

Bonneville Power Administration Available Transfer Capability Calculations

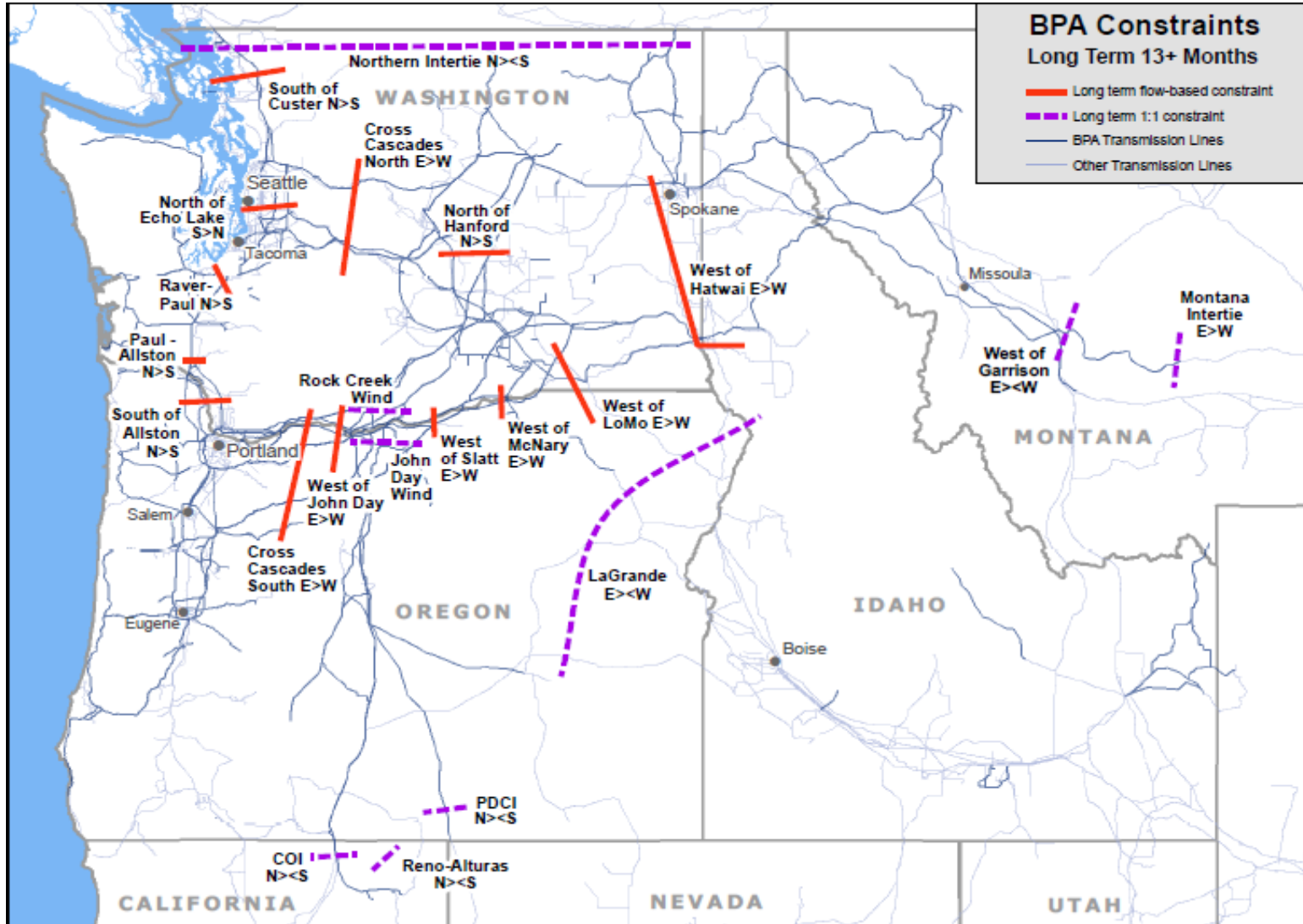
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November 30, 2021

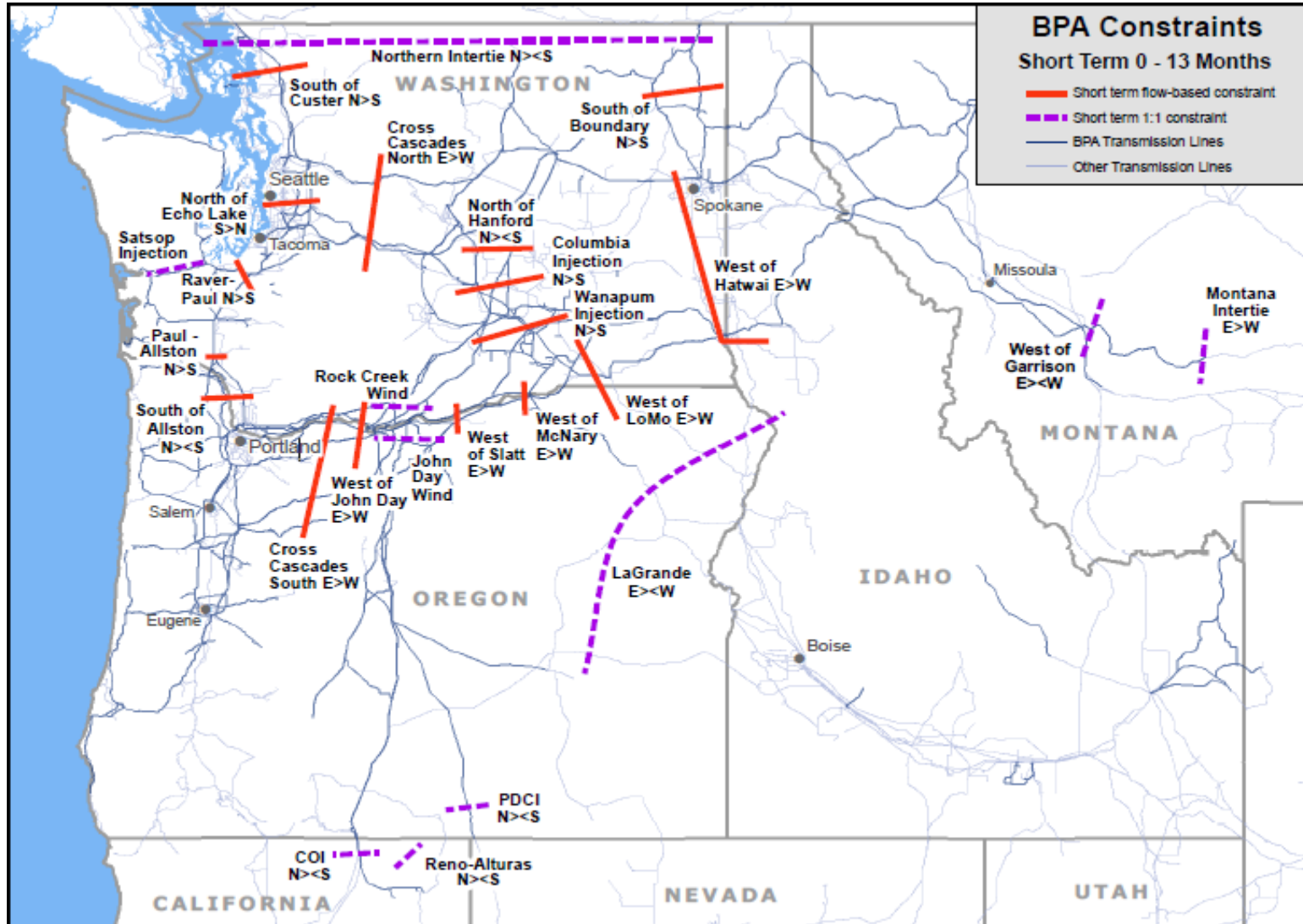
Calculating ETC in the All Time Horizons

- BPA has a mix of 1:1 (“rated path”) and flow-based paths (“flowgates”)
 - See maps on following slides
 - MOD-029-2a (Rated System Path Methodology) is used in the short-term 0-13 month NERC horizon for all paths
- For 1:1 paths, BPA calculates ETC by assuming each 1 MW of transmission service granted has 1 MW impact to ETC
- For flow-based paths, BPA calculates ETC by using power flow studies and Power Transfer Distribution Factor (PTDF) analyses
 - This methodology sums base ETC and interim ETC to calculate a total ETC for each constraint
 - Base ETC is derived from a power flow study
 - PTDFs are used to calculate interim ETC
 - ❖ $(\text{Source/POR PTDF} - \text{Sink/POD PTDF}) * \text{MW} = \text{Interim ETC Impact}$

ATC Long Term Constraints



ATC Short Term Constraints



Calculating Long-Term ATC

- Long-Term ATC is defined as the period beyond 13 months, out to ten years
- Firm reservations are used to calculate Long-Term ETC
 - BPA does not calculate a Long-Term Non-Firm ATC
- BPA does not use CBM, TRM, Counterflows or Postbacks in Long-Term ATC calculations

Calculating Short-Term Firm ATC

- Short-Term ATC is defined as the 0-13 month period
- Firm reservations are used to calculate Short-Term Firm ETC
 - BPA makes ETC adjustments across its paths if needed for encumbrances or releases not captured in the powerflow and PTDF accounting
- BPA does not use CBM, Counterflows or Postbacks in Short-Term Firm ATC
 - TRM is applied to Northern Intertie N>S, Northern Intertie S>N, Satsop Injection, and West of Garrison E>W

Calculating Short-Term Non-Firm ATC

(Beyond Real-Time Horizon)

- Firm and non-firm reservations are used to calculate Short-Term Non-Firm ETC
- Same ETC adjustments as for Short-Term Firm ATC
- BPA does not use CBM or Postbacks in Short-Term Non-Firm ATC
 - TRM is applied to Northern Intertie (both directions)
 - Counterflow schedules are included except for Dynamic, Pseudo-Tie, and Capacity tag types

Calculating Short-Term Non-Firm ATC

(Real-Time Horizon)

- Real-time horizon begins at 22:00 the day prior to the delivery day
- BPA sums firm schedules, non-firm schedules, and unscheduled non-firm reservations to calculate Short-Term Non-Firm ETC
- BPA does not use CBM in Short-Term Non-Firm ATC for the real-time horizon
 - Counterflow schedules are included except for Dynamic, Pseudo-Tie and Capacity tag types
 - Postbacks are used on COI N>S to account for any unused share of non-firm capacity available to BPA from capacity ownership agreements, to prevent curtailments
 - TRM is applied to Northern Intertie (both directions)

Base ETC for Flow-Based Constraints

- Base ETC is calculated from power flow studies
 - These studies utilize seasonal WECC base cases to calculate BPA's peak transfer commitments across each flow-based constraint
 - BPA only includes firm reservations in the base ETC studies
 - Counterflows are accounted for in power flow studies
- The seasonal base cases are updated with assumptions related to:
 - System topology
 - Loads
 - Generation patterns
 - Intertie import/export levels

Base ETC for Flow-Based Constraints (cont.)

- WECC Winter and Summer heavy load seed cases are utilized to calculate base ETC across almost all flow-based constraints
- For Spring studies, the Long-Term uses a light load case created through modifications to a WECC Summer peak load seed case, and the Short-Term uses a WECC Spring heavy load seed case
- West of Hatwai is the exception to using WECC seasonal heavy load seed cases:
 - The Long-Term uses the Spring light load case as most limiting
 - The Short-Term utilizes Winter and Summer WECC light load seed cases and uses those results as the monthly base ETC for the path
- The seasonal cases are then stressed under different scenarios to determine ETC

Base ETC for Flow-Based Constraints (Federal Generation Assumptions)

Season	Load Profile	Wind	Canadian Entitlement Return	Stressed Zones
Winter (January)	Peak	On LT On/Off ST	On LT On/Off ST	Upper Columbia Lower Snake Lower Columbia
Spring (May)	Off-Peak LT Peak ST	On/Off	On LT On/Off ST	Upper Columbia ST only Lower Snake Lower Columbia
Summer (August)	Peak	On/Off	Off LT On/Off ST	Upper Columbia Lower Snake Lower Columbia
Winter & Summer (ST only)	Off-Peak	Default	On	Eastern Federal Hydro

LT = long-term; ST = short-term

Long-Term Base ETC for Flow-Based Constraints

- Generation rights are modeled, except in generation-surplus scenarios in which all generation is scaled down *pro rata*
- Each season calculated separately
- Minimum ETC for 5 and 10 year cases interpolated to calculate ETC for 2 years out
- Growth factor calculated, may be positive or negative
- The lowest ETC value from the scenarios for each season is used as the base ETC across each flow-based constraint
 - The difference between seasonal min and max ETC values is held out as a commercial uncertainty margin
- Three seasonal values are used to calculate monthly values:
 - Winter case feeds November, December, January, February
 - Spring case feeds April, May and June
 - Summer case feeds July, August
 - March is an average of Winter and Spring cases
 - October is an average of Winter and Summer cases
 - September is 75% of Summer case and 25% of Winter case

Short-Term Base ETC for Flow-Based Constraints

- Heavy load base ETC studies
 - Monthly granularity
 - BPA loads in the WECC seasonal cases are replaced with monthly 1 in 2 year heavy load forecasts
 - Generation is modeled based on scenario being studied
 - Import and export values are modeled based on rights
- Light load base ETC studies (West of Hatwai)
 - Seasonal (Winter, Spring, and Summer) granularity
 - Loads in the WECC seasonal cases are used except for Montana; for Montana, loads in the WECC seasonal cases are compared to loads provided by NorthWestern Energy; BPA uses the lower of the two in the light load base ETC studies
 - ETC from winter studies is used as base ETC for November through March
 - ETC from summer studies is used as base ETC for June through October
 - ETC from spring studies is used as base ETC for April and May. If the WECC Spring seasonal light load case is not available, the higher of the summer or winter values is used as base ETC

Short-Term Base ETC for Flow-Based Constraints (cont)

- All Lines in Service for all base ETC studies
 - Transmission outages accounted for in the 2-3 week horizon for PTDFs
- The maximum base ETC value from the scenarios is used as the base ETC for firm ATC calculations
- The minimum base ETC value from the scenarios is used as the base ETC for non-firm ATC calculations

ATC Postings

- BPA posts a Long-Term ATC Methodology document, ATCID, and TRMID to describe our calculations
 - [Home \(bpa.gov\)](http://bpa.gov)
- ETC, ATC, TRM and TTC values are posted both to OASIS and, for Long-Term ATC, via our external website (annual values only)
- BPA hosts an annual meeting to describe Long-Term ATC study updates (including generation assumptions) and results
- BPA also hosts Short-Term ATC meetings at least twice a year to share progress on efforts to improve Short-Term ATC calculations
- A Commercial Transmission Inventory Map (CTIM) is made available for interested parties to “self score” the likelihood of a new Long-Term Transmission Service Request being granted



Appendix

Base ETC for Flow-Based Constraints (cont.)

All values are for example only

Total FCRPS Big 10 Obligation: 10,000 MW

Distribution of obligation:

UC: 50% LC: 30% LS: 20%

Values vary by season and year

Stressed zone peak values:

UC: 7000 LC: 6000 LS: 3500

Forecasted values updated yearly

UC Stressed: UC = 7000
3000 remains → LC = 1800 LS = 1200

LS Stressed: LS = 3500
6500 → UC = 4063 LC = 2437

LC Stressed: LC = 6000
4000 → UC = 2857 LS = 1143

Upper Columbia: Grand Coulee, Chief Joseph

Lower Snake: Lower Granite , Little Goose, Lower Monumental, Ice Harbor

Lower Columbia: McNary, John Day, The Dalles, Bonneville