Welcome!
Transmission Corridors Work Group
Meeting #5
Day 1: April 13, 2022; 9 AM – 12 PM

Observers: Please join the meeting via Livestream: www.rossstrategic.com/livestream
If you are having technical difficulties, please email Tess at twendel@rossstrategic.com
Public Participation

- Public observers, if you are currently in the Zoom meeting, please log off and listen/watch the meeting via livestream: www.rossstrategic.com/livestream
- If you wish to provide public comment, please join the Zoom meeting tomorrow at 11:45 AM.
- We will share Zoom info at that time (available through livestream)
- Written comments are always welcome via email: transmissioncorridors@rossstrategic.com

If you need technical assistance, please send a Zoom chat to Tess Wendel or twendel@rossstrategic.com.
Welcome and agenda review
Rob Willis, TCWG Facilitator, Ross Strategic
Kathleen Drew, EFSEC
**Today's agenda – Day 1 (April 13)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
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<tbody>
<tr>
<td>9:00 AM</td>
<td>Opening (agenda review, remarks, etc.)</td>
</tr>
<tr>
<td>9:10 AM</td>
<td>Deep Dive Presentations</td>
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<tr>
<td></td>
<td>• Benefits of Regional Transmission Coordination</td>
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<td></td>
<td>• Flow-Based Modeling</td>
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<td>• Analysis of East to West Transmission Conditions in Pacific Northwest</td>
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<tr>
<td>10:05 AM</td>
<td>Break</td>
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<td>10:15 AM</td>
<td>Emerging Principles Breakout Groups</td>
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<tr>
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<td>• Introduction to the revised Emerging Principles</td>
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<td>• Plenary to affirm Meeting 3 Emerging Principles</td>
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<td>• Breakout Groups to identify issues and concern with Meeting 4 Emerging Principles</td>
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<tr>
<td>11:55 AM</td>
<td>Day 1 Wrap-Up</td>
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<td>• Look ahead to Day 2</td>
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<td></td>
<td>• Closing remarks</td>
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<tr>
<td>12:00 PM</td>
<td>Adjourn</td>
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**Tomorrow’s agenda – Day 2 (April 14)**

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<td>Emerging Principles Discussion Review</td>
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<td>• Review of breakout groups, reporting out on Day 1 emerging principles discussion</td>
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<tr>
<td>10:30 AM</td>
<td>Break</td>
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<td>10:40 AM</td>
<td>Emerging Principles Discussion Review (continued)</td>
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<td>Round-Robin Check-in with TCWG members</td>
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Deep Dive Presentations
Perspectives shared today & tomorrow

Today (Day 1):

• Benefits of Regional Transmission Coordination (Megan Decker, Oregon PUC)
• Flow-Based Modeling (Vic Howell, WECC)
• Analysis of East to West Transmission Conditions in PNW (Randy Hardy)

Tomorrow (Day 2):

• Overburdened Communities (Mariel Thuraisingham, Front and Centered)
Benefits of Regional Transmission Coordination

Megan Decker
Flow-Based Modeling

Vic Howell (WECC)
Contract Path versus Flow-based Method Concepts

April 13, 2022

Vic Howell
Director of Reliability Risk Management
Two Approaches

- **Objective**—to determine how much power can be reliably transferred
- **Two general approaches**
  - Contract path method
  - Flow-based or flowgate method
What is a contract path?

“...a path that can be designated to form a single continuous electrical path between the parties to an agreement.” (FERC, Order 888, April 24, 1996)
Contract Path

- Starts with Total Transfer Capability (TTC) of the contract path. TTC = 1,000 MW
- Transfer 100 MW
  - 100% of flow assumed to occur on the contract path
  - Available Transfer Capability (ATC) on this path reduced by 100 MW
Contract Path

- Power flows on path of least resistance across the entire network
- Everything except red is “loop flow” or “unscheduled flow”
Contract Path

G1

5 MW

4 MW

1 MW

4 MW

G2

L1

4 MW

L2

4 MW
Contract Path

- Starts with TTC
  - TTC calculation practices vary
  - TTC can be somewhat static, conservative value
- Scheduling based on a specific path
- Does not account for how power flows in the transmission system
Flow-based Method

▪ Determines impacts on predefined flowgates
  • Transmission element such as a line or a transformer
  • Flowgates can account for contingencies

▪ Uses a power-flow model
  • Flowgate impact data
  • Loads
  • Generation
  • Committed transmission system reservations
  • Out-of-service system elements
Flow-based Method

- When I transfer 100 MW from G1 to L1, how does it impact F1, F2, and F3?
- Uses distribution factors

Meshed network

F1
F2
F3

- F1 = 500 MW
- F2 = 600 MW
- F3 = 200 MW
Flow-based Method

- Distribution Factors calculated for flowgates for the given topology
- 100 MW transfer from G1 to L1
- Sched x 28% = 28 MW
- Available Flowgate Capability (AFC) reduced by 28 MW
- Meshed network
- Sched x 16% = 16 MW
- Sched x 9% = 9 MW
- F1 = 500 MW
- F2 = 600 MW
- F3 = 200 MW

Planned outages

G1

L1
Flow-based Method

- Starts with Total Flowgate Capabilities (TFC)
  - TFC determined based on Facility Rating
- Calculates impacts on predetermined flowgates
- Scheduling based on source and sink and impacts on flowgates—not a specific path
- Accounts for how power flows in the transmission system
Contact:

Vic Howell
Director of Reliability Risk Management
vhowell@wecc.org
Analysis of East to West Transmission Conditions in PNW

Randall Hardy
I. Current Situation

(1) WA/OR legislation requires IOUs to reach 80% clean energy by 2030

(2) Current Status
   - PSE = 35% clean energy
   - PGE = 40 - 50% clean energy

(3) PSE/PGE Non-Distributed Resource Needs
   - PSE = 1,500 MWa energy (2031)
     1,850 MW capacity (2027)
   - PGE = 1,500 - 2,00 MWa energy (2030)
     800 MW capacity (2030)

(4) Major Potential Problems
   - East to West Long Term Firm (LTF) Tx to wheel wind/solar to Seattle/Portland
     □ CCN from Mid C to Seattle
     □ CCS from Mid C to Portland
II. BPA 2021 Tx Cluster Study (CS)

(1) Released in June 2021

(2) Analyzed 5,842 MW of TSRs

(3) 1,400 MW of TSRs could only reach PGE with a $750 million upgrade to Raver-Paul 500 kV line
   • All these TSRs withdrawn

(4) Most likely tx upgrades
   • Schultz-Raver SCPS
     □ 72 TSRs for 2,264 MW
     □ Increases CCN ATC by 500 MW
     □ BPA decision to proceed: summer 2022
     □ Energization: fall 2025
   • Portland area 230 kV upgrade
     □ 48 TSRs for 934 MW
     □ Increases CCS ATC by 500 MW
     □ BPA decision to proceed: late 2023
     □ Energization: fall 2026
III. Current Tx Status/Trends

(1) TSRs remaining in BPA queue (as of 12/7/21)
   • 4,800 – 5,000 MW
   • Probably 3,000 – 3,500 MW need CCN or CCS

(2) Amount of TSRs steadily increasing
   • 2020 CS = 4 GW
   • 2021 CS = 6 GW
   • 2022 CS = 11 GW

(3) PSE dual fuel CT(s)
   • located on Westside
   • could lessen PSE E-W tx needs for RA capacity

(4) BPA Near Term CCN/CCS Tx upgrades
   • help meet E-W tx needs 2022-26
   • unlikely to help meet 2026-30 E-W tx deficit
IV. Other Coping Strategies

1. Repurposing tx previously used for thermal resources to wheel wind/solar (e.g. Coalstrip 3 & 4 tx)
   - Possible but complicated
   - Likely need to provide more VAR support and accommodate different generation patterns.

2. Co-locating wind/solar near existing thermal resources (to use their tx). Needs to comply with more recent FERC reliability requirements

3. As a result, both strategies may require additional tx measures/constraints

4. Such changes illustrate the uncertainty involved with determining whether BPA/PNW needs additional E-W tx (and, if so, how much) to meet WA/OR 2030 clean energy goals
V. Implications / Needed Actions

(1) Unclear whether PSE or PGE likely have sufficient LTF to meet 2030 clean energy goals

(2) BPA needs to proceed with Schultz-Raver SCPs and Portland 230 kV upgrades

(3) BPA needs to identify additional likely needed E-W Tx upgrades ASAP
   • However, given workload and other priorities, not likely until late 2024/early 2025

(4) Additional E-W tx measures could involve new 230/500 kV lines for CCN/CCS
   • New tx lines typically take 10-15 years to permit/build
   • If such a major build required, it will not be completed until well after 2030.

(5) PAC/IPC need to complete B2H and Gateway West
VI. Interim Measures

(1) BPA liberalize terms of its conditional firm reassessment tx product
   • Increase term from 2 years to 5/6 years
   • Vary number of curtailable hours

(2) Work with vendors to evaluate use of power flow control devices
   • Reduce overloaded lines
   • Short installation times and lower costs

(3) Such measures not substitutes for new tx, but could provide interim relief
VII. Conclusions

(1) Lack of E-W tx on CCN/CCS is a major challenge, especially 2026 - 2030.

(2) Need to identify likely E-W tx scenarios/additions by late 2022 to enable possible energization by 2030.

(3) If not timely addressed, this issue will seriously limit effectiveness of WA/OR clean energy effort
   • PNW BAs will be unable to access full range of regional resource diversity benefits, either for decarbonization or Resource Adequacy.
Brief Q&A
Break
Please return at 10:45 AM
Emerging Principles
Emerging Principles
In Breakout Groups

Please rejoin us at 11:55am for the final wrap up of Day 1.
Day 1 Wrap Up
Day 2 Preview
Closing remarks
Adjourn

Thank you – see you 9:00 AM tomorrow for Day 2!
Welcome!
Transmission Corridors Work Group
Meeting #5
Day 2: April 14, 2022, 9 AM -12 PM

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Kathleen Drew, EFSEC
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Opening Remarks
Kathleen Drew, EFSEC, TCWG Chair
Overburdened Communities

Mariel Thuraisingham: Front and Centered
Emerging Principles: Discussion Review
Break
Return at 10:45 AM

For those wishing to provide public comment at 11:50 AM:

• Log into the Zoom meeting at 11:45 AM by typing this address into your browser:
  https://www.zoomgov.com/j/1604913492
• You can also join by phone:
  Phone number: (669) 254 5252
  Meeting ID: 160 491 3492
Emerging Principles for Expediting Environmental Review:
Facilitated discussion

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Round Robin
For those wishing to provide public comment

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  Phone number: (669) 254 5252
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Public Comment Opportunity will start at 11:50 AM
Public Comment Opportunity
Public Comment Opportunity

• Each commentor has up to 2 minutes to provide comment.
• The facilitation team will call on commenters when it is their turn to speak. You will be muted until your turn.
• Commenters may also email comments to transmissioncorridors@rossstrategic.com
Looking Forward and Wrap Up
Looking Forward and Wrap Up

- Action items/next steps
- Meeting #6 currently scheduled for June 8 & 9, 2022
Closing remarks
Thank you!

Please direct group member questions and public comments to:

transmissioncorridors@rossstrategic.com