Results: As in the previous study work, the limiting N-1 contingency is the loss of the Midpoint-Summer Lake 500 kV line itself. Loss of this line loads the Lolo-Imnaha 230 kV line to 98.8% of the emergency rating and the Brownlee-Hells Canyon 230 kV line to 93.3% of the emergency rating. These results are acceptable. The post-transient voltage deviations are also similar to previous study points with 9.0% and 8.7% at the Peterson Flat 230 kV bus and the Amps 69 kV bus respectively. The Big Grassy 69 kV bus also has a 6% delta V. Similar post-transient voltage deviations were accepted by the facility owners in the original studies.

Loss of the Captain Jack-Olinda 500 kV line loads the Copco-Weed Jct 115 kV line to 109% which is within the short-term emergency rating. Loss of the Dworshak-Hatwai 500 kV line results in a voltage deviation of 7.1% at Peterson Flat 230 bus and loss of the Wallula-McNary 230 kV line results in a 6.2% voltage change at Dodd Rd 69 kV bus. These results are accepted by the facility owners. The loss of the Pacific DC bipole outage with the northwest RAS, including the Fast AC Reactive Insert (FACRI) scheme and 2400 MW of northwest generator tripping results in acceptable results.

As for N-2 outages, loss of the Lolo-Oxbow and the Brownlee-Hells Canyon 230 kV lines results in loading the Roundup-McNary 230 kV line to 113.8% of the continuous rating. These results are similar to the results in the original study where the owner was willing to accept this level of overload considering the short-term emergency rating which was not listed in the base case data. Also, the loss of the two Malin-Round Mtn 500 kV lines results in loading the Copco-Weed Jct 115 kV line to 112.7% of the continuous rating which is acceptable considering the short-term emergency rating.

As in the previous studies, loss of the Grizzly-Malin and the Grizzly-Summer Lake 500 kV lines results in loading the Redmond-Round Butte 230 kV line to 110% of the continuous rating. In the original studies the owners were willing to accept this loading level considering the short-term emergency line rating. A breaker failure at Summer Lake, resulting in the loss of the 500 kV station, loads the Lolo-Imnaha 230 kV line to

100.8% (marginal). At this flow level, the Copperfield 230 kV series reactor would likely switch in and reduce the flow on this line to acceptable levels.

The loss of the Bridger-Goshen and Bridger-Kinport 345 kV lines results in low voltage (82%) at the Peterson Flat 230 kV bus which would result in tripping 13 MW of load at that bus. The voltage deviation at this bus is 13.8% before load tripping. Idaho Power has seen similar results in other studies and is working with the Path 18 and Bridger owners to resolve this issue. The voltage deviation of 12% at the Amps 69 kV bus is accepted by PacifiCorp. These results are more a function of Bridger West and Path 18 simultaneous flows rather than a function of Midpoint-Summer Lake 500 kV line flow.

Also, the loss of the two Garrison-Taft 500 kV lines results in marginal voltage levels at the Peterson Flat 230 kV bus unless generation is tripped at Colstrip. The original studies showed that with Montana to the Northwest flow levels of >600 MW, one Colstrip unit would trip for this double line outage. Tripping a Colstrip unit produces acceptable results. For the double Palo Verde unit outage the post-transient results are acceptable. A summary of all the post-transient study results are in Table MPSL-701b in Appendix 2.

QV Study Results: Reactive margin study results conducted by Bonneville Power Administration (BPA) engineers showed minimum reactive margins in the northwest of 316 MVAR for the double Palo Verde unit outage, 656 MVAR for the double Diablo Canyon unit outage, and 1369 MVAR for the PDCI bipole outage with existing northwest remedial action. Therefore the reactive margin results are acceptable for this case. The reactive margin study results are included in Appendix 3.

Dynamic Study Results: All of the transient stability results were well damped and met all WECC/NERC Planning Standards (see summary of results in Appendix 2 and plots in Appendix 4).

Case 2 (801b) Maximum COI, Maximum MPSL, Lower PDCI:

Post-Transient Results: N-1 outage results are similar to previous study points. Loss of the Midpoint-Summer Lake 500 kV line loads the Brownlee-Hells Canyon 230 kV line to 100% (marginally acceptable) and the Lolo-Imnaha 230 kV line to 98.2% (acceptable). The post-transient voltages for this outage are 9.4% and 9.2% for Peterson Flat 230 kV bus and the Amps 69 kV bus respectively. Big Grassy 69 kV bus has a delta V of 6.1%. All of these voltage deviations are considered acceptable by the owners (as in original studies). Loss of the Lolo-Oxbow 230 kV line results in loading the Brownlee-Hells Canyon 230 kV line to 99.4% of the emergency limit which is acceptable.

Loss of the Capt. Jack-Olinda 500 kV line results in loading the Copco-Weed Jct. 115 kV line to 114% of the continuous rating with a voltage deviation of 8.6% at the Mt. Shasta 69 kV bus. This is acceptable for a short period since the Weed Jct 115 kV phase shifter can be used to decrease the flow on the 115 kV line. The resultant flow on the Malin-Round Mt #2 line is 99.5% of the emergency rating (acceptable). Loss of the Dworshak-Hatwai 500 kV line results in a voltage change of 5.8% at Peterson Flat 230 kV bus which is acceptable to the owners.

Loss of the Wallula-McNary 500 kV line results in a 6.5% voltage change at the Cold Sprg 69 kV bus and the loss of the Grizzly-Capt. Jack 500 kV line results in a 5.7% voltage change at the Northcst 69 kV bus. These are acceptable to the facility owners. Loss of the PDCI bipole with northwest remedial action, including 1550 MW of northwest generator tripping, gives acceptable results.

As for N-2 outages, Loss of the Grizzly-J.Day #2 and the Grizzly-Buckley 500 kV lines, with Low Northwest Generator Tripping (1400 MW), results in overloading the Grizzly-J.Day #1 500 kV line to 123% of the continuous rating and exceeds the emergency rating (unacceptable). With High Northwest Generator Tripping (2400 MW) the #1 line loads to only 112% of the continuous rating (acceptable). A solution to this overload of either using the High Generator Tripping Scheme or re-conductoring 1.5 miles of 500 kV line will be worked out with Bonneville Power.

Loss of the two Malin-Round Mtn 500 kV lines results in loading the Copco-Weed Jct 115 kV line to 121.7% of the continuous rating. This is acceptable to the owners for a short period as the Weed Jct 115 kV phase shifter can be used to reduce the flow on this line. A breaker failure at Summer Lake, resulting in the loss of the 500 kV station, loads the Brownlee-Hells Canyon 230 kV line to 101% of its emergency rating (marginal). The Lolo-Imnaha 230 kV line also loads to 99.9% of the emergency rating. Also a breaker failure at Midpoint resulting the loss of the 500/345 kV transformer and the Midpoint-Adelaide-Borah 345 kV line, as well as the Midpoint-Summer Lake 500 kV line and the Midpoint-Boisebench #2 230 kV line double line outage, would load the same two 230 kV lines to near 100%. Idaho Power has indicated that the Brownlee and Oxbow hydro generation will likely pick up on control for these outages, which will reduce the line overloads. Therefore these results are considered acceptable.

Loss of the Lolo-Oxbow and the Brownlee-Hells Canyon 230 kV lines results in the operation of the FACRI scheme in the northwest. The loading of the Roundup-McNary 230 kV line goes to 107% of the continuous rating. This result is similar to the results in the original study where the owner was willing to accept this level of overload considering the short-term emergency rating which was not in the base case data. Loss of the Grizzly-Malin and the Grizzly-Summer Lake 500 kV lines results in loading the Redmond-Round Butte 230 kV line to 102% of the continuous rating. Although not listed in the base case data, this should be within the short-term emergency line rating.

As in case 1, the loss of the Bridger-Goshen and Bridger-Kinport 345 kV lines results in low voltage (81%) at the Peterson Flat 230 kV bus which would result in tripping 13 MW of load at that bus. The voltage deviation at this bus is 14.1% before load tripping. Idaho Power has seen similar results in other studies and is working with the Path 18 and Bridger owners to resolve this issue. The voltage deviation of 12.7% at the Amps 69 kV bus will also need to be resolved in these discussions. These results are more a function of Bridger West and Path 18 simultaneous flows rather than a function of Midpoint-Summer Lake flow.

For the double Palo Verde unit outage, the post-transient results are acceptable. A summary of these study results are in Table MPSL-801b in Appendix 2.

QV Study Results: Reactive margin study results were conducted by BPA. These study results showed a negative reactive margin (unacceptable) in the northwest for the double Palo Verde unit outage with the North of J.Day flow at 7411 MW, even after removing the 150 MVAR reactor and adding the proposed 200 MVAR capacitor at the Meridian 500 kV bus. The minimum reactive margin was 194 MVAR for the double Diablo Canyon unit outage and 1174 MVAR for the PDCI bipole outage without any additional action at the Meridian bus.

When the North of J.Day flow was reduced to 7190 MW, there was a minimum reactive margin of 142 MVAR (marginally acceptable) for the double Palo Verde unit outage and 535 MVAR for the double Diablo unit outage after removing the 150 MVAR reactor and adding a new 200 MVAR capacitor at the Meridian 500 kV bus. The reactive margin is 1190 MVAR for the PDCI bipole outage without any additional action at the Meridian bus. These results show a reactive margin limitation for North of J.Day flow greater than approximately 7150 MW.

Dynamic Study Results: All of the transient stability results were well damped and met all WECC/NERC Planning Standards (see summary of results in Appendix 2 and plots in Appendix 4).

Case 3 (901b) Maximum COI, MPSL=400 MW, Lower PDCI:

Post-Transient Results: As with the other cases, the critical single contingency is loss of the Midpoint-Summer Lake 500 kV line. This results in loading the Lolo-Imnaha 230 kV line to 93% of the emergency rating (acceptable). The post-transient voltage deviation is 6.6% at the Peterson Flat 230 bus and the Amps 69 bus. These are acceptable to the owners. Loss of the Capt. Jack-Olinda 500 kV line loads the Copco-Weed Jct 115 kV line to 114% of the continuous rating with a post-disturbance voltage change of 8% at Mt. Shasta 69 bus. This is acceptable for a short period as the Weed Jct phase shifter can be adjusted to resolve the overload. Loss of the Wallula-McNary 230 kV line results in a 7% voltage change at the Dodd Rd 69 bus. This is accepted by the owners. Loss of the Dworshak-Hatwai 500 kV line results in a voltage change of 5.7% at Peterson Flat 230 bus which is acceptable to the owners. Loss of the PDCI bipole with northwest remedial action, including 1550 MW of northwest generator tripping, gives acceptable results.

As for the N-2 outages, the loss of the two Malin-Round Mtn 500 kV lines results in loading the Copco-Weed Jct 115 kV line to 122% of the continuous rating. This is acceptable for a short period as the Weed Jct phase shifter can be used to reduce the flow. Loss of the Grizzly-J.Day #2 and the Grizzly-Buckley 500 kV lines, with Low Northwest Tripping (1400 MW), results in loading the remaining Grizzly-J.Day line to 119% of the continuous rating (marginal). With High Northwest Generator Tripping the result is 110% of the continuous rating (acceptable).

Loss of the Lolo-Oxbow and the Brownlee-Hells Canyon 230 kV lines causes the FACRI scheme to operate. The resultant flow on the Roundup-McNary 230 kV line is 104.5% of the continuous rating (acceptable to owners considering the short-term overload rating). Loss of the Grizzly-Malin and the Grizzly-Summer Lake 500 kV lines results in loading the Redmond-Round Butte 230 kV line to 101.7% of the continuous rating, which is acceptable to the owners based on the short-term capability of the line.

As in the other two cases, the loss of the Bridger-Goshen and Bridger-Kinport 345 kV lines results in low voltage (81%) at the Peterson Flat 230 bus which would result in tripping 13 MW of load at that bus. The voltage deviation at this bus is 14.1% before load tripping. Idaho Power has seen similar results in other studies and is working with the Path 18 and Bridger owners to resolve this issue. The voltage deviation of 12.5% at the Amps 69 kV bus will also need to be resolved in these discussions. These results are more a function of Bridger West and Path 18 simultaneous flows rather than a function of Midpoint-Summer Lake 500 kV line flow.

For the double Palo Verde unit outage the post-transient results are acceptable. A summary of these study results are in Table MPSL-901b in Appendix 2.

QV Study Results: Reactive margin study results conducted by BPA engineers showed minimum reactive margins in the northwest of 95 MVAR (low) for the double Palo Verde unit outage, 498 MVAR for the double Diablo Canyon unit outage, and 1186 MVAR for the PDCI bipole outage with existing northwest remedial action plus switching out the Meridian 150 MVAR reactor. If a 200 MVAR reactor is also switched in at the Meridian 500 kV bus, the reactive margins are: 333 MVAR for the double Palo Verde unit outage and 685 MVAR for the double Diablo Canyon unit outage. Thus the reactive margin would be acceptable with the addition of reactor switching and the proposed new 200 MVAR capacitor at the Meridian 500 kV bus. The reactive margin study results are included in Appendix 3.

Dynamic Study Results: All of the transient stability results were well damped and met all WECC/NERC Planning Standards (see summary of results in Appendix 2 and plots in Appendix 4).

Conclusions:

1. With COI reduced to 3550 MW, it is possible to operate the Midpoint-Summer Lake line to 550 MW in the eastbound direction simultaneously with PDCI at its maximum north to south limit of 3100 MW without any additional mitigation.
2. With PDCI reduced to 1700 MW, COI flow at 4800 MW, north of John Day flow at 7283 MW and Midpoint-Summer Lake eastbound flow at 400 MW, there is adequate reactive margin (333 MVAR) for the double Palo Verde unit outage. This requires tripping the Meridian 150 MVAR reactor and switching in the proposed 200 MVAR capacitor at Meridian.
3. With PDCI reduced to 1700 MW, COI flow at 4800 MW, the Midpoint-Summer Lake eastbound flow at 550 MW and north of John Day limited to 7190 MW, there is marginal reactive margin (142 MVAR) for the double Palo Verde unit outage. This includes switching out the 150 MVAR reactor and switching in the proposed 200 MVAR capacitor at the Meridian 500 kV bus with FACRI.
4. Operating COI at 4800 MW and Midpoint-Summer Lake at 550 MW may require the re-conductoring of 1.5 miles of the Grizzly-J.Day #1 500 kV line or using the High Generator Tripping Scheme to accommodate N-2 outages north of Grizzly.

North of John Day flow will also need to be limited to less than 7150 MW to have adequate reactive margin.

5. With COI at 4800 MW, increasing the eastbound flow on MPSL from 400 MW to 550 MW impacts the reactive margin in the northwest by about 190 MVAR for the double Palo Verde unit outage. Adding a 200 MVAR capacitor at Meridian to the FACRI scheme provides the necessary reactive margin to mitigate this impact.
6. The Bridger post-transient voltage deviations are a function of high southbound Path 18 flow and Bridger West flow only. As long as Path 18 is at its limit, the problems will occur for the Bridger N-2 regardless of the Midpoint-Summer Lake line flow. This problem will need to be resolved as a separate issue from this rating study.