

MONTANA RENEWABLE DEVELOPMENT ACTION PLAN

SPONSOR MEETING

May 2, 2018

Missoula, Montana



▶ **Project Specifics:**

▶ **Objective**

- ▶ Explore opportunities and barriers to Montana's potential renewable resources
- ▶ Recommend sustainable solutions to barriers
- ▶ Initiate actions to achieve solutions

▶ **Schedule – 6 months**

- ▶ Dec 8, 2017 to June 30, 2018

▶ **Deliverable – Action Plan**

- ▶ for potential development and delivery of Montana renewable resources
- ▶ to enable thriving commercial market for renewable resource development

PROJECT REVIEW AND TODAY'S AGENDA

▶ **Process:**

✓ **Establish project structure**

- ✓ Steering Committee comprised of key stakeholders
- ✓ Sub-committee structure to address policy, planning and operational issues
- ✓ Define detailed project schedule

✓ **Identify and commit staff to accomplish objective**

✓ **Open, inclusive work flow to ensure stakeholder interests are understood and considered**

PROJECT REVIEW AND TODAY'S AGENDA

- ▶ **Subcommittees have differing assignments:**
 - ▶ Some tasks are to find facts
 - ▶ Some are to consider policy questions, and develop and analyze alternatives
 - ▶ Some are to debate the alternatives and make policy recommendations to the Steering Committee if consensus is able to be achieved
- ▶ **Progress reported today will be:**
 - ▶ Facts where they have them
 - ▶ Draft Recommendations where they have them

PROJECT REVIEW AND TODAY'S AGENDA

9:15 – 9:30	Introductions & Logistics Vickie VanZandt
9:30 – 10:00	Sub-committee Report #1: Commercial/Policy Bill Pascoe and Brian Altman
10:00 – 10:30	Sub-committee Report #2: Planning Cameron Yourkowski and Pat Rochelle
10:30 – 10:45	Sub-committee Report #3: Operations Libby Kirby and Bart McManus (by phone)
10:45 – 11:00	BREAK
11:00 – 11:30	Sponsors' Guidance and Review
11:30 – 11:45	Public Comment
11:45 – 12:00	Wrap-up and Next Steps – Next meetings, agenda etc.

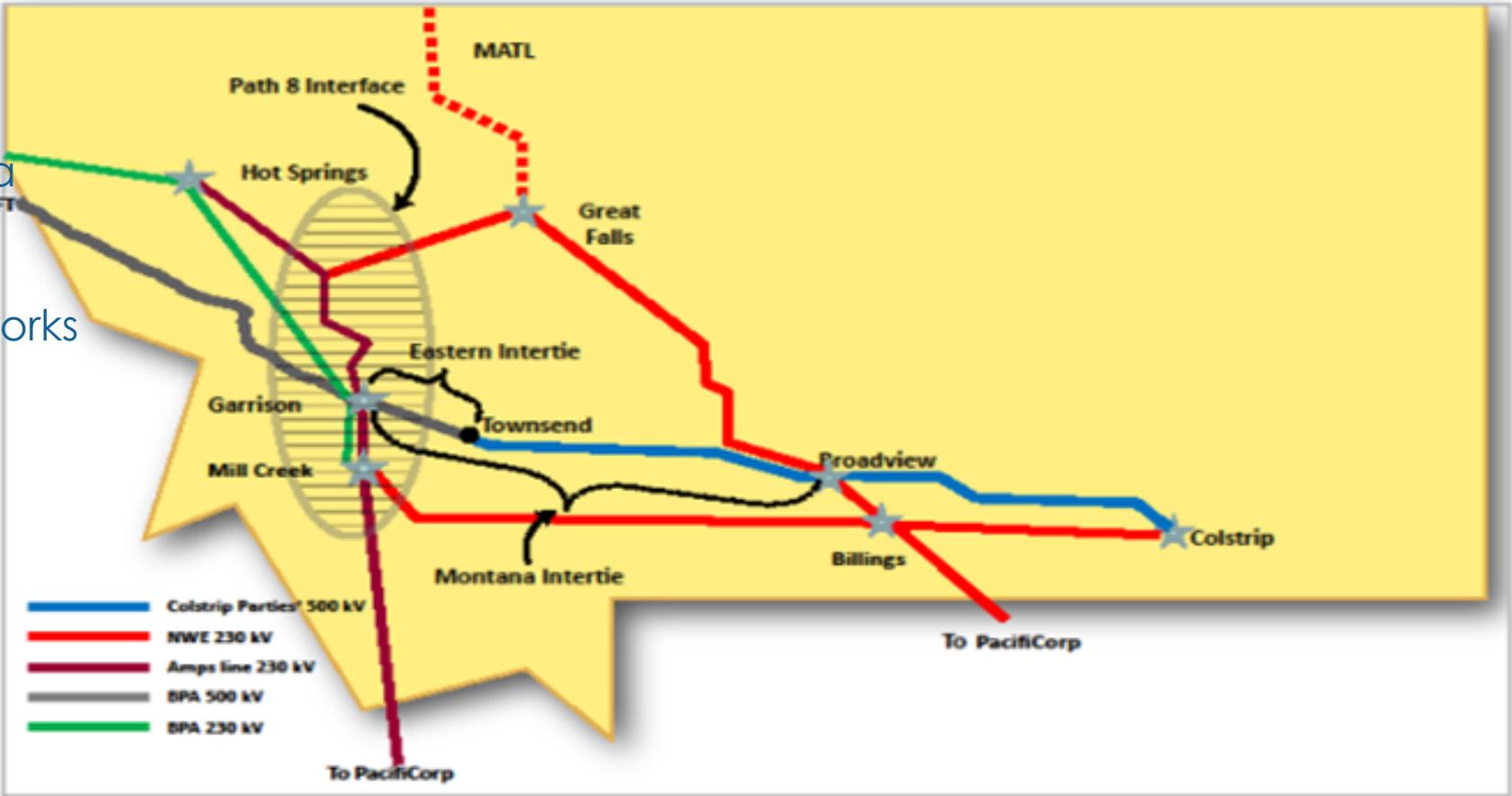
TODAY'S AGENDA



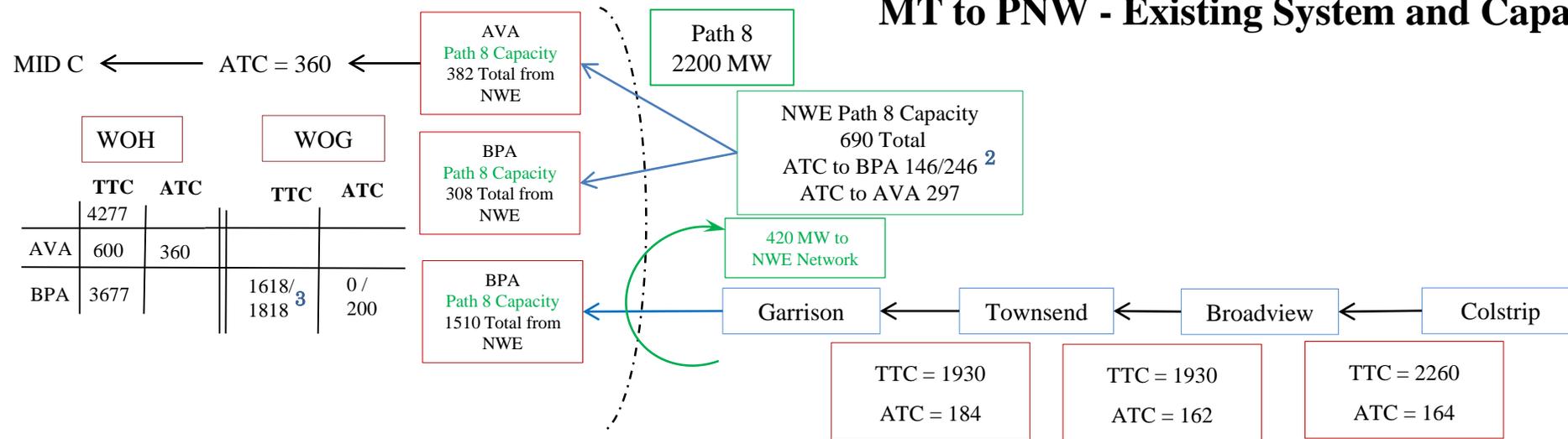
COMMERCIAL POLICY SUBCOMMITTEE

Major Montana Transmission

Avista
&
BPA
Networks



MT to PNW - Existing System and Capacity



	WOH		WOG	
	TTC	ATC	TTC	ATC
	4277			
AVA	600	360		
BPA	3677		1618/ 1818 ³	0 / 200

BPA Network		BPA Eastern Int.		Colstrip Tx System	
West of Garrison TSRs	Rights Holder		T'send-Garrison TTC / ATC	B'view-T'send TTC / ATC	Colstrip-B'view TTC / ATC
757 ⁵	PSE	PSE	680 / 0	759 / 96	746 / 83
270	PGE	PGE	280 / 0	312 / 5	308 / 0
205	AVA	AVA	210 / 0	234 / 12	230 / 8
156	PAC	PAC	140 / 0	156 / 0	154 / 0
0	NWE	NWE	420 / 0	469 / 49	823 / 73
230 ⁴	Other	BPA	200 / 184	0 / 0	0 / 0
1618 ³	Total		1930 / 184 ¹	1930 / 162	2260 / 164

1. BPA sales of 16 MW to PAC on Eastern Intertie
2. 146 MW ATC as of Feb 2018; 246 MW ATC in Jan 2019
3. 1818 MW w/RAS; 1618 MW w/o RAS
4. BPA WOG "Others": SNOPUD (50 MW, 5/48) , PPLM (100 MW, 7/20), PWRX (80 MW, 12/22)
5. Termination dates: 663 MW Aug 2019, 94 MW Oct 2021

- ▶ These draft recommendations are based on the co-chairs' understandings of work to date by the Commercial/Policy Committee. These draft observations and recommendations have not yet been approved by the Committee, and will not be finalized until May 22.

DISCLAIMER

Observations:

1. Advocates for Montana renewables (state government, developers and public interest groups) are “pushing” the export of Montana renewables. There needs to be a corresponding interest from potential purchasers “pulling” for the acquisition of Montana renewables.

Observations (cont):

2. Montana wind resources appear to be competitive with other renewable resources available to Pacific Northwest utilities. However, uncertainties about transmission and integration services are impediments to securing contracts for Montana wind resources.

Observations (cont):

3. There is (or will soon be) a significant amount of transmission capacity (from existing capacity, relatively low-cost upgrades and the planned retirement of Colstrip 1 & 2) to support development of a substantial quantity of Montana renewables for export to the Pacific Northwest, but not necessarily all the way to the I-5 load centers.

Observations (cont):

4. Retirement of Colstrip 3&4 will free up substantial additional transmission capacity for Montana renewables exports, but there is uncertainty about the transfer capability of the Colstrip Transmission System following the retirement of Colstrip 1-4.

Observations (cont):

5. The Operations Committee indicate that dynamic transfer capability (DTC) is available to support development of a substantial quantity of Montana wind for export to the Pacific Northwest.

DTC is necessary to meet Washington's RPS and enables options for integrating (balancing/regulating) Montana wind in Pacific Northwest BA's.

Observations (cont):

6. Many of the transmission and integration challenges faced by Montana developers could be mitigated by the development of a Pacific Northwest regional transmission organization.

Observations (cont):

7. Modifications to the Montana Intertie Agreement (MIA) are needed to facilitate future use of capacity on the BPA Eastern Intertie and the Colstrip Transmission System (CTS).

Draft Recommendations:

1. State RPS policies should not unjustifiably favor in-state over out-of-state resources.

Draft Recommendations (cont):

2. BPA should evaluate its potential for integrating Montana wind including 1) the availability of flexible generating capacity for this purpose and 2) pricing structures that compensate BPA for the market value of this flexible capacity.

Draft Recommendations (cont):

3. Pacific Northwest utilities that may have an interest in acquiring Montana renewables should include scenarios with Montana renewables when studying their flexible capacity needs.

Draft Recommendations (cont):

4. In regard to the 184 MW capacity dispute between BPA and NWE, the parties should seek a negotiated solution as soon as possible.

Draft Recommendations (cont):

5. BPA should evaluate the feasibility and business case for offering Conditional Firm service for Montana exports.

Draft Recommendations (cont):

6. BPA and the CTS owners should review the MI and CTS Agreements and make any needed modifications to facilitate future use of the MI and CTS based on non-discriminatory, open access principles. This includes:
 - Modifying the MIA to allow for third-party and non-Colstrip use.
 - Reviewing the appropriateness of the MIA's 5% loss rate for third party use.

Draft Recommendations (cont):

7. BPA should hold a pre-rate case workshop discussion on alternatives for the Montana Intertie rate.

Draft Recommendations (cont):

8. Developers of Montana renewable projects should present credible and executable transmission plans to potential purchasers.

Purchasers considering Montana renewables should allow a reasonable period after a resource is identified for acquisition to work with the developer to execute the transmission plan.

Draft Recommendations (cont):

9. BPA should consider modifying its current policy to allow for developer-funded NEPA costs to be refunded if LTF service is ultimately purchased at rolled-in embedded cost rates.

Draft Recommendations (cont):

10. Transmission providers and customers should work together to evaluate possible changes to transmission tariffs and business practices that may be impediments to exporting Montana renewables. Possible changes to be considered include developing (provided lower-queued TSRs are not adversely affected):

- A Service Across Multiple Transmission System (SAMTS) - like service
- Procedures that do not require a transmission customer to pay for ATC in order to get upgrade studies
- Procedures under which TSRs on the BPA system could be redirected

PLANNING SUBCOMMITTEE



Options for Incremental Additions to Available Transfer Capacity (ATC):

- Some segments of unused Transmission System Capacity exist today
- Transmission System Capacity should become available as coal fired generation at Colstrip retires
- Incremental ATC can be added with 3 Projects
 - BPA Remedial Action Scheme (RAS)
 - Colstrip Transmission Upgrade
 - Montana to Washington

Options for Incremental Additions to ATC (cont):

- BPA RAS
 - West of Garrison Incremental ATC – 200 MW
 - West of Hatwai Incremental ATC – 200 MW
 - Costs – ~ \$ 2M per site – costs will be site specific
 - Timing – 1-3 years

Options for Incremental Additions to ATC (cont):

- Colstrip Transmission Upgrade
 - Colstrip to Garrison Incremental ATC – 800 MW
 - Facilities – 500kV series compensation, line and transformer upgrades, subsynchronous resonance protection, RAS
 - Costs – ~ \$ 252 M
 - BPA – \$ 127 M
 - CTS – \$ 87 M
 - Avista – \$ 38 M
 - Timing – ??? (Avista's items have been or will be completed)

Options for Incremental Additions to ATC (cont):

- Montana to Washington
 - West of Garrison Incremental ATC – 600 MW (LTF)
 - West of Hatwai Incremental ATC – 550 MW
 - BPA Facilities – New substation, upgrade 5 existing substations, reconductor 11 miles of 500kV transmission
 - Costs – ~ \$ 140 M
 - Timing – 2023
 - BPA proceeding with offers to pursue NEPA and preliminary engineering after 2016 Transmission Service Request Study and Expansion Process (TSEP) indicated need for additional capacity

Review of Existing Study Work:

- The Planning Committee has reviewed four transmission studies and one whitepaper analyzing various Colstrip Unit 1-4 retirement scenarios and have the following findings

Review of Existing Study Work:

Key Findings:

1. Remedial Action Schemes (RAS) will be necessary for any new generation acquiring firm transmission service across the CTS
2. The studies performed to date have not identified that new transmission lines are required (as long as the 500 kV system is intact)
3. The studies included transient stability analysis and did not identify new concerns

Review of Existing Study Work:

Key Findings:

4. As Colstrip units retire, adequate voltage support may be a concern on local areas of the system; the location of replacement generation may help address this concern
5. The 500 kV is, and will continue to be, an essential part of load service to Montana and supports transfers to the Northwest
6. With relatively minor reinforcements, the system can support a one-for-one replacement of Colstrip generation with new resources, including variable renewable energy resources

Review of Existing Study Work:

Key Findings:

7. Blackstart, subsynchronous resonance mitigation, RAS, and WECC Path Rating requirements can be addressed timely with Colstrip unit retirements and replacement generation

Development of Study Scope for Potential Retirement of Colstrip Units 3 and 4:

- The Planning Committee prepared a study scope to address the eventual retirement of Colstrip 3 & 4. It will be augmented to include WECC study process steps covering any unexpected loss of all Colstrip units
- The whole scope will be preserved for implementation when the time is right

BPA Processes Underway to Increase ATC:

- For service on the existing BPA Network, BPA is:
 - Considering administrative changes that should result in additional ATC availability
 - Considering a Conditional Firm product on its interties and external interconnections

BPA Processes Underway to Increase ATC:

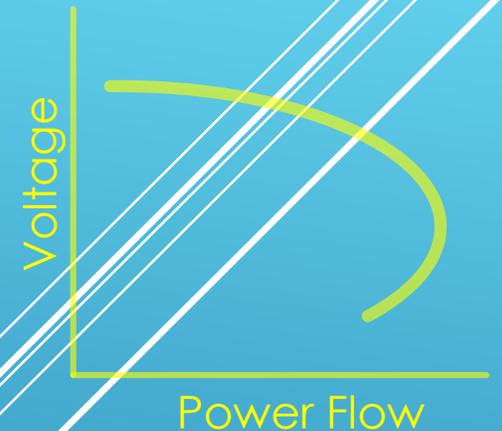
- For potential expansion of the BPA Network, BPA is considering:
 - Flexible, scalable options to meet service requests across BPA Network Flowgates including:
 - Non-wires solutions
 - Planning re-dispatch
 - Battery storage
 - Demand side management
 - Timing:
 - Commercial Assessment: Quarter 4 – 2018
 - Corresponding Cluster Studies: Quarter 1 – 2019



OPERATIONS SUBCOMMITTEE

Dynamic Transfer Capability (DTC):

- DTC is the amount of MW movement over a transmission path that can be accommodated in-hour without violating voltage limits, based on the “P-V” curve of the path
- DTC is a use of already-available transmission, and thus inherently respects system operating limits
- DTC is used when resources are moving around in-hour. BPA is considering better reflecting this by only counting bi-directional movement against the DTC limit, meaning more wind generation could be accommodated within the current limit



Dynamic Transfer Capability (DTC): (cont)

- NorthWestern does not have DTC limits on its system
- Recent BPA study has verified that the Montana Intertie has a DTC limit of +/- 170 MW
 - Can potentially double this limit with an automatic reactive device
- The capacity of wind accommodated is much greater than the DTC limit – possibly in excess of 1000 MW – due to:
 - Partial Transmission Distribution Factor (i.e. how much of the generation actually shows up on the interchange)
 - Location of balancing reserves with respect to the interchange
 - Diversity of wind plants

Ancillary Services:

BPA studied Montana wind versus Columbia River Gorge wind in 2010.

- Montana wind required 25% of the balancing reserve needed for wind in the Gorge
- BPA will re-analyze the balancing reserve necessity under our methodology
- Pumped Hydro Storage could provide +/- rated MW

Generation Loss Impacts:

- Wind Resources May Need to Provide
 - Frequency response (by feathering the blades to decrease MW for a load loss or adding other devices to increase MW output when there is a generation loss)
 - Voltage Support
 - Inertia via special controls
- RAS participation is required to maintain transmission path rating

Note:

- It is possible that Colstrip units could be retained for use as synchronous condensers (for both inertia and voltage support)
- Pumped storage could provide inertia and balancing reserves equal to the +/- MW rating of pumps/generators

ADDITIONAL GUIDANCE, SPONSORS?



NEXT MEETINGS AND DELIVERABLES:



STEERING COMMITTEE - JUNE 5, 2018 – HELENA, MT
SPONSORS – JUNE 18, 2018 – MISSOULA, MT
FINAL ACTION PLAN ISSUED – JUNE 29, 2018

APPENDIX



PLANNING SUBCOMMITTEE



Montana to Washington & Colstrip Transmission Upgrade

Guidance: Refresh the cost and timing of previous estimates for the Montana to Washington (M2W) and Colstrip Transmission Upgrade combined incremental ATC efforts. Do not do new studies for this – just update with today's dollars and apply current project knowledge to timing provisions.

Colstrip Transmission Upgrade:

AVA, NWE, and BPA identified transmission reinforcements that might enable the Transmission Owners to increase the transfer capability of the system between Montana and the Pacific Northwest

Colstrip Transmission Upgrade: Facilities

- Series compensation additions on the 500 kV system between Broadview in Montana and Coulee and Hatwai substations in Washington
- Several line upgrades on the BPA network
- Line and transformer upgrades, and continued operation of the “star” network on the AVA system
- Sub-Synchronous Resonance (SSR) mitigation at Colstrip due to the series compensation changes
- Participation in Remedial Action Scheme(s) (RAS) from resources that would require access to the incremental capacity

Colstrip Transmission Upgrade: Costs

- Facilities' Estimated Costs from the June 2012 Study:
 - BPA transmission system – \$126.7 million
 - CTS – \$87 million
 - AVA transmission system – \$38 million

Colstrip Transmission Upgrade: Status

- Identified Reinforcements on the Avista system have been or will be completed
- SSR studies have been completed which identified the mitigation for Colstrip generation assuming all four units would be in service. Additional studies would be needed to address retirement of Units 1 & 2

Colstrip Transmission Upgrade: Status

- No further project development of series compensation east of Garrison substation has taken place
- Neither cost allocation nor capacity allocation has taken place for capacity east of Garrison (between and Transmission Owners, including CTS owners)
- No capacity allocation has occurred for capacity within the Pacific Northwest (AVA and BPA)

Montana to Washington (M2W):

- BPA initiated M2W on its network following the 2010 Network Open Season (and further informed in the 2013 Network Open Season)
- M2W addressed transmission requirements on the BPA network only
- BPA initiated a National Environment Policy Act (NEPA) and preliminary engineering effort for M2W
- In 2014, BPA discontinued efforts when requests for transmission service to support the M2W discontinued their participation

Montana to Washington (M2W):

- In the 2016 Transmission Service Request Study and Expansion Process (TSEP), there were again a significant number of requestors that would need access to the capacity from the M2W project
- BPA is proceeding with a NEPA and preliminary engineering effort to determine whether to proceed with development of the M2W project

Montana to Washington (M2W):

- M2W upgrades five BPA substations (Garrison and Hot Springs Substations in Montana, Dworshak and Hatwai Substations in Idaho, and Bell Substation in Washington)
- Reconductor approximately 11.4 miles of BPA's Dworshak-Taft transmission line
- Construction of a new substation in Montana along the BPA's existing Garrison-Taft transmission corridor
- Direct costs: \$119 M (no contingency); energization post 2023 (optimistic)

Recommendation 1:

- The Planning Committee has reviewed the Colstrip Transmission System Upgrade and Montana to Washington transmission projects
- The material will be included as an inform for the Steering Committee final report
- No further action is anticipated at this time

Additional Study Work

Guidance: ...Steering Committee advises utilizing either existing studies or providing directional, high level assessments to answer assigned questions. The Steering Committee will be judicious in asking for additional planning information. High level non-discriminatory planning scenarios are recommended. Make maximum use of the existing studies such as NWE's Colstrip Shutdown Reports and the Northern Tier Transmission Group (NTTG) Studies. Consider the content of the Stigers report based on existing studies.

Additional Study Work (con't):

Review of Existing Studies:

The Planning Committee has reviewed four transmission studies and one whitepaper analyzing various Colstrip Unit 1-4 retirement scenarios:

- 2014-2015, Public Policy Consideration Study for NTTG
- 2016-2017, Public Policy Consideration Study for NTTG
- NWE sponsored study, retirement of CS Units 1 and 2
- NWE sponsored study, retirement of all coal in NWE's BA
- RNW sponsored whitepaper by Chuck Stigers

Additional Study Work (con't):

Key Findings:

1. Remedial Action Schemes (RAS) will be necessary for any new generation acquiring firm transmission service across the CTS
2. The studies performed to date have not identified that new transmission lines are required (as long as the 500 kV system is intact)
3. The studies did include transient stability analysis that did not identify new concerns

Additional Study Work (con't):

Key Findings:

4. As Colstrip units retire, adequate voltage support may be a concern on local areas of the system; the location of replacement generation may help address this concern
5. The 500 kV is, and will continue to be, an essential part of load service to Montana and supports transfers to the Northwest
6. With relatively minor reinforcements, the system can support a one-for-one replacement of Colstrip with wind energy 61

Additional Study Work (con't):

Generator Interconnection:

Transmission planning studies will have to confirm the results of the generic studies reviewed by this committee once specific generators are identified

- **Local voltage control issues:**

- New generation helps, especially closer to Billings
- Other options (Capacitors, Static Var Compensators, Storage, Synchronous Condensers)
- Not cost prohibitive

Additional Study Work (con't):

- **Sub-Synchronous Resonance:**
 - Frequency Scans
 - Filters can be added to wind machines
 - Not cost prohibitive
- **RAS Design:**
 - Cost Effective
 - “The Transmission Owners anticipate that they will be able to identify appropriate schemes that will support the reliable operation of the system in a timely fashion”

Additional Study Work (con't):

- **Black Start (con't):** Blackstart studies are required to confirm that a system can recover from a complete system blackout/outage
 - Required every five years, or within 90 days of a major system change
 - The last blackstart study conducted by NorthWestern was in 2017 and did not include the now planned closure of Colstrip Units 1 and 2
 - NWE's current plan is to follow the regular cycle
 - Begin next blackstart study in 2021 and file in 2022

Additional Study Work (con't):

- **Black Start:** NWE is well-prepared to meet blackstart requirements under a variety of resource and topology scenarios by utilizing the hydro resources, Dave Gates generating station, Colstrip 3 and 4, and imports from neighboring systems

Recommendation 2:

The Planning Committee is comfortable with NWE waiting until 2021 for the next regularly scheduled blackstart study:

- Understanding the 90 day requirement if there is an earlier closure of CS Units 1 and 2
- Recognizing that even without CS Units 1-4, several options available to NWE

Transmission Planning for a Shutdown of Colstrip 3 & 4

Guidance: *Prepare a study scoping document to assess the transmission system with retirement of Colstrip 3 and 4, and return to the Steering Committee when complete for consideration of this scope*

Transmission Planning for a Shutdown of Colstrip 3 & 4

Potential Scope:

- Additional analysis to confirm the ability of the CTS to maintain its path rating when all four Colstrip Units are retired
- The analysis could be similar to the work NWE is currently conducting for Units 1 and 2
- It is expected to take up to a year to develop the assumptions and to conduct the study work

Transmission Planning for a Shutdown of Colstrip 3 & 4

- **Narrative Paper has scope of work**
- **Additional decisions about the study parameters will also have to be made:**
 - All coal in Montana or just the Colstrip Units
 - New transmission lines necessary to serve all resources in NorthWestern's transmission and interconnection queues, or just enough to utilize the freed up capacity from coal retirements?

Transmission Planning for a Shutdown of Colstrip 3 & 4

Planning Committee Discussion:

- Several Committee participants emphasize urgency and interest to the State of Montana in understanding the implications for the CTS if all Colstrip Units retire
- The Planning Committee has laid out a scope of work that could provide incremental value. It is less clear there is enough new information that would substantially change the inputs, and thus the findings, of the previous studies
- The Path 8 transmission providers concerned about the staff resources necessary to complete this study work at this time 70

Recommendation 3:

- The Planning Committee prepared a study scope to address the eventual retirement of Colstrip 3 & 4. It will be augmented to include WECC study process steps covering any unexpected loss of all Colstrip units
- The whole scope will be preserved for implementation when the time is right

WECC Path Rating Questions

Guidance: *OK to do the WECC Path Rating process on an advantageous schedule – with retirement of Colstrip 1 and 2 and identification of replacement resources examined together*

Recommendation 4:

- The Transmission Owners believe that they will be able to select an appropriate time to pursue a timely WECC rating for Path 8 for the retirement of Colstrip Units 1 and 2
- Immediate action is not warranted at this time

Remedial Action Scheme Changes

Guidance: *The Steering Committee does not advise preparation of a broad specification of Remedial Action Scheme (RAS) as detailed specifications of replacement generation is required to do so*

Recommendation 5:

- While design modifications to the RAS are needed to coordinate with the Colstrip ATR or to implement a RAS when all coal fired generation at Colstrip is retired, the TOs anticipate that they will be able to identify appropriate schemes that will support the reliable operation of the system in a timely fashion
- The TOs will work together and with the developers of replacement resources to ensure the timely incorporation of the RAS system needed
- The Planning Committee does not propose further action at this time

Access to ATC on the Larger BPA Network

- Last year BPA decided not to build the I-5 Reinforcement Project, instead embracing a more flexible, scalable, and risk based approach to managing the transmission system
- BPA is implementing the Transmission Integrated Planning Process to help shift BPA's business model in reflection of that decision
- The focus of this effort is to refine both BPA's processes for awarding transmission service on the existing network transmission system as well as how BPA provides service when transmission expansion is required

Access to ATC on the Larger BPA Network

- For service on the existing network transmission system, the refinements focus on three areas:
 1. Evaluation and modification of assumptions used to define Long Term Firm (LTF) ATC, particularly refinement of assumptions related to existing transmission commitments (for example, modifications that include upcoming planned generation retirements)
 2. Additional engineering evaluation of whether and how much additional capacity is required to award service on the **existing transmission system**
 3. Investigation of a Conditional Firm product to apply to its Interties and External Interconnections – including West of Hatwai and West of Garrison

Access to ATC on the Larger BPA Network

- BPA is actively considering more flexible, scalable approaches to identify capacity to make available to requests for service. These include:
 - Non-wires solutions
 - Planning re-dispatch
 - Battery storage
 - Demand side management
- BPA expects to make modifications to its long-term ATC methodology that account for present and future market conditions, and **allow for increased network transmission availability**
- The timeline for completion of commercial assessment is 4th quarter of 2018, with TSEP cluster studies to initiate in the 1st quarter of 2019
- BPA believes these steps will help identify **additional ATC across BPA Network Flowgates**



OPERATIONS SUBCOMMITTEE

▶ We'll address questions in 2 categories today:

▶ C1 Dynamic Transfer Capability (DTC)

- ▶ BPA DTC Studies

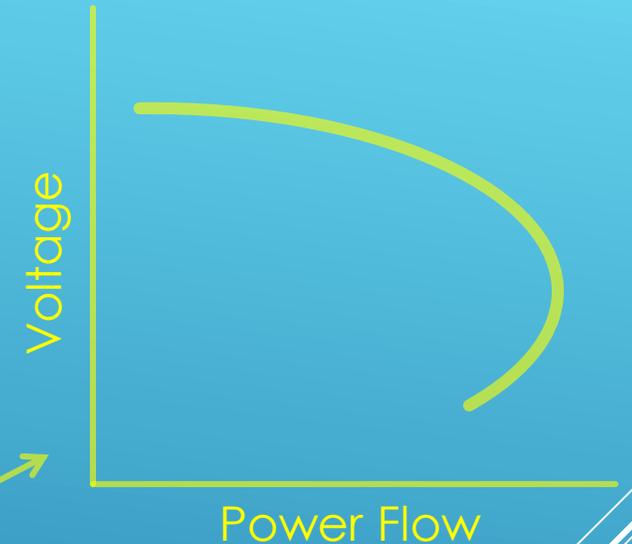
- ▶ BPA/Montana Wind Diversity Studies

▶ C2 Generation Loss Impacts

- ▶ NorthWestern BA Frequency Response/Voltage support/Inertia Issues

▶ **DTC is the amount of MW movement over a transmission path that can be accommodated in-hour without violating voltage limits.**

- ▶ When MW flow increases, voltage decreases.
- ▶ When MW flow decreases, voltage increases.
- ▶ The percent change in voltage allowed may vary depending on which path is being studied for DTC limits



DYNAMIC TRANSFER CAPABILITY

- ▶ **Currently, the amount of DTC allowed over a transmission path is set so it does not push the voltage to a point that Dispatch needs to take action (putting on or taking off a reactive device).**
 - ▶ Studies analyze the change in voltage for corresponding change in flow at various initial flow values to produce a DTC nomogram
 - ▶ The most limiting value from the nomogram is set as the DTC limit
 - ▶ Exceedance of a DTC limit does not result in immediate system degradation, but can put the system in an unreliable or suboptimal state

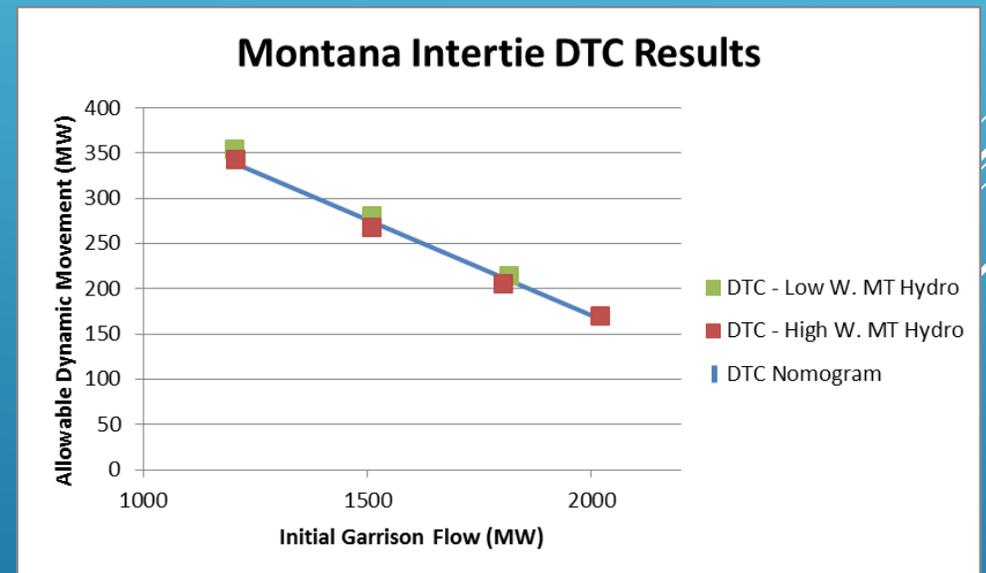
C1 Dynamic Transfer Capability (DTC): How much DTC is available on key interchange points to schedule wind out of Montana and into the BPA network? How much wind can be supported by this DTC?

- ▶ NWE does not have DTC limits on its system
- ▶ Only the Garrison interchange point has been studied.
- ▶ The Wind Integration Study Team (WIST) estimated **170 MW east-to-west** and **197 MW west-to-east** across the Montana Intertie in a study from 2011
 - ▶ **250MW** of generic wind (NW) resources were supported

DYNAMIC TRANSFER CAPABILITY (CON'T)

C1 ✓ Action Item 1: Update Montana Intertie DTC Study

- ▶ BPA Transmission Planning completed Montana Intertie DTC Study
- ▶ The study included scenarios for both high and low generation at western Montana hydro generators
- ▶ The study confirmed the WIST study results of 170 MW east-to-west, and thus a total range of +/- 170MW



DYNAMIC TRANSFER CAPABILITY (CON'T)

C1 Action Item 2: Compare Updated DTC Study with actual Montana wind data

- ▶ BPA is preparing analysis while Operations Committee works to secure Montana wind data

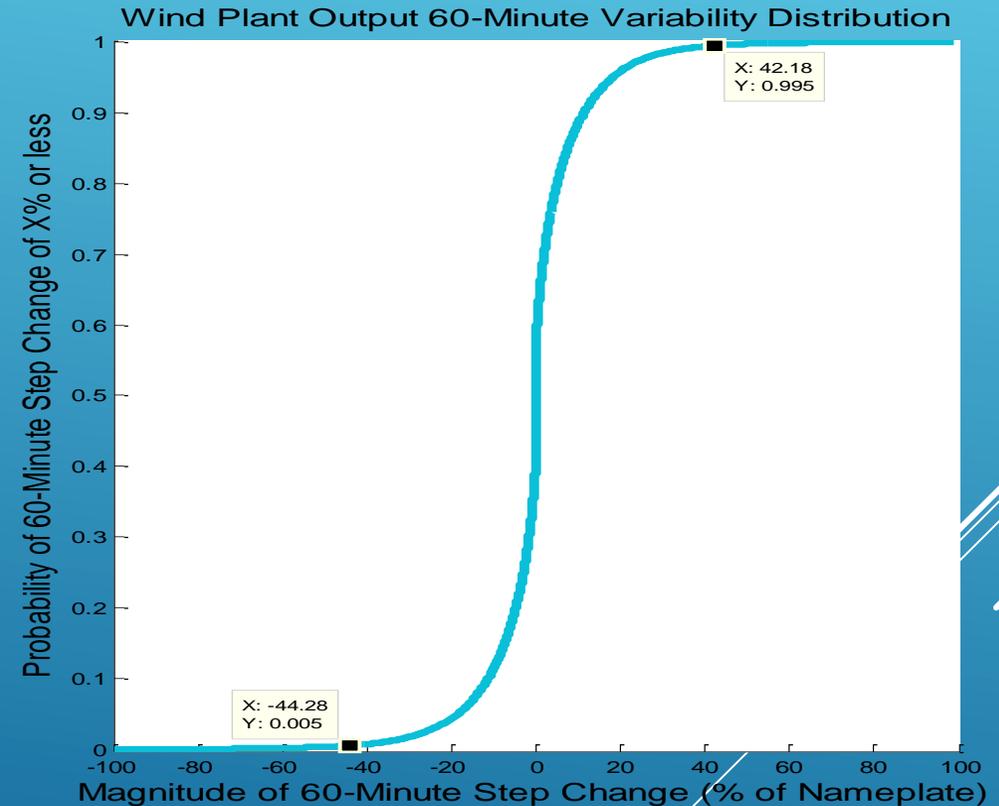
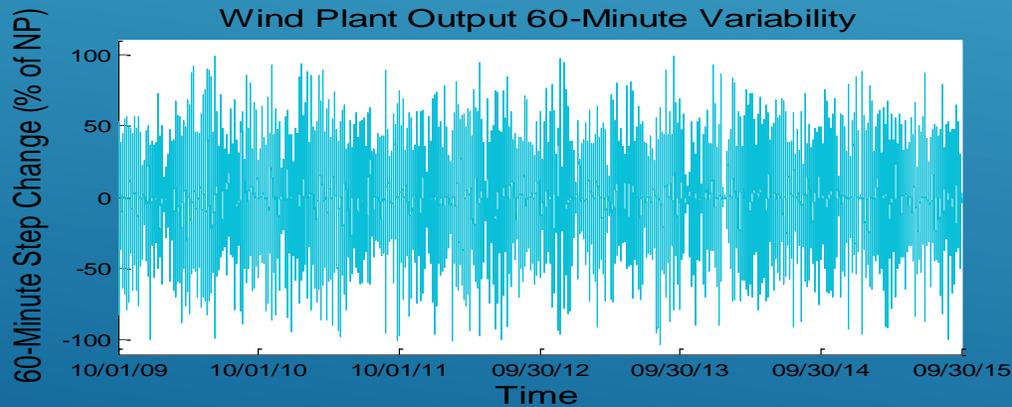
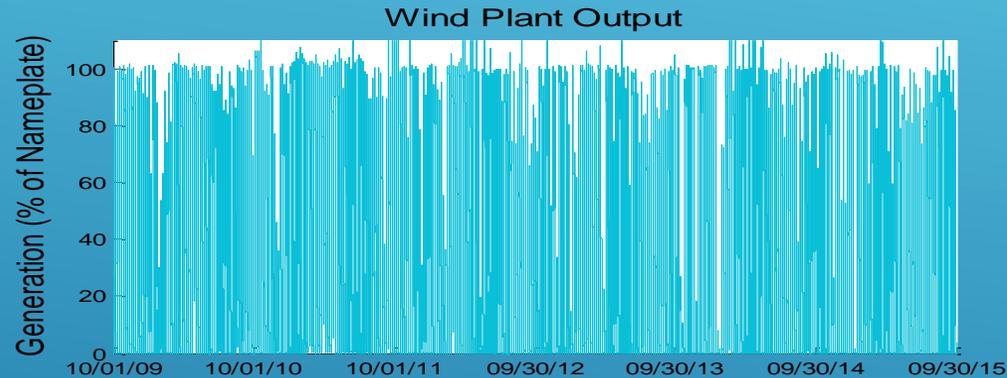
DYNAMIC TRANSFER CAPABILITY (CON'T)

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C1

Action Item 2: Compare Updated DTC Study with actual Montana wind data

- ▶ Data below is on a single non-Montana wind plant to provide illustration of analysis

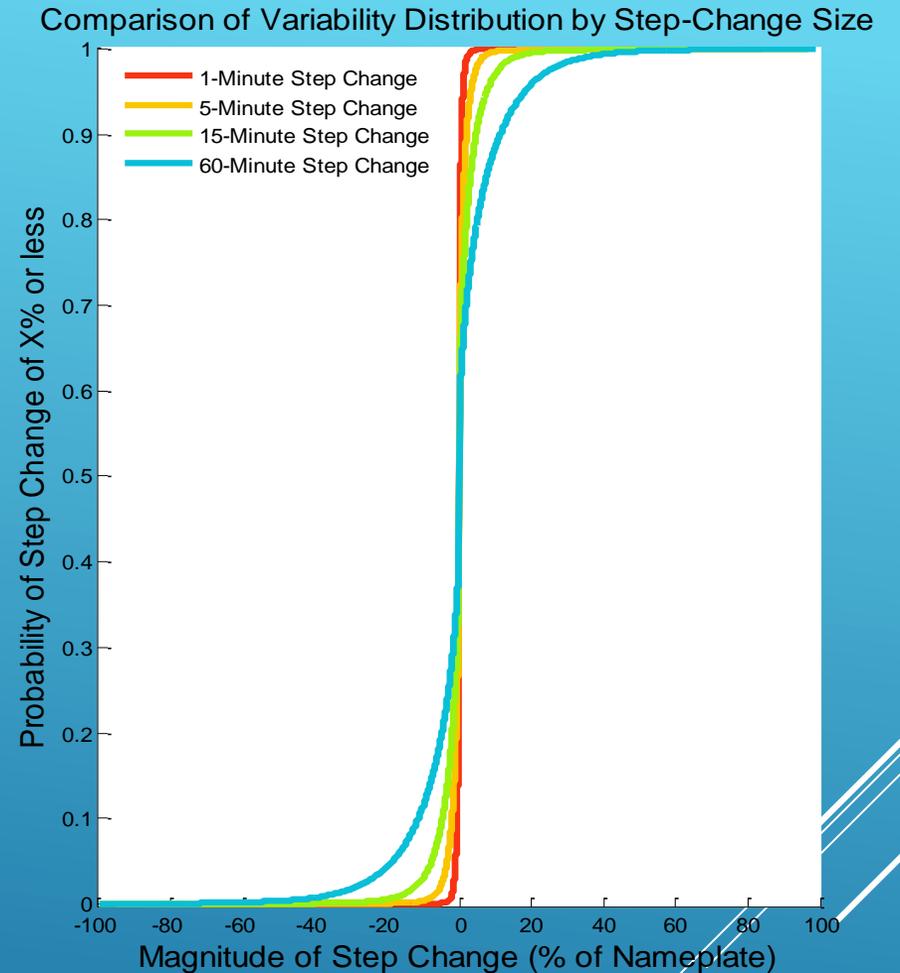


DYNAMIC TRANSFER CAPABILITY (CON'T)

C1

Action Item 2 (con't): Compare Updated DTC Study with actual Montana wind data

► Illustration of analysis



DYNAMIC TRANSFER CAPABILITY (CON'T)

C1

Dynamic Transfer Capability (DTC): How much DTC is available on key interchange points between the BPA network and other PNW BAs (West of Montana) that may be viable markets for Montana renewables (PSE, PGE, AVA, etc.)? How much wind can be supported by this DTC?

- ▶ There are currently no DTC limitations between BPA and other NW parties - the DTC limitation on the Montana Intertie would keep these transfers low enough to not adversely impact transmission paths
- ▶ If DTC on the Montana Intertie is significantly increased in the future, interchange points further west may then be limiting
- ▶ BPA to Study OR/WA/MT wind data to study diversity potential

DYNAMIC TRANSFER CAPABILITY (CON'T)

C2 Is there an impact from the loss of the inertia, frequency response, and voltage support provided by Colstrip if replaced by generation without system inertia (wind and solar)?

► Issues:

► Inertia

- Yes. VERs may need to provide special controls (synthetic inertia) if required by system studies. Some wind turbines have the capability, though at a cost.
- Will study keeping Colstrip 1 and 2 as Synchronous Condensers.

► Voltage support

- Yes. VERs must provide the voltage support needed for their integration.

GENERATION LOSS IMPACTS (CON'T)

C2 Is there an impact from the loss of the inertia, frequency response, and voltage support provided by Colstrip if replaced by generation without system inertia (wind and solar)?

▶ Frequency Response

- ▶ **Necessary**: All new VERs may need to provide Frequency Responsive Reserve – self supply or purchase

▶ Operations group to suggest options available for solutions to VER Integration issues

▶ Operations will coordinate with Planning concerning Inertia and Stability needs

GENERATION LOSS IMPACTS (CON'T)

ACRONYMS

Acronym	Full Description
ATC	Available Transfer Capability
ATR	Acceleration Trend Relay
AVA	Avista Corporation
BPA	Bonneville Power Administration
CF	Conditional Firm
DOE	Department of Energy
FCRPS	Federal Columbia River Power System
FCRTS	Federal Columbia River Transmission System
IPC	Idaho Power Corporation
LTF	Long Term Firm
MT	Montana
NF	Non-Firm
NWE	NorthWestern Energy
OTO	Other Transmission Options
PAC	Pacificorp
PGE	Portland General Electric
PRG	Project Review Group
PSE	Puget Sound Energy
RAS	Remedial Action Scheme
TO	Transmission Operator
TSP	Transmission Service Provider
WECC	Western Electric Coordinating Council
WOG	West of Garrison
WOH	West of Hatwai