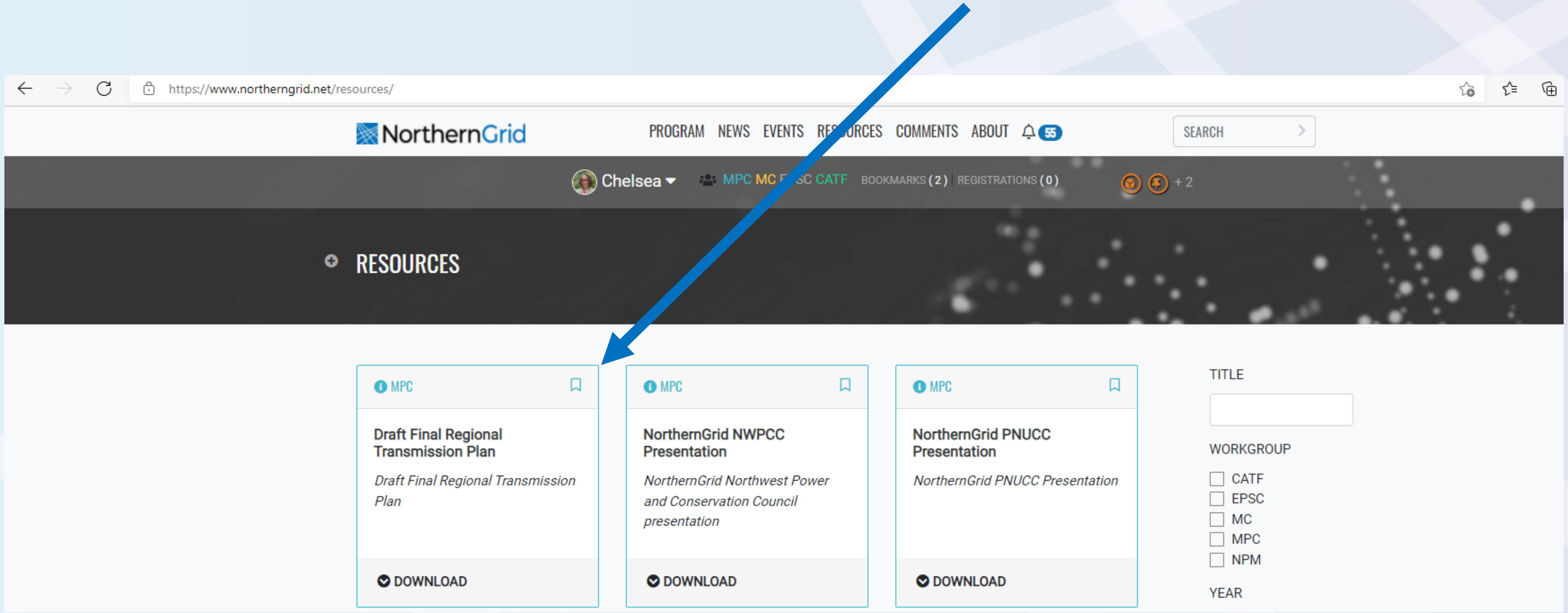
NorthernGrid

Draft Final Regional Transmission Plan
Public Review

Planning Requirement

- Draft Final Transmission Plan posted on 9/30/21



From the Draft to the Draft Final

1. Posted the Draft
2. Received comment
3. Approved responses to the comments
4. Developed the Draft Final
5. Posted the Draft Final for Comment

Setting the stage

WALK-THROUGH OF REPORT

HIGHLIGHT MAJOR CHANGES FROM THE DRAFT REGIONAL TRANSMISSION PLAN

General Corrections

- References to “OATT” either removed or spelled out
- Plan selected on efficiency (rather than cost-effective)
- Appendices updated or created
- Appendix references cleaned up
- 500 kV updated throughout

Cover Page

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NorthernGrid

Draft Regional Transmission Plan for the 2020- 2021 NorthernGrid Planning Cycle

NorthernGrid Member Planning Committee Approval Date: tbd

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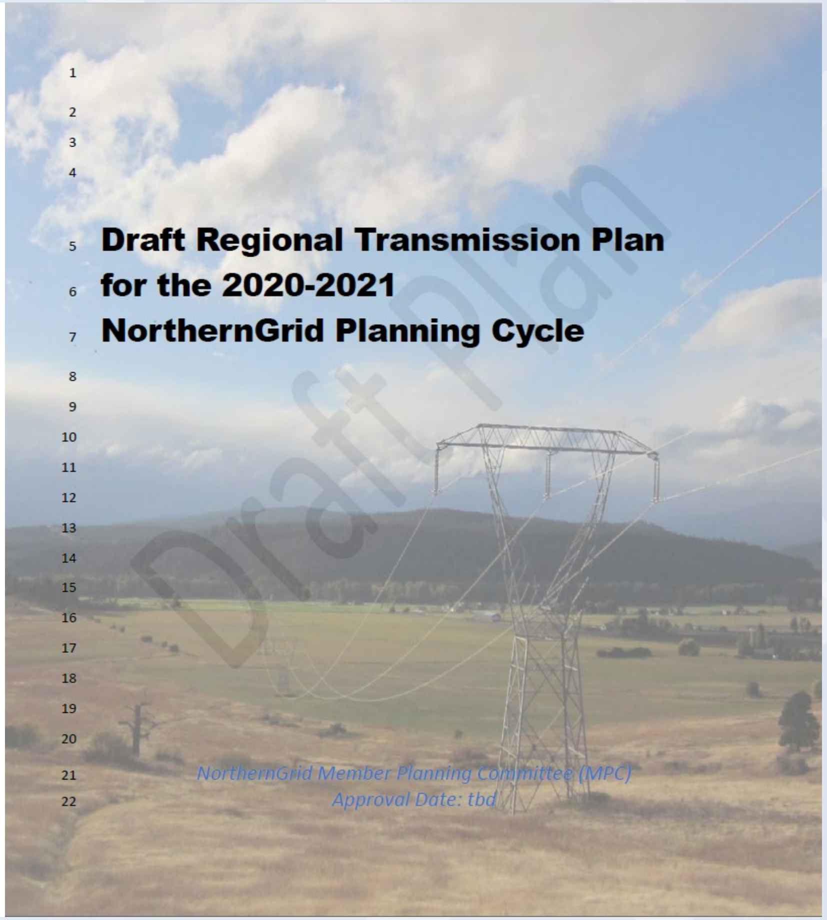

New Page Added: Acknowledgements

Acknowledgements:

NorthernGrid Members & Participants

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Idaho Power Company
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Portland General Electric
Puget Sound Energy
Seattle City Light
Snohomish County PUD
Tacoma Power

Consultants and Other Contributors

Northwest Power Pool
Power Systems Consulting (PSC)
Old Saw Consulting
Harris PCM
CAISO
WestConnect

Interregional or non-Incumbent Transmission Project Sponsors

Fill in here...

State Commissions etc.

Fill in here...

Disclaimer Added

Disclaimer: The data and analyses contained in this report are not warranted by NorthernGrid or any other party, nor does NorthernGrid accept delegation of responsibility for compliance with any industry compliance or reliability requirement, including any reliability standard. Any reliance on this data or analyses is done so at the user's own risk.

Regional Planning Development

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Regional Planning Development

The Regional Transmission Plan is the result of the work performed as outlined in the study scope for the NorthernGrid 2020-2021 regional transmission planning process. Regional Planning is required under FERC Orders No. 890 and 1000 and was executed in accordance with each Enrolled Party's Open Access Tariff (OATT) Attachment K – Regional Planning Process and NorthernGrid Planning Agreement. The production of a Regional Transmission Plan satisfies FERC Order 1000 requirements for each region to produce a plan. To develop the Plan, the NorthernGrid members established the Baseline Projects which were then evaluated for inclusion in the final Regional Transmission Plan. NorthernGrid used steady state analysis to assess which projects could best meet system reliability performance requirements and transmission needs for the NorthernGrid footprint in a 10-year future. Enrolled Parties submitted updated Load and Resource information which was incorporated into the study effort. There were no Material Adverse Impacts noted for any of the solutions considered.

NorthernGrid Overview

The NorthernGrid is comprised of Avista (AVA), Bonneville Power Administration (BPA), Chelan PUD (CHPD), Grant County PUD (GCPD), Idaho Power Company (IPC), Berkshire Hathaway Energy (BHE, formerly Montana Alberta Tie Line, MATL), NorthWestern Energy (NWMT), PacifiCorp East and West (PACE and PACW), Portland General Electric (PGE), Puget Sound Energy (PSE), Seattle City Light (SCL), Snohomish PUD (SNPD), Tacoma Power (TPWR). The member Balancing Authority Areas are illustrated in Figure 2 below.

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Regional Planning Development

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The regional planning process is designed to be a "bottom up" approach in that it begins with a compilation of the Members' local area plans which allows the planning emphasis to shift from the local to the regional footprint. The Transmission Providers, in conjunction with participation from stakeholders, public service commissioners, and interested parties have developed local area plans that meet the regulatory requirements for their respective areas. The projects that have been identified in the local area planning process are assumed to be in service for the regional planning effort.

This regional planning process is intended to focus on those projects that are of "regional significance". "Regional significance" is not a defined term in either the Members Planning Agreement or the OATT; rather, it is used to describe those projects whose presence, or lack thereof, would influence the overall reliability of the NorthernGrid footprint. A local project may improve the ability to serve native load or decrease the number of unplanned outages for a specified subsystem but typically is not going to influence larger transmission paths. A project that is more regional in nature may both increase the ability to serve native load as well as influence a larger transmission path.

NorthernGrid Overview

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About the process

Local versus Regional

The geographic boundary

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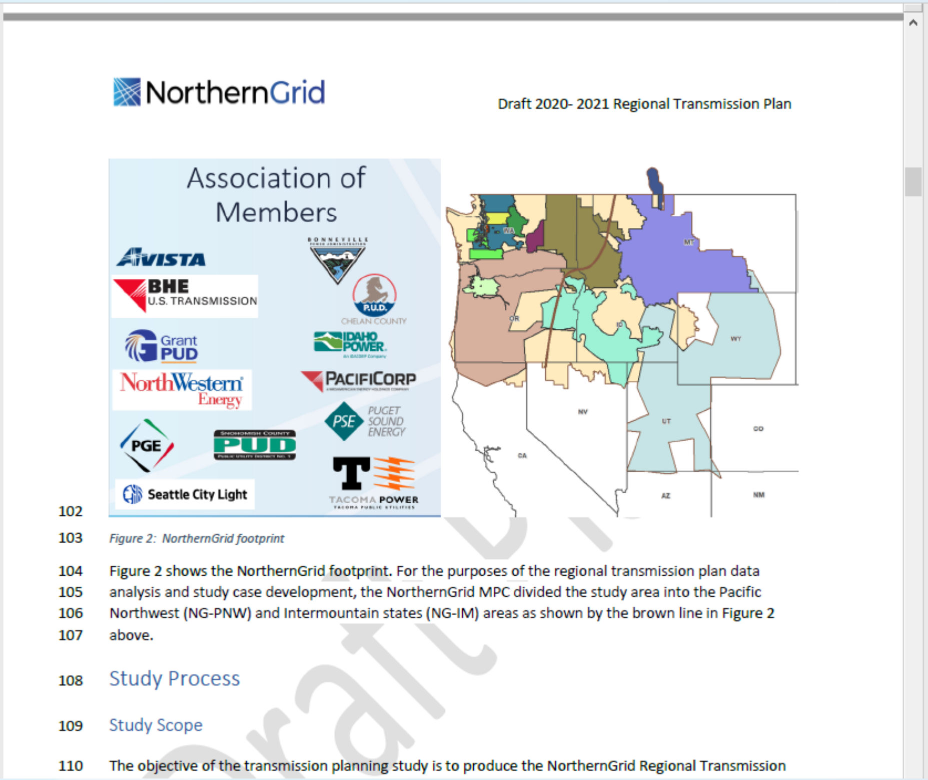

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Association of Members

Figure 2: NorthernGrid footprint

Figure 2 shows the NorthernGrid footprint. For the purposes of the regional transmission plan data analysis and study case development, the NorthernGrid MPC divided the study area into the Pacific Northwest (NG-PNW) and Intermountain states (NG-IM) areas as shown by the brown line in Figure 2 above.

Study Process

Study Scope

The objective of the transmission planning study is to produce the NorthernGrid Regional Transmission

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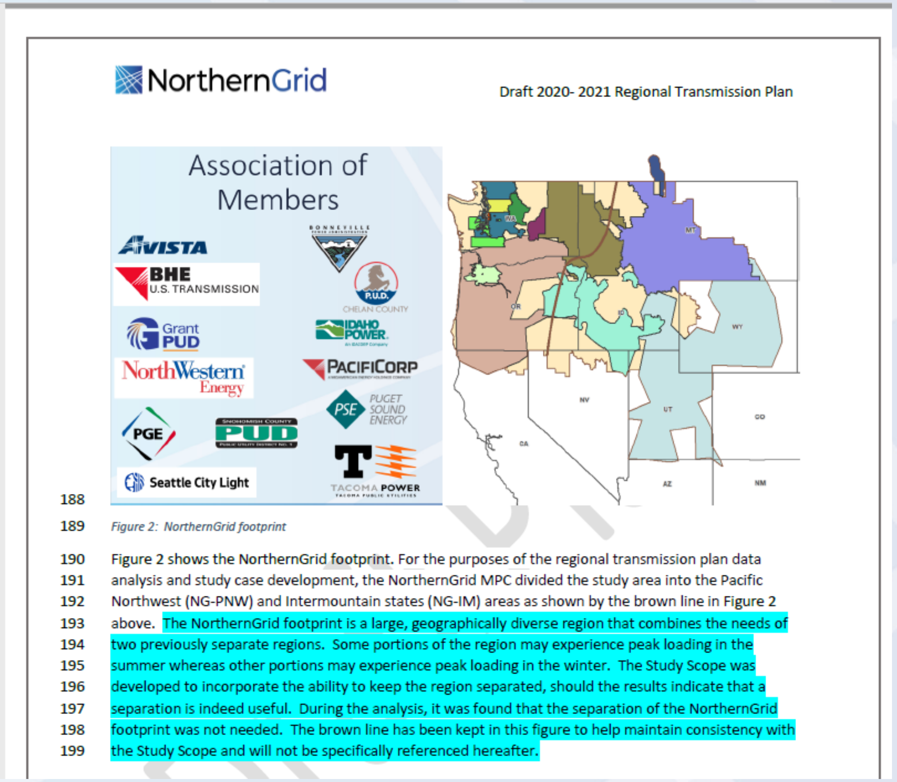

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Association of Members

Figure 2: NorthernGrid footprint

Figure 2 shows the NorthernGrid footprint. For the purposes of the regional transmission plan data analysis and study case development, the NorthernGrid MPC divided the study area into the Pacific Northwest (NG-PNW) and Intermountain states (NG-IM) areas as shown by the brown line in Figure 2 above. The NorthernGrid footprint is a large, geographically diverse region that combines the needs of two previously separate regions. Some portions of the region may experience peak loading in the summer whereas other portions may experience peak loading in the winter. The Study Scope was developed to incorporate the ability to keep the region separated, should the results indicate that a separation is indeed useful. During the analysis, it was found that the separation of the NorthernGrid footprint was not needed. The brown line has been kept in this figure to help maintain consistency with the Study Scope and will not be specifically referenced hereafter.

Introduces language to explain geographic boundary

NorthernGrid

New Section: Planning Development

Planning Development

The intent of FERC 1000 is to improve the regional planning process and identify opportunities for any transmission developer, incumbent or non-incumbent, to coordinate and develop solutions that are both beneficial to the developer as well as the region to which that developer interconnects. Given proper coordination and communication, only the necessary facilities would get identified, and those facilities become the RTP. The RTP is not a construction plan and the Members have no obligation to build the facilities identified in the RTP.

A few notables about the planning process: amongst other things, transmission needs are driven by reliability and by integrated resource planning. Reliability planning is driven by North American Reliability Council (NERC) criteria which provides utilities with a consistent methodology to identify facilities needed to support reliability. Integrated resource planning is driven by the market and resources are identified by the specific utility that is looking to build future generation. The member utilities combine the transmission needs driven by reliability with the transmission needs driven by the

market to develop their overall transmission needs in the form of the Loads and Resources data submittal to the Western Electric Coordinating Council (WECC); that data gets consolidated and is the basis for building base cases. Member utilities are also tasked with ensuring that all public policies are reflected in their transmission needs. Public policies that initiate at the beginning of a planning cycle or make a shift during the planning cycle may not necessarily get reflected in the regional planning process. Member utilities need to decide how they are going to implement the changes to the transmission system that will result from a change to public policy and those decisions take some time to make. Similarly, not all generation or transmission projects driven by public policy changes can be reflected in a long-term planning study. While this RTP may not reflect the changes driven by public policy in this cycle, the process is such that there is the opportunity for those changes to get captured in the next planning cycle.

Improving the ADS: new language

Draft

any area-specific Member Committee criteria, otherwise, NERC TPL 001-04 criteria was used.

Loads and Resources

Members submitted Loads and Resources data along with their current transmission plans in the first quarter; this data was consolidated and used to develop the Study Scope. The needs of the NorthernGrid footprint were identified through these submittals. No Loads and Resources data updates were submitted in the fifth quarter. All loads and resources characteristics are captured in the Study Scope which is available in Appendix B: Study Scope.

Base Case Development

The WECC 2030 Anchor Data Set seed case was used as the starting point to produce the base cases used in the reliability analysis. The Anchor Data Set seed case was put through a production cost modeling effort to identify the stress conditions of interest for the NorthernGrid footprint from 8760 potential hourly conditions. These operating conditions were created through modeling the economic dispatch of the resources combined with the expected loading conditions for the time of year and creating base cases for each of the 8760 hours in a year. These models account for seasonal variations in load and resource availability. For example, base cases representing a spring condition will reflect more availability of hydro generation than do the base cases that represent a fall condition. The NorthernGrid Planning Committee discussed the stress conditions of interest and ultimately selected eight hours to model and study the regional transmission system. These eight hours, representing eight dispatch system conditions, were selected to represent known or expected operating conditions for the NorthernGrid footprint and are identified in Table 1. Members reviewed these cases and provided additional tuning and adjustments as appropriate for each scenario.

The hours were selected for known or expected "stresses" on the NorthernGrid footprint. The NorthernGrid footprint spans a wide geographic area; because of this, heavy conditions for both summer and winter were selected. There is enough proposed wind generation in Wyoming to have a potential impact on the reliability of the NorthernGrid footprint; because of this, an hour representing high output from Wyoming wind resources was selected. Needs were also identified across southern Idaho, so a high Idaho to Northwest (west to east) case and Borah West (east to west) case were developed. The NorthernGrid Planning Committee voted on, and approved, the study hours identified in

.

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Base Case Development

The WECC 2030 Anchor Data Set (ADS) seed case was used as the starting point to produce the base cases used in the reliability analysis. The Anchor Data Set seed case was put through a production cost modeling effort to identify the stressed conditions of interest for the NorthernGrid footprint from 8760 potential hourly conditions. These operating conditions were created through modeling the economic dispatch of the resources combined with the expected loading conditions for the time of year and for each of the 8760 hours in a year. These models account for seasonal variations in load and resource availability. For example, base cases representing spring conditions will reflect more availability of hydro generation than do the base cases that represent fall conditions. The NorthernGrid Planning Committee discussed the conditions of interest and ultimately selected eight hours to model and study the regional transmission system. These eight hours were selected to represent known or expected operating conditions for the NorthernGrid footprint and are identified in Table 1. Members reviewed these cases and provided additional tuning and adjustments as appropriate for each scenario.

In the process of developing and selecting the stressed dispatch conditions, it was found that there are opportunities for improving the ADS. NorthernGrid worked closely with WECC to provide a list of topics where the ADS could be improved and WECC is actively working through those issues. A simple example of where the ADS could be improved is in the weather data that is being used: the data is based on years-old data and does not necessarily reflect current weather data. All topics are provided in Appendix H: Complete list of all ADS opportunities supplied to WECC.

The hours were selected for known or expected "stresses" on the NorthernGrid footprint. The NorthernGrid footprint spans a wide geographic area; because of this, heavy conditions for both summer and winter were selected. There is enough proposed wind generation in Wyoming to have a potential impact on the reliability of the NorthernGrid footprint; because of this, an hour representing high output from Wyoming wind resources was selected. Needs were also identified across southern Idaho, so a high Idaho to Northwest (west to east) case and Borah West (east to west) case were developed. The NorthernGrid Planning Committee voted on, and approved, the study hours identified in

Table 1.

Complete overhaul of Contingencies and Criteria

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Contingencies and Criteria

Contingency analysis is the modeling of systematically removing specified pieces of equipment from service and measuring the resulting impact to the transmission system. Thermal overloads occur when the electrons flowing through a piece of equipment exceed the capability of the equipment which causes heat to build up; excess heat occurs which can then damage the equipment. Typically, a thermal overload results from the loss of a transmission line or transformer, not necessarily from the loss of voltage control elements such as capacitor or reactor banks. Voltage excursions occur when the reactive support of the transmission system changes, as can happen during the loss of a piece of equipment. Voltage excursions can be high or low, either of which causes undue stress on the equipment experiencing the excursion. Due to the interplay of all the pieces of equipment in a transmission system, the loss of any piece of equipment has the potential to cause a voltage excursion on the transmission system.

NorthernGrid Members submitted regionally significant contingencies used in the analysis for the development of the Plan. Contingencies on major WECC Paths relevant to the NorthernGrid footprint as well as contingencies on pieces of equipment in the 200 kV and above voltage classes were the primary focus. These regionally significant contingencies were selected for their criticality to the NorthernGrid footprint. The contingencies were categorized using Table 1 from NERC TPL-001-4. The post-contingency system analysis was performed using applicable NERC and WECC criteria while accounting for any member provided thermal or voltage criteria.

The NorthernGrid footprint as well as neighboring regions were monitored during the contingency analysis to determine if any negative impacts occur to the reliability of the transmission system due to the introduction of the regional projects. If negative impacts to the transmission system of neighboring regions could not be mitigated through operational changes for any regional combination, coordination would have to occur to identify the appropriate mitigation and the costs of that mitigation would be added to the cost of the regional project. No negative contingency results were observed in the neighboring regions and as such no Material Adverse Impacts were identified for any of the combinations considered.

Selection of Projects

The objective of the regional transmission analysis is to identify a set of transmission projects that cost-effectively meets the transmission service and reliability needs of the NorthernGrid footprint ten years in the future. To accomplish this goal, NorthernGrid started with base cases that include member planned future regional projects modeled as "in-service", as displayed below in Figure 4. Collectively, these regional projects comprise the Baseline Member Projects, or the "BLMP". Sensitivity cases based on combinations of various regional project components being systematically removed from the BLMP cases created a set of Regional Combination cases to test against the performance of the BLMP cases. While the BLMP includes the highest number of regional projects, the analysis will evaluate whether a

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Contingencies and Criteria

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Thermal overloads occur when the electrons flowing through a piece of equipment exceed the capability of the equipment which causes heat to build up; excess heat occurs which can then damage the equipment. Typically, a thermal overload results from the loss of a transmission line or transformer, not necessarily from the loss of voltage control elements such as capacitor or reactor banks. Operationally, there are multiple ways to mitigate thermal excursions. For example, remedial action schemes are designed to respond to specific events on the transmission system to help preserve reliability and load service; these actions are programmed and the outcomes to the transmission are expected. Generators may be programmed to reduce their output in response to specific changes on the transmission system. These operational mitigation actions decrease the loading on the overloaded equipment by either reducing the number of electrons altogether or redirecting the electrons to pieces of equipment with larger capabilities. In instances where no pre-planned responses are in place, the transmission system is protected through standard protection devices including relays and breakers. As an example, the pieces of equipment experiencing the thermal overload would be disengaged from service through the actions of the relays and breakers and subsequently, changes the transmission topology naturally occur. This change in topology redirects the electrons which may or may not lead to further thermal excursions on the transmission system. Changes in transmission topology increase the need for Operator intervention and action as the transmission system is in a new state.

Voltage excursions occur when the reactive support of the transmission system changes, as can happen during the loss of a piece of equipment. Voltage excursions can be high or low, either of which causes undue stress on the equipment experiencing the excursion. Due to the interplay of all the pieces of equipment in a transmission system, the loss of any piece of equipment has the potential to cause a voltage excursion on the transmission system. Voltage excursions can be mitigated automatically through switching schemes on capacitor and/or reactor banks. These switching sequences do not add further stress or burden to the transmission system as they reduce the reactive need on the transmission system.

NorthernGrid Members submitted regionally significant contingencies used in the analysis for the development of the Plan. Contingencies on major WECC Paths relevant to the NorthernGrid footprint as well as contingencies on pieces of equipment in the 200 kV and above voltage classes were the primary focus. These regionally significant contingencies were selected for their criticality to the NorthernGrid

Selection of Projects

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subset of the BLMP may cost-effectively meet the needs of the NorthernGrid footprint while maintaining system reliability.

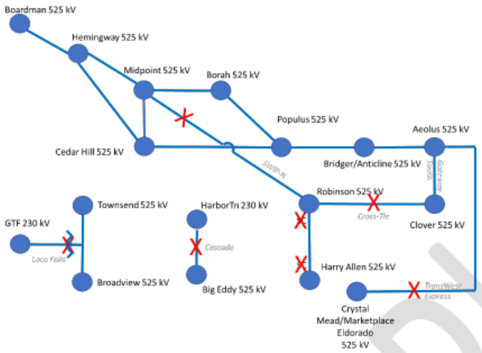

Figure 4: BLMP Example

Table 2: Table to demonstrate BLMP

Modeled Projects	Filter	B2H [H]	Gateway West (Pop - Ced - Hem) [E]	Gateway West (Pop - Bor - Mid - Hem)	Gateway West (Mid - Ced)	Gateway West (Ant - Pop) [D.3]	Antelope	Gateway South [F]	SWIP-N	Cross-Tie	TransWest Express ACDC	TransWest Express DC 0 MW Schedule	TransWest Express DC 500 MW Schedule	TransWest Express DC 1100 MW Schedule	Loco Falls Greenline	Cascade Renewable	Cascade Renewable DC 0 MW Schedule	Cascade Renewable DC 500 MW Schedule	Cascade Renewable DC 1100 MW Schedule
BLMP	X	X	X	X	X	X	X	X											
Total	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0

Figure 4 and Table 2 provide a visual demonstration of the BLMP. None of the interregional or non-incumbent projects are selected in the BLMP. This figure is not demonstrative of the entire set of upgrades associated with any main portion of the regional combinations, rather it is intended to help the reader understand in general the topology of interest. Boardman 525 kV is listed as the terminating

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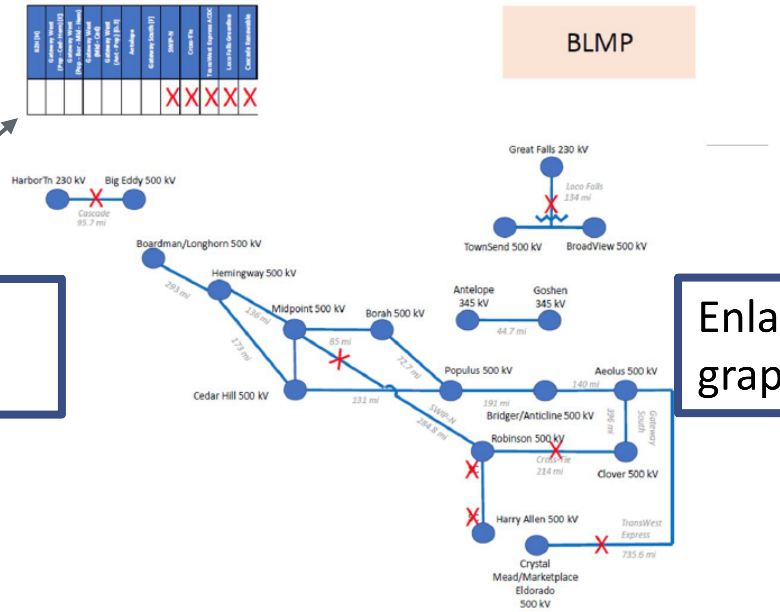

Figure 4: BLMP Example, "stick figure" representation

Simplified Table

Enlarged graphic

Selection of Projects

New Graphic

New language

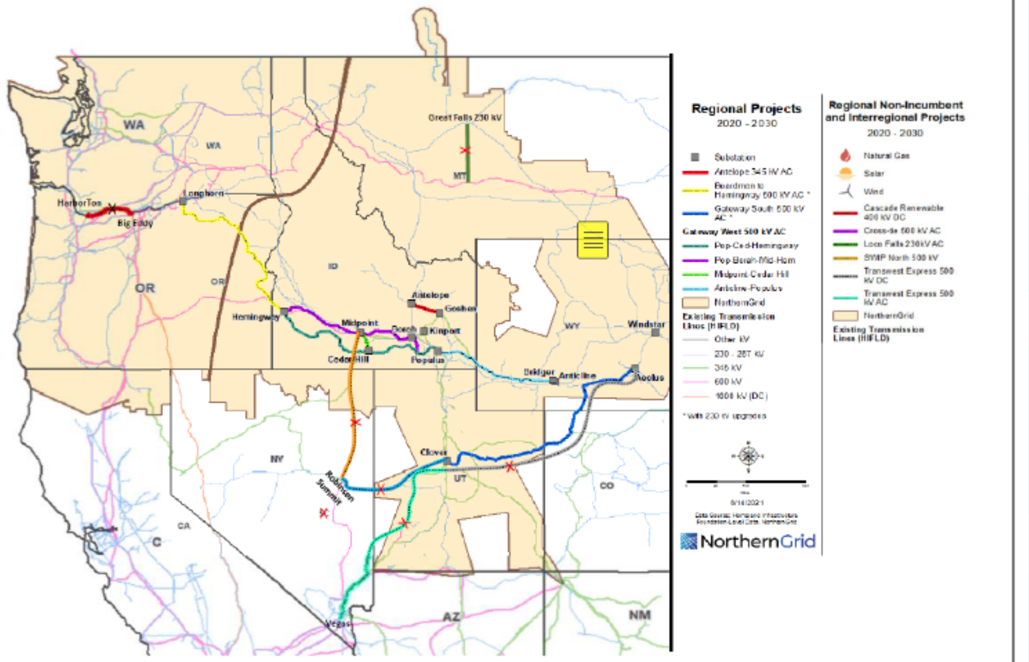

Figure 5: NorthernGrid geographical overlay with all Regional, Interregional, and Non-Incumbent Regional projects displayed

Figure 4 and Figure 5 provide a visual demonstration of all of the projects that have been submitted for consideration in the Regional Transmission Plan. In the top left-hand corner of Figure 4, a table is displayed to show which projects are included in the BLMP. The blue "stick figure" diagram on the left is the visual representation of the projects and each segment has a corresponding geographically aligned element depicted on Figure 5. This figure is not demonstrative of the entire set of upgrades associated with any main portion of the regional combinations, rather it is intended to help the reader understand in general the topology of interest. Boardman 500 kV is listed as the terminating point of the Boardman to Hemingway project to help preserve continuity with the naming convention; in actuality, the project terminates at Longhorn. Visual Aides for all the combinations can be found in Appendix E.

After the contingencies were run, the raw counts of violations were ranked using weighting criteria developed by the NorthernGrid Member Planning Committee. The rankings give less weight to those contingency categories that either have system adjustments available, can be addressed locally – such

Analysis Results: re-write of entire section

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interconnecting with the AC grid at Big Eddy and Harborton substation. There is no proposed generation resource associated with the transmission line.

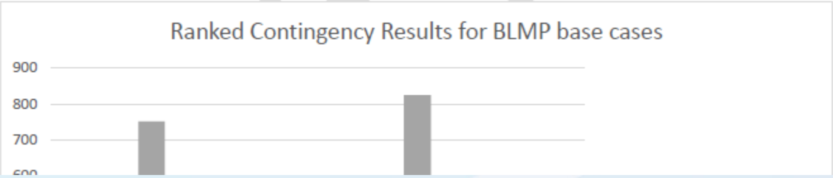
Loco Falls Greenline

Absaroka is proposing a merchant transmission project connecting Great Falls 230 kV substation to the Colstrip 500 kV Transmission System. The project consists of two 230 kV transmission circuits and a new Loco Mountain Substation with 230 to 500 kV transformation. There are no proposed generation resources associated with the transmission line.

Analysis Results

Once the base cases were created to reflect the topology and loading conditions of interest, they were run through contingency analysis. When running contingency analyses, both the cause of the contingency and the impact of the contingency are vital to ascertaining the reliability of the transmission system. The cause and the impact are considered in conjunction with the voltage class of the equipment. In general, losses of higher voltage equipment have more of an impact on the transmission system than do the losses of lower voltage equipment. Altogether, the ranking factor for each of the three categories: voltage class, cause of the contingency, impact of the contingency was multiplied to produce an overall Ranking, an example is provided in Appendix C: Rankings.

Base Cases



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Analysis Results

Once the base cases were created to reflect the topology and loading conditions of interest, they were run through contingency analysis. When running contingency analyses, both the type of the contingency and the impact of the contingency are vital to ascertaining the reliability of the transmission system. The type and the impact of the contingency are considered in conjunction with the voltage class of the equipment. In general, losses of higher voltage equipment have more of an impact on the transmission system than do the losses of lower voltage equipment. From a NorthernGrid perspective, the contingencies that result in the loss of large amounts of load or the inability to honor transmission arrangements are those that are regionally significant and warrant further scrutiny.

Initially, the results were compiled and the total number of violations from each contingency summed together, regardless of the voltage level of the piece of equipment lost, the voltage of the piece of equipment impacted, or the extremity of the event. Appendix C: Rankings shows a figure of the unranked results of the contingency analysis.

To help identify regionally significant contingencies, each contingency result was multiplied by ranking factors: voltage class, type of the contingency, and impact of the contingency, to produce an overall Ranking for that contingency. The larger the resulting ranking, the more regionally significant the contingency. Voltage class refers to the kV rating of the equipment: the larger the rating, the larger the ranking factor. Type of the contingency refers to the NERC TPL-001-4 criteria which is the guiding document used to classify all contingencies analyzed. The contingencies in NERC TPL-001-4 contain scenarios that range from outages of single pieces of equipment to severe faults that impact multiple pieces of equipment. It is quite common for a transmission system to have a single piece of equipment out of service, either planned or unplanned, and it is less common for a transmission system to experience fault events that result in the loss of multiple pieces of equipment. Because of this, single outage contingencies were given a larger ranking factor than severe contingencies. The impact of a contingency refers to what happens to the transmission system when a contingency occurs. Contingencies that caused minor violations were given a smaller ranking factor than those that led to major violations. From a NorthernGrid perspective, a minor violation is one that can be readily mitigated operationally with no anticipated damage to equipment. A major violation may cause cascading outages or equipment damage. Each contingency from each base case was ranked per the ranking factors; all contingency results displayed in this report are ranked contingency results. Ranked contingency results have no known unit. An example calculation of ranking a contingency as well as a comparison of the ranked versus the un-ranked results is provided in Appendix C: Rankings.

Base Cases

Base Cases: revamp of entire section

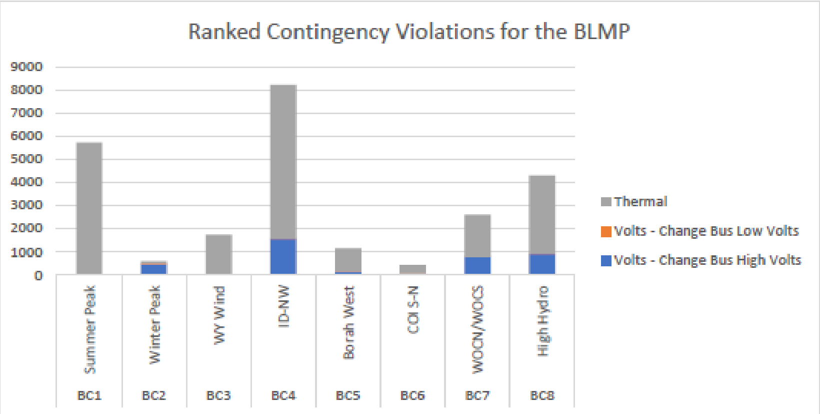

Figure 8: Ranked contingency results for the eight BLMP base cases

Figure 8 displays the ranked contingency violations for the eight base cases developed to represent the different stress conditions of interest. All eight base cases are derived from the BLMP and their only differences stem from the varying load and resource combinations that resulted from the production cost model analysis. Thermal excursions identify the portions of the system that may need infrastructure improvement to support the movement of electrons whereas voltage changes identify the portions of the transmission system that may need reactive equipment to support the overall voltage. By emphasizing the change in volts, either high or low, the analysis effort is well situated to identify those contingencies that led to changes in the transmission system and to put less emphasis on voltage excursions that may be present in the BLMP due to the initial conditions of the case selected through the PCM process.

A few observations about the results from the BLMP analysis:

1. It makes sense that there are fewer thermal excursions in the winter case than the rest of the loading conditions. Many entities allow for extra loading on transmission elements in the winter due to the cooling effect of the lower temperatures associated with winter conditions. The cooling effect of the temperature allows for an increase of electrons to transfer without damaging equipment.
2. Northbound flows on the COI resulted in the fewest violations for these 8 cases.
3. The Summer Peak operating condition resulted in a large number of thermal overloads.

The projects in the BLMP have been identified to resolve the reliability concerns and meet the transmission obligations of the entities on an individual level and do not necessarily resolve all the potential operating conditions or stressed conditions that may occur in the larger NorthernGrid footprint.

Regional Combinations

Regional Combinations

After the initial analysis was performed on the BLMP, the contingency analysis was then extended to looking into different subsets of the BLMP. The Technical Subcommittee of the Member Planning Committee convened to determine the subsets, or regional combinations, of the BLMP to analyze.

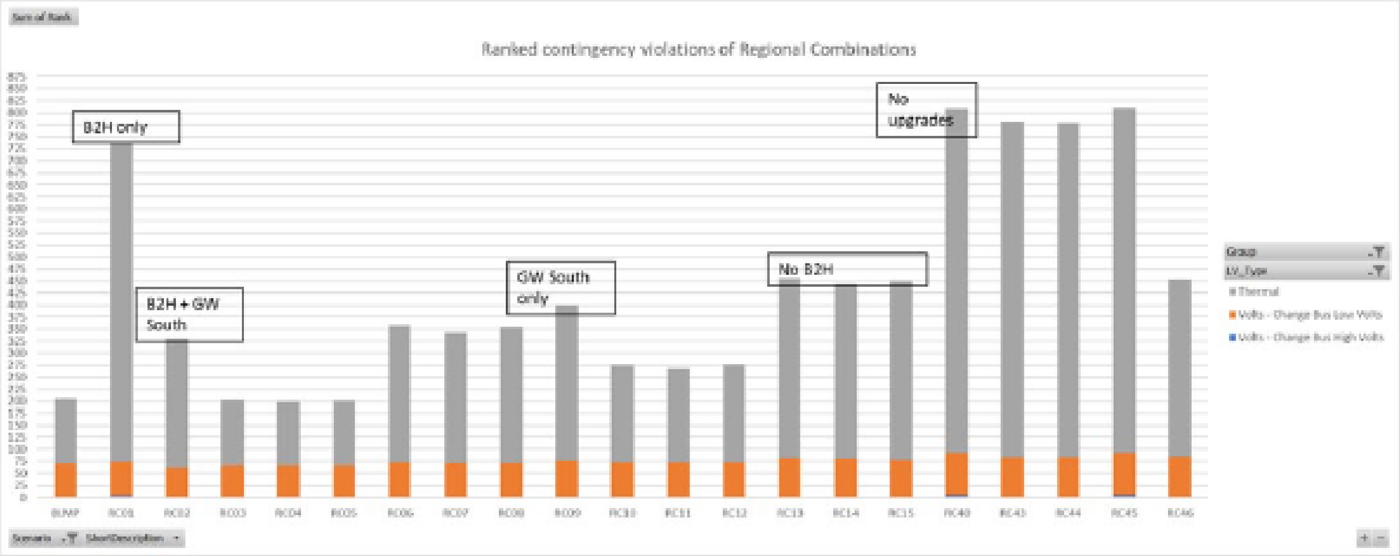

Figure 9: Ranked contingency results, all regional combinations with all cases

Updated Graph
Observations adjusted to correspond

New material in Regional Combinations

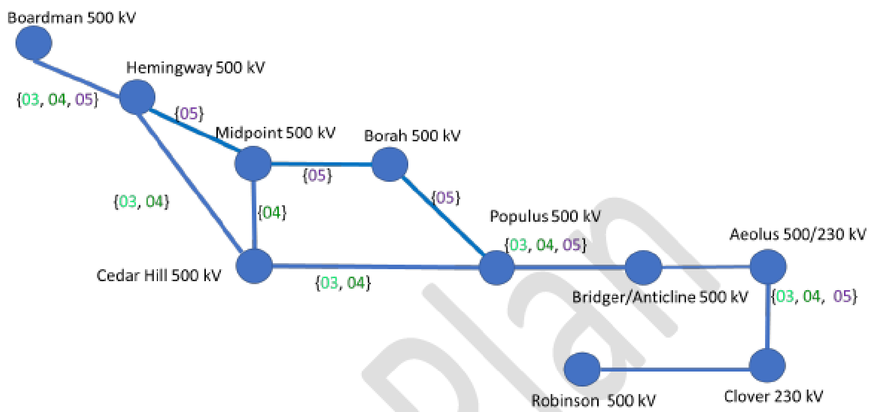

Figure 11: Regional combinations {03, 04, 05}

In all regional combinations of interest, the upgrade from Bridger/Anticline to Aeolus will not be specifically mentioned as construction is already complete.

As can be seen in Figure 11, there are multiple subsets of the BLMP that perform similiarly to the BLMP, and further considerations are warranted. The following section provides more discussion and introduces some of the merits and demerits of each of these five regional combinations.

Regional combination {03} is a new line that connects Hemingway to Populus via Cedar Hill. Regional combination {03} increases the west-bound capacity from Populus to Hemingway because it adds a new, independent path for electrons to flow. Regional combination {03} also mitigates the limiting contingency; currently, the limiting contingency for megawatts flowing between Populus and Hemingway is a loss on the Hemingway-Midpoint-Borah-Populus line.

Regional combination {04} takes regional combination {03} and adds in the Midpoint to Cedar Hill segment. The Midpoint to Cedar Hill segment does not fundamentally improve the reliability results over regional combniation {03} as can be seen in the results in Figure 11. The change in reliability results from regional combinations {03} to {04} does not warrant the cost incurred to construct Midpoint to Cedar Hill in this analysis; therefore, regional combination {04} will be removed from further scrutiny.

Regional combination {05} rebuilds existing facilities and does not create a new path for electrons to flow. the loss of any of the line segments: Hemingway to Midpoint, Midpoint to Borah, Borah to Populus, could lead to the reduction of west-bound schedules; regional combination {05} does not ameliorate this situation. Regional combination {05}, however, re-builds existing faciliites and the

New graphic to help illustrate the main "contenders"

New language to discuss the pros and cons of the main contenders

Interregional and Non-Incumbent Projects (Essentially New)

- New and Improved Graphs
- More language

The interregional projects that have been submitted to the NorthernGrid region for consideration in the 2020-2021 regional transmission process are designed to take the output from renewable generation and deliver it to a load in a neighboring region.

Three interregional and two non-incumbent regional projects were incorporated and analyzed to determine if either alone or in conjunction with the leading regional combinations, they would create a more cost-effective or efficient NorthernGrid transmission system.

The first stage of the analysis was designed to ascertain if the interregional or non-incumbent regional project would meet the needs of the NorthernGrid region alone, without the presence of the other planned projects. The second stage of the interregional and non-incumbent regional analysis was to determine if there was any benefit in adding the interregional or non-incumbent regional project to subsets of the BLMP. The third phase of the interregional and non-incumbent regional analysis allowed for increased flows on the interregional or non-incumbent projects and the opportunity to determine if the interregional or non-incumbent project with megawatts flowing on them was better for the NorthernGrid footprint than just the projects alone.

Figure 13 below shows the ranked contingency results for the first stage of the interregional and non-incumbent regional analysis. Each interregional or non-incumbent regional project was first modeled alone with no regional upgrades.

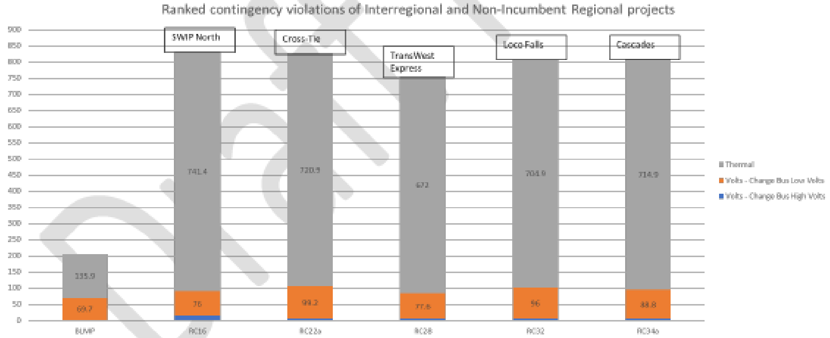

Figure 13: Each interregional or non-incumbent regional project with no regional upgrades

Each interregional or non-incumbent regional project alone results in significantly more ranked contingency violations than the BLMP.

The second stage of the analysis explored the interaction of the interregional and non-incumbent projects with various regional projects.

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Thank you!