NORTHERN TIER
TRANSMISSION GROUP

# NTTG 2019 Q7 Stakeholder Meeting

Bozeman, Montana

September 26, 2019

# NTTG 2018-2019 Planning Cycle Q7 Milestones

# NTTG Q7 Stakeholder Meeting

| Agenda | |
|---|---|
| 10:00 – 10:15 | **WELCOME AND AGENDA REVIEW** |
| | **2018-2019 DRAFT FINAL REGIONAL TRANSMISSION PLAN (DFRTP)** |
| 10:15 – 10:45 | • Stakeholder comments, NTTG's responses and revisions to the Plan |
| 10:45 – 11:20 | • NTTG 2019 Economic Study Request |
| 11:20 – 11:30 | **WECC ANCHOR DATA SET UPDATE** |
| 11:30 – 11:50 | **NEIGHBORING PLANNING REGION UPDATES** |
| 11:50 – 12:00 | **NEXT STEPS/ STAKEHOLDER COMMENTS/ OTHER BUSINESS** |
| 12:00 | **ADJOURN** |

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# 2018-2019 Draft Final Regional Transmission Plan

Bozeman, Montana

September 26, 2019

# Stakeholder Comments and NTTG's Response

- NTTG's Draft Final Regional Transmission Plan was posted for stakeholder comment during Q7
- One set of comments were received from TransCanada
- NTTG has reviewed and responded to each comment. These comments and NTTG's responses are posted on the NTTG website
- Based on the comments, changes were incorporated into the Draft Final RTP.

# Draft Final Regional Transmission Plan Revisions

- In August, the Planning Committee voted to approve NTTG's responses to the stakeholder comments and to support the subsequent revisions to the plan

  – Link to Stakeholder comments and NTTG's response
  – Link to Draft Final RTP

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# NTTG 2019 Economic Study Request

Bozeman, Montana

September 26, 2019

# 2019 Annual Economic Study Request (ESR)

- One (1) Economic Study Request was submitted during the 2019 Annual ESR window by Joint Parties
- The request was to study replacing 500 kV Gateway West and South project segments with 345 kV construction.
- Studies were performed on the eight powerflow cases used to develop the dRTP. A sensitivity was also run on one PPC case.

# ESR Study

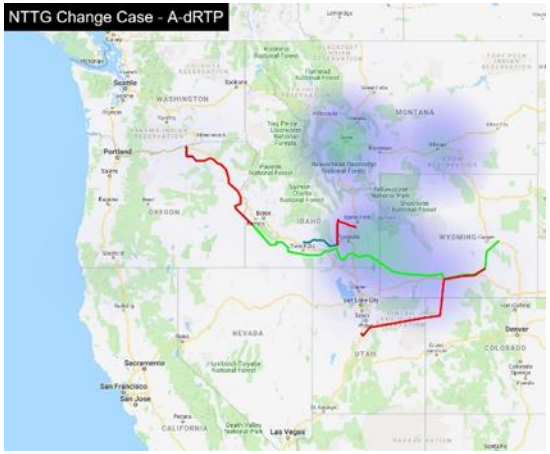
- Transmission Configuration Studied
  - Two 345 kV circuits  between Aeolus and Anticline  (154 Miles)
  - One 345 kV circuit between Anticline and Bridger (5 Miles)
  - Two series compensated  345 kV circuits between Anticline and Populus (203 Miles)
  - A single series compensated 345 kV circuit between Populus and Midpoint (153 Miles)
  - A single series compensated 345 kV circuit between Midpoint and Hemingway (130 miles)
  - With two Hemingway 345/500 kV transformers (700 MVA each) using 1272 kcm two conductor bundled H-frame construction

# ESR Study

- For the studied conditions, the ESR appears to perform acceptably.
- However, the ESR configuration changes the flows and support of the Wasatch Front and the Utah area in general.

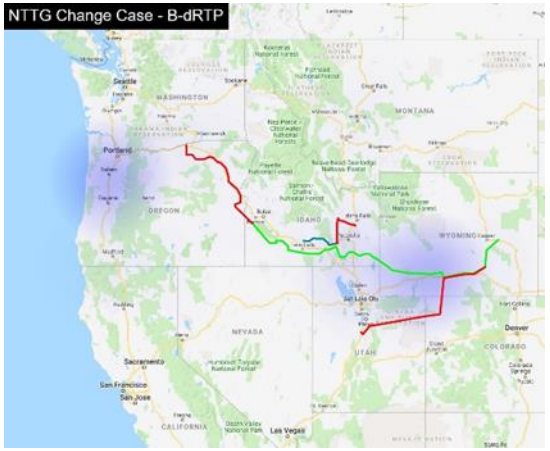
# ESR Study

## Case A – Heavy Winter



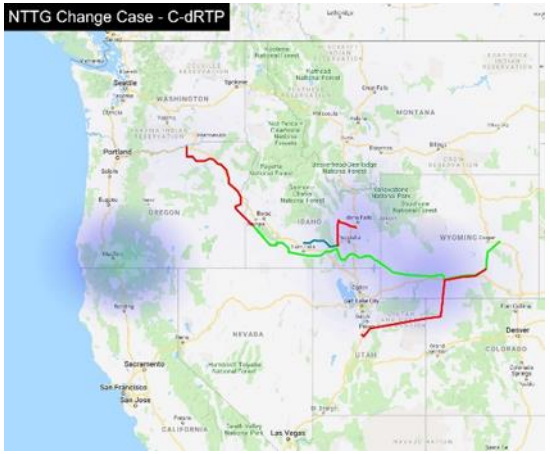


## Case B – Heavy Summer



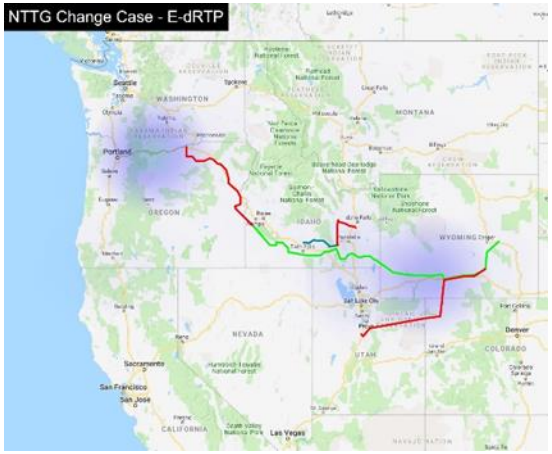

# ESR Study

Case C – Heavy Winter





Case E – High Tot2/COI

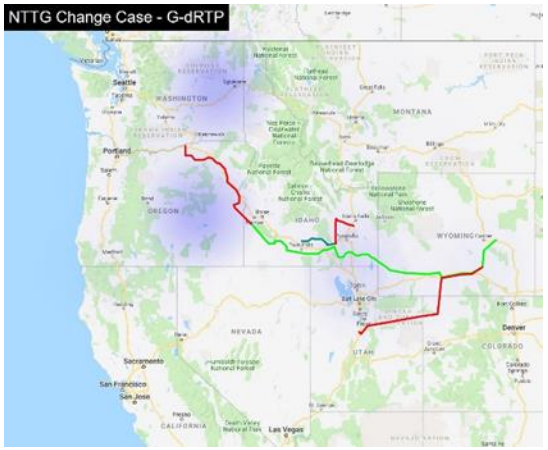



# ESR Study

## Case F – High Wyoming Wind

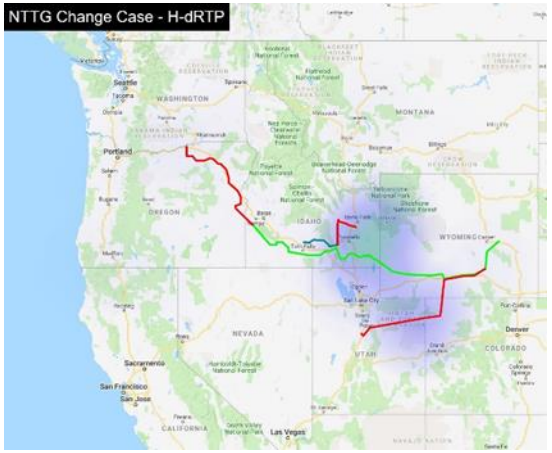


## Case G – High Borah West



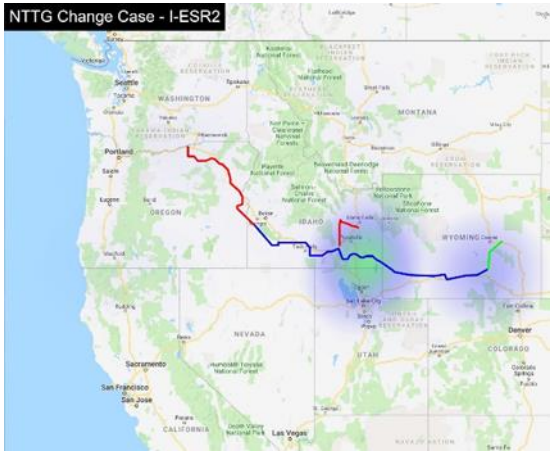

# ESR Study

## Case H – High NTTG Import





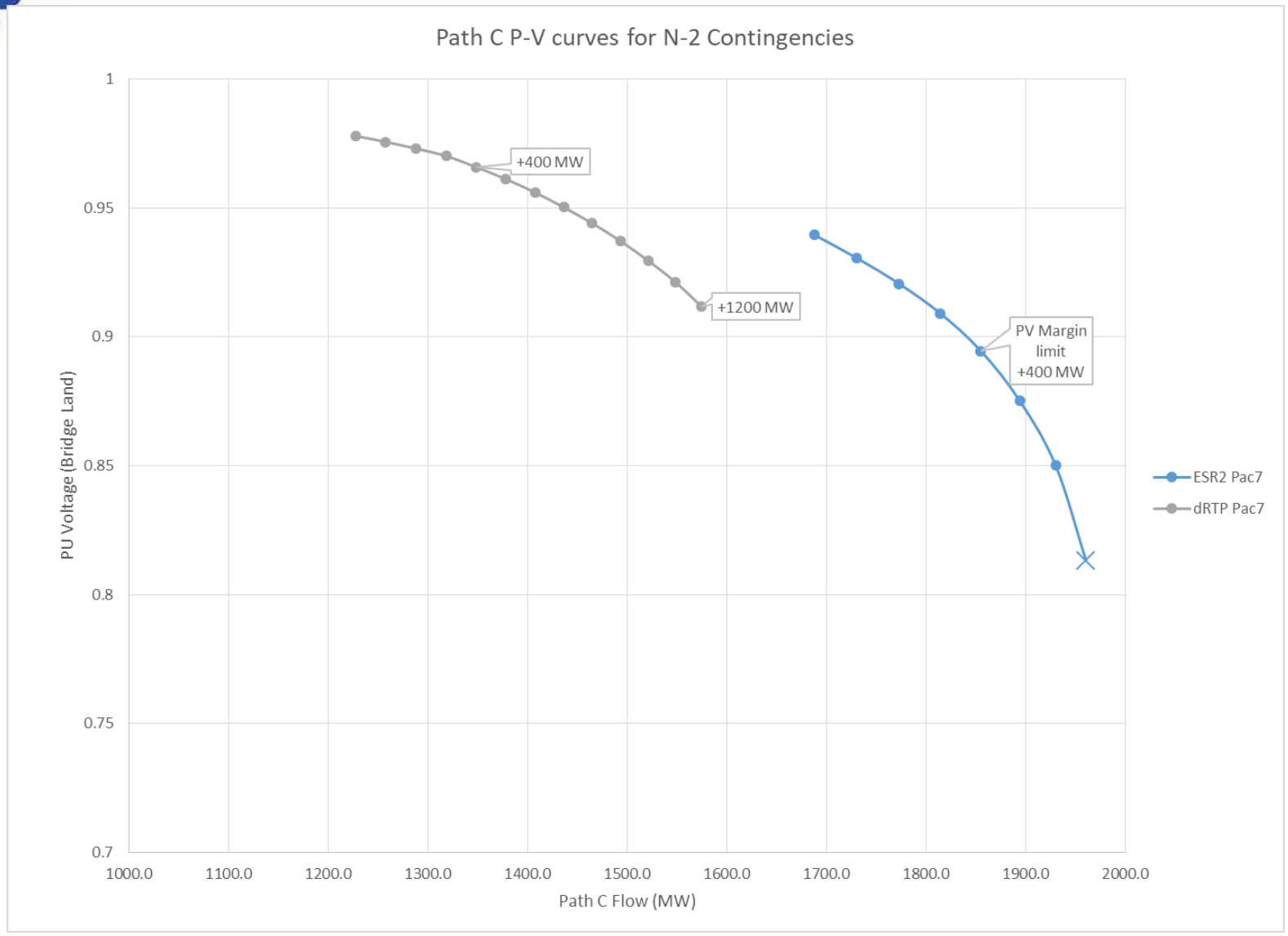
## Case I – High Aeolus West and South

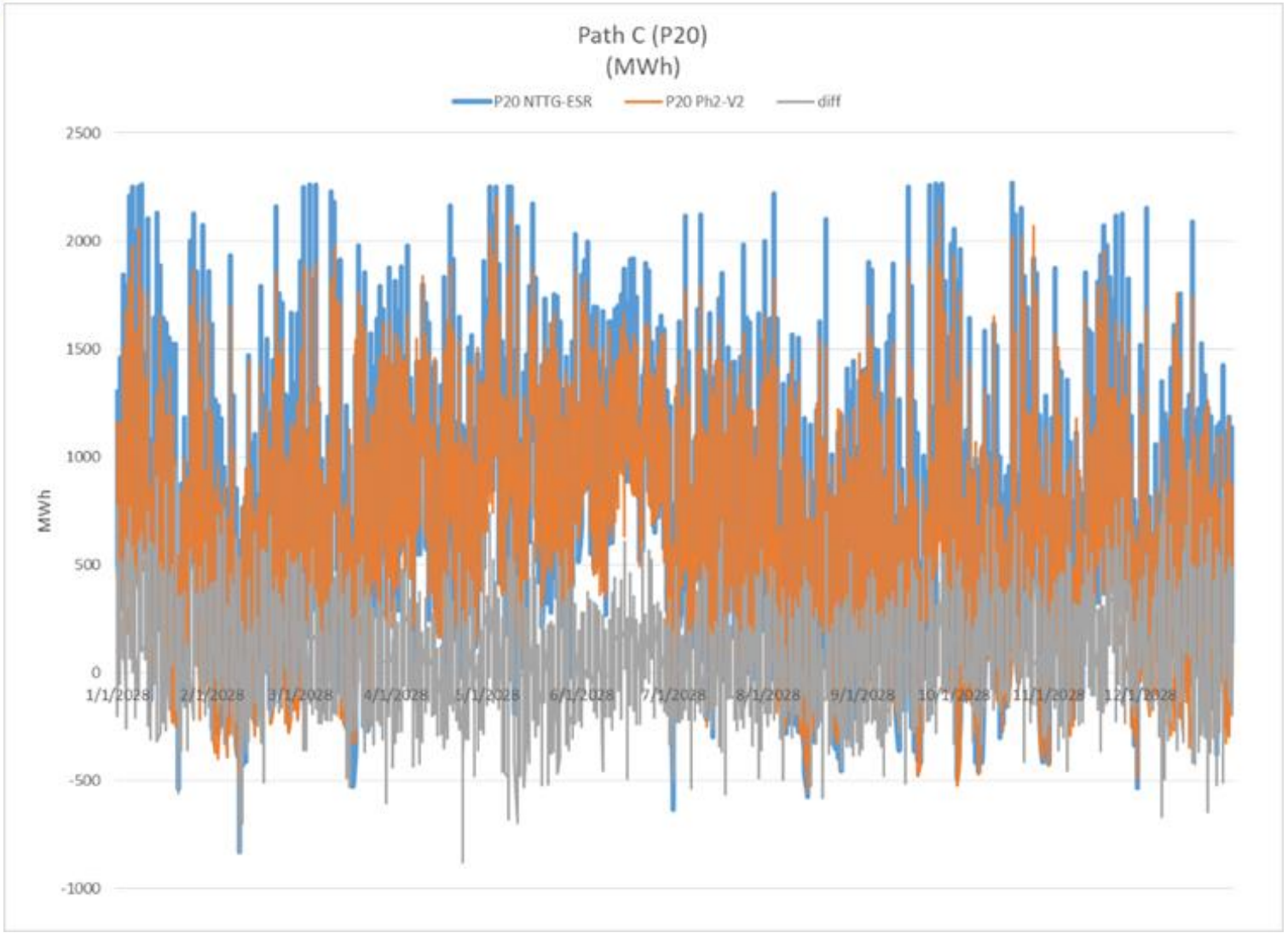
# ESR Study

- In the dfRTP, Gateway South provides support for outages in the Path C cutplane.
- In the ESR configuration, the Gateway South support does not exist. Consequently, the configuration has limited future expansion capability or might have unacceptable performance under conditions not considered in the study cycle.
  - The ESR configuration was tested with an increased flow south on Path C. That configuration may be limited to 400 MW.
  - For the same source-sink pair, the dfRTP configuration can accommodate increased transfers greater than 1200 MW due to the support provided by Gateway South.

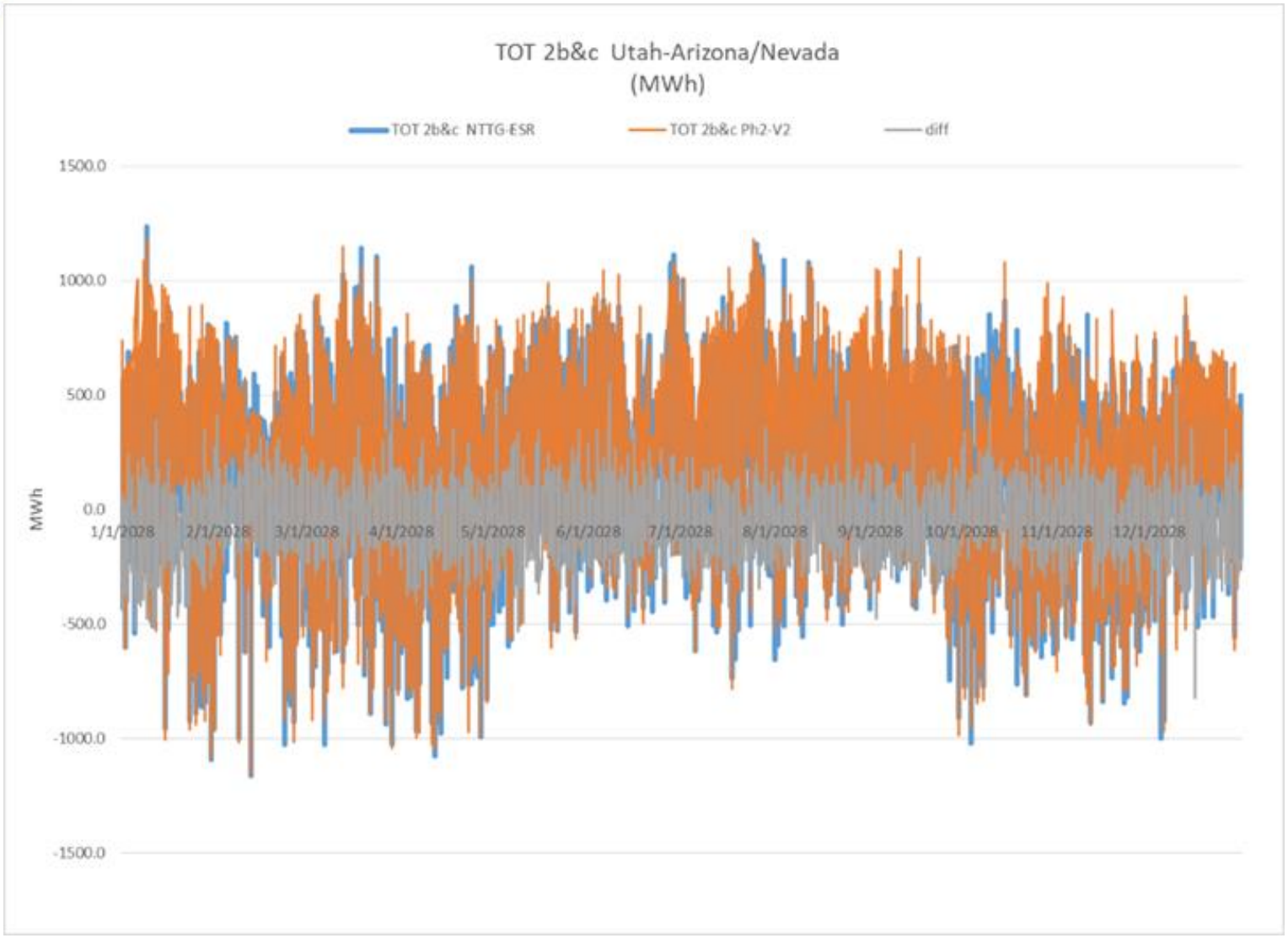
# ESR Study


Path C P-V curves for N-2 Contingencies
PU Voltage (Bridge Land)
1
0.95
0.9
0.85
0.8
0.75
0.7
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0
2000.0
Path C Flow (MW)
+400 MW
+1200 MW
PV Margin limit +400 MW
ESR2 Pac7
dRTP Pac7

# ESR Study


Path C (P20)
(MWh)
P20 NTTG-ESR
P20 Ph2-V2
diff
2500
2000
1500
1000
500
0
-500
-1000
MWh
1/1/2028
2/1/2028
3/1/2028
4/1/2028
5/1/2028
6/1/2028
7/1/2028
8/1/2028
9/1/2028
10/1/2028
11/1/2028
12/1/2028

# ESR Study

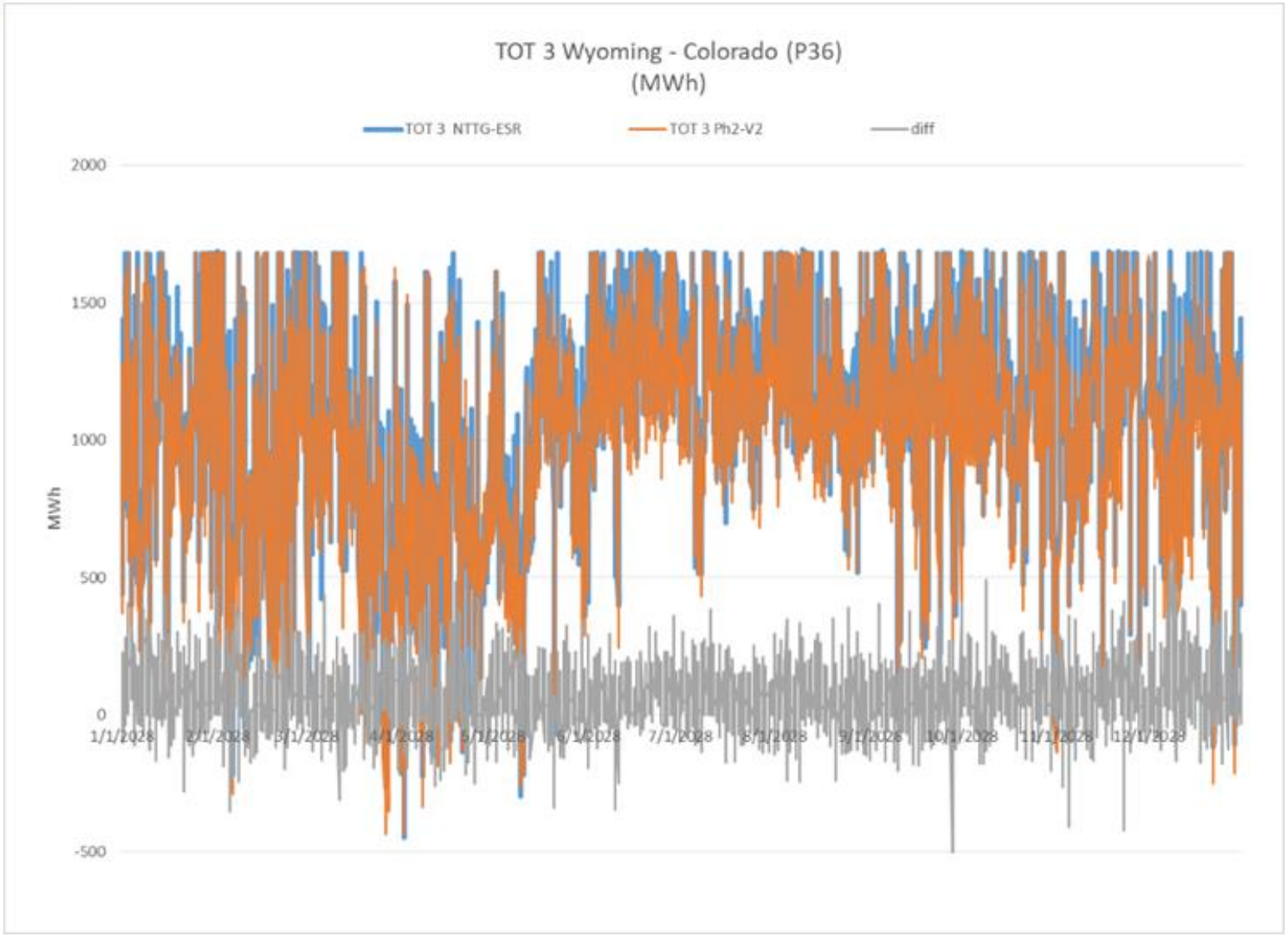

TOT 2b&c Utah-Arizona/Nevada
(MWh)
TOT 2b&c NTTG-ESR
TOT 2b&c Ph2-V2
diff
1500.0
1000.0
500.0
0.0
-500.0
-1000.0
-1500.0
MWh
1/1/2028
2/1/2028
3/1/2028
4/1/2028
5/1/2028
6/1/2028
7/1/2028
8/1/2028
9/1/2028
10/1/2028
11/1/2028
12/1/2028

# ESR Study

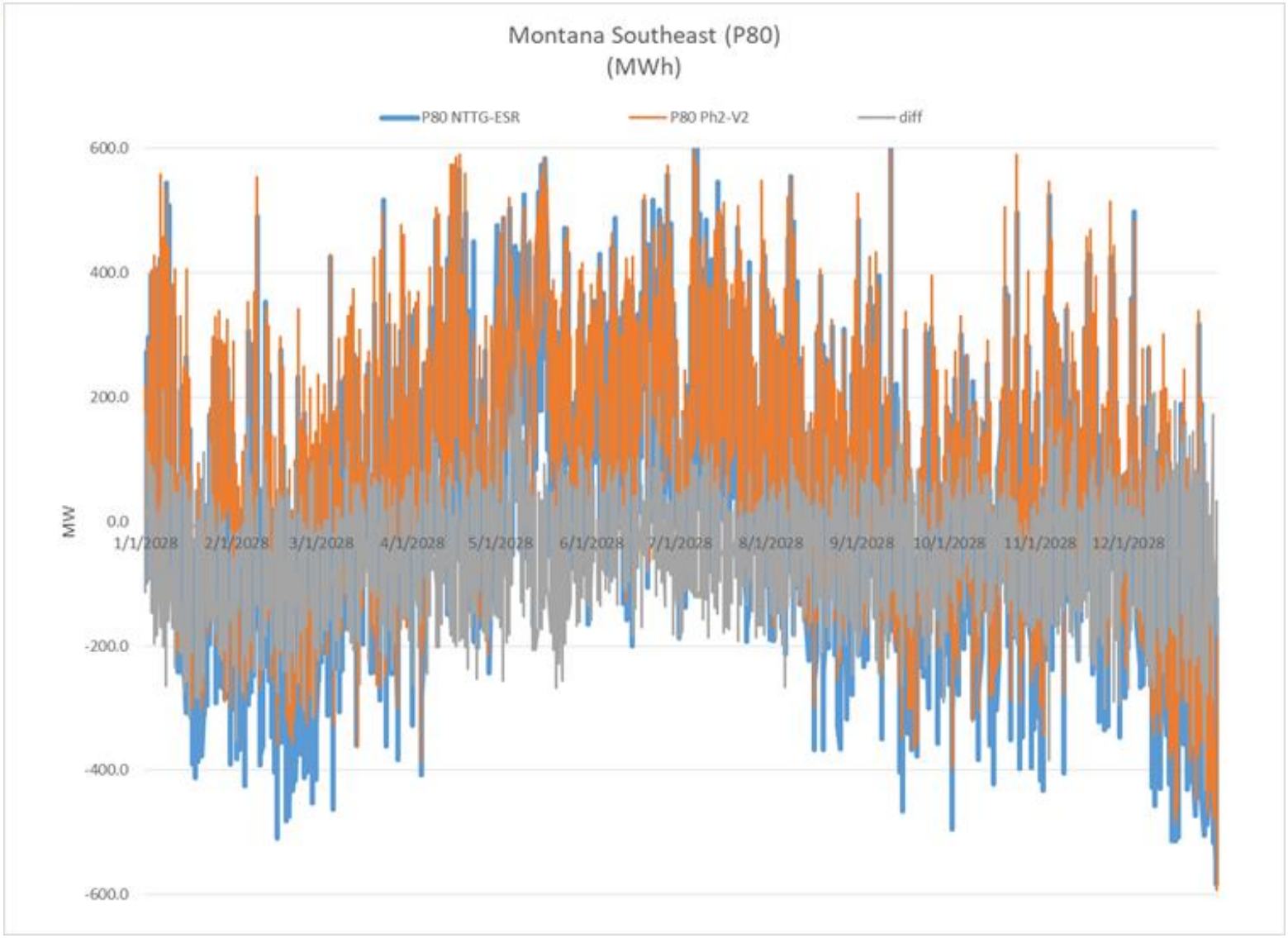
- A number of paths in Wyoming and out of Wyoming become more congested, as well as, other WECC paths:

| Total Congestion Cost ($) | dRTP | ESR | diff |
|---|---|---|---|
| P08 Montana to Northwest | 498,056 | 932,607 | 434,552 |
| P18 Montana-Idaho | 14,890 | 28,654 | 13,764 |
| P20 Path C | - | 568,026 | 568,026 |
| P32 Pavant-Gonder InterMtn-Gonder 230 kV | 2,524,955 | 2,936,094 | 411,139 |
| P36 TOT 3 | 3,920,847 | 6,860,597 | 2,939,750 |
| P39 TOT 5 | - | 142,631 | 142,631 |
| P65 Pacific DC Intertie (PDCI) | - | 145,014 | 145,014 |
| P66 COI | 10,672 | 3,412 | (7,260) |
| P75 Hemingway-Summer Lake | 6,622,456 | 5,821,117 | (801,339) |
| P80 Montana Southeast | 47,212 | 210,098 | 162,886 |
| P83 Montana Alberta Tie Line | 49,338,336 | 53,604,504 | 4,266,168 |
| South of Custer | 2,409,188 | 3,745,993 | 1,336,805 |
| W27_BS_PACE__RM_WACM_1 | 9,430,535 | 10,050,967 | 620,432 |
| W17_NW_NWMT+__RM_WACM_1 | 2,119,987 | 2,243,588 | 123,602 |
| Total | | | 10,356,169 |

# ESR Study

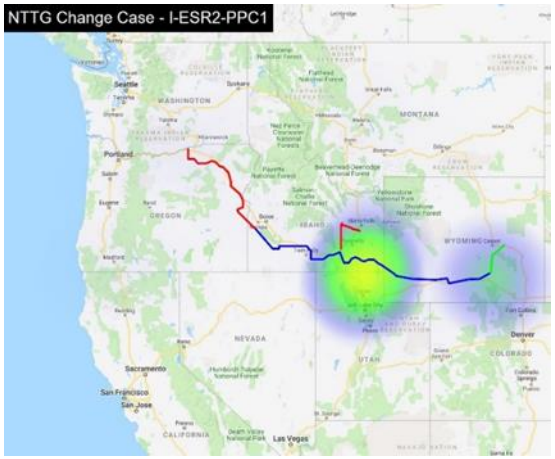

TOT 3 Wyoming - Colorado (P36)
(MWh)
TOT 3 NTTG-ESR
TOT 3 Ph2-V2
diff
2000
1500
1000
500
0
-500
MWh
1/1/2028
2/1/2028
3/1/2028
4/1/2028
5/1/2028
6/1/2028
7/1/2028
8/1/2028
9/1/2028
10/1/2028
11/1/2028
12/1/2028

# ESR Study


Montana Southeast (P80)
(MWh)
P80 NTTG-ESR
P80 Ph2-V2
diff
600.0
400.0
200.0
0.0
-200.0
-400.0
-600.0
MW
1/1/2028
2/1/2028
3/1/2028
4/1/2028
5/1/2028
6/1/2028
7/1/2028
8/1/2028
9/1/2028
10/1/2028
11/1/2028
12/1/2028

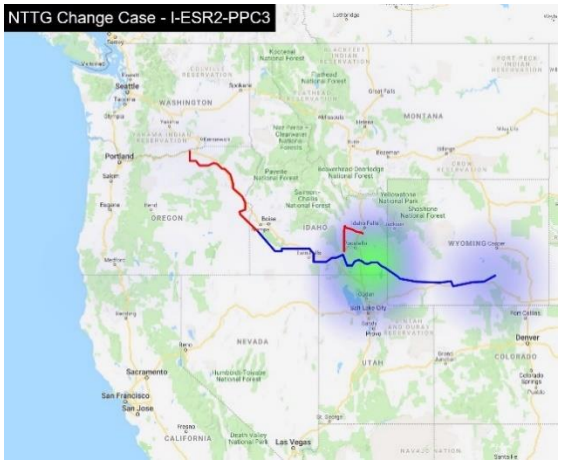
# ESR Study

PPC Scenario 1 – Replace retired coal with Wyoming Wind


PPC Scenario 2 – Replace retired coal with Utah Wind


PPC Scenario 3 – Replace retired coal with Northwest resource



# ESR Study

## ESR Configuration Costs

| Segment | Miles | Cost/mile | Cost |
|---|---|---|---|
| Wyoming 230 kV Line Segments | 147 | 981,246 | 144,635,610 |
| Aeolus – Anticline #1 | 154 | 2,154,692 | 331,844,061 |
| Aeolus – Anticline #2 | 154 | 2,154,692 | 331,844,061 |
| Anticline – Bridger | 5 | 2,127,863 | 10,639,314 |
| Anticline – Populus #1[1] | 203 | 2,358,823 | 478,841,071 |
| Anticline – Populus #2 | 203 | 2,358,823 | 478,841,070 |
| Populus – Midpoint | 152 | 2,292,848 | 348,512,922 |
| Midpoint – Hemingway | 126 | 2,001,499 | 263,197,134 |
| Total | 794 | | 2,388,355,243 |

| Substation | Cost |
|---|---|
| Windstar, DJ, Heward 230 kV | 20,369,890 |
| Aeolus | 52,848,571 |
| Anticline | 24,596,296 |
| Bridger | 4,364,976 |
| Populus | 44,438,329 |
| Midpoint | 19,759,439 |
| Hemingway | 47,188,170 |
| Total | 213,565,671 |

Total

ESR Cost $2,601,920,914

dRTP Cost $4,525,329,044

# ESR Report Summary

- Potential $1,924M capital cost savings.
- However, Path C cutplane becomes a limiting constraint:
  - Causing increased forced Utah dispatch
  - Causing increased flows and congestion on Wyoming/WECC interconnections
  - Increased Wyoming dump energy
  - Impacts future load service decisions

# ESR Study

- The ESR Study was posted for Stakeholder comment and 1 set of comments were received.
- On September 18, 2019 the Planning Committee reviewed and approved the responses and recommended changes to the ESR Report.
  - Link to Stakeholder Comments/NTTG's Response
  - Link to changes to the ESR Report

# Questions

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# Regional Coordination

NTTG Stakeholder Meeting

September 26, 2019

# Regional Coordination

**WECC ANCHOR DATA SET (ADS) UPDATE (VERBAL)**

# Planning Region Updates

- CAISO – Gary DeShazo
- ColumbiaGrid – Larry Furumasu
- WestConnect – Charlie Reinhold

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# Next Steps and Upcoming Opportunities for Stakeholder Input

NTTG Stakeholder Meeting

April 18, 2019

# NTTG 2018-2019 Planning Cycle

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# Stakeholder Comments/ Other Business

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# Thank You!