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September 8, 2010

MEMORANDUM

TO: Power Committee

FROM: Wally Gibson

SUBJECT: Transmission Congestion and Resource Adequacy Analysis

Several of the Council's models, including that used for resource adequacy analysis, contain only limited representations of the Northwest transmission system and its constraints. This raises a question whether that limited representation distorts the results of the adequacy analysis by assuming transmission access to certain resources when that access may actually be limited by contractual limitations or physical transmission congestion. The staff will present the results of an inquiry into that question.

The staff has previously presented a review of major transmission additions that are in various planning stages, noting that the driver for some of the upgrade capability is new generation to serve regional and extra-regional sales and RPS requirements. The present analysis focuses on load service requirements within the Northwest. Two kinds of congestion were investigated: lack of Available Transmission Capacity (ATC) and physical power flows near or at Operating Transfer Capability (OTC) limits. The former is a measure of transmission capacity available for sale; the latter is a real time reliability limit. Six major paths or flowgates in the Northwest were examined, looking at both winter and summer conditions for the power flow issue.

The general conclusion of the analysis is that there are two areas where the current transmission system can become a constraint on load service in the intermediate term, the Portland area and Idaho. In both of these areas, transmission expansion projects and/or new local generation projects to alleviate potential problems are in the planning and development stages with target dates to prevent load service problems in the future.

The staff will continue to investigate expanding the capabilities of the Council's models to incorporate more transmission information as warranted.

Northwest Transmission Constraints and Resource Adequacy Impacts



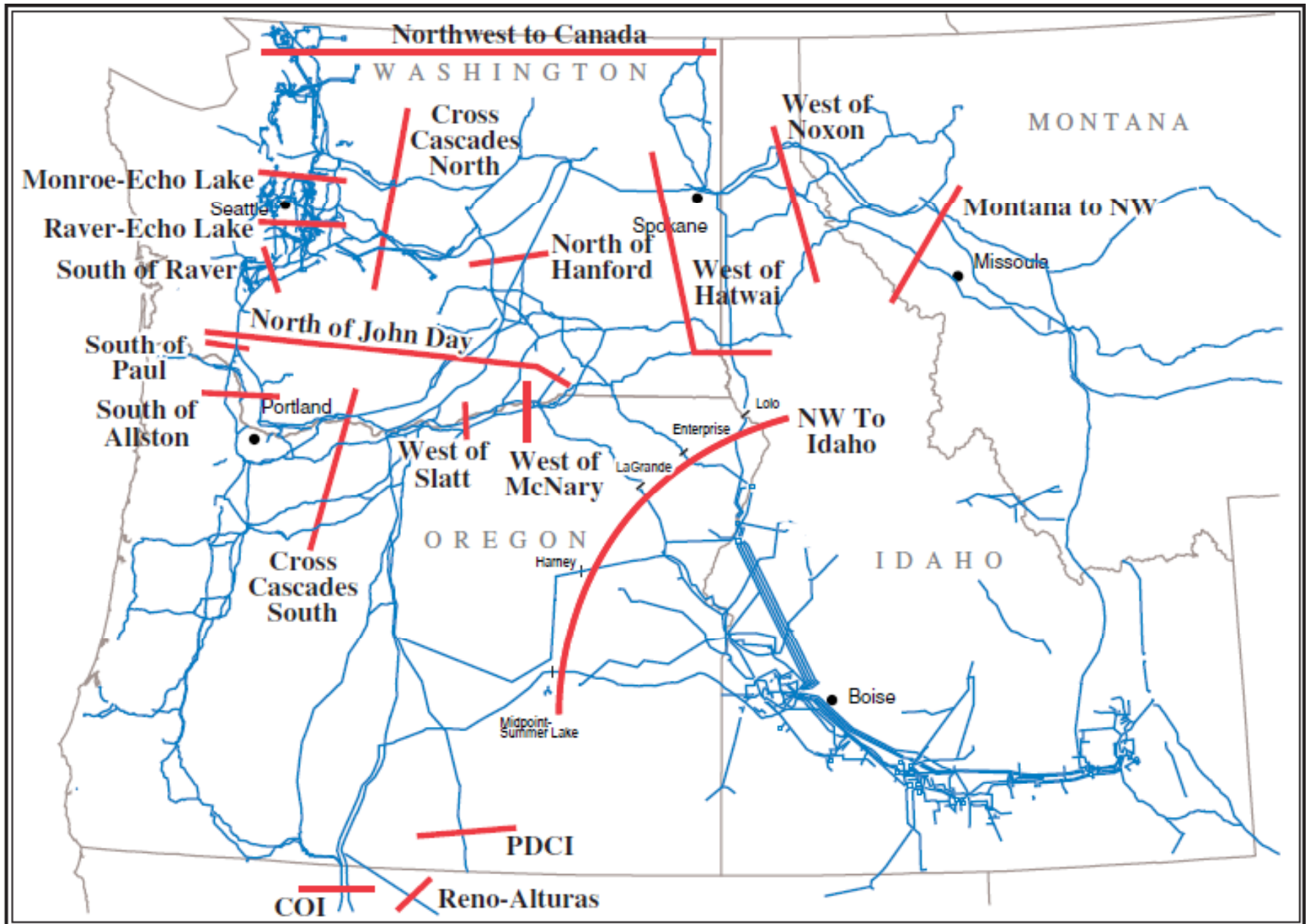
Wally Gibson
Northwest Power and Conservation Council
Bend, Oregon
September 21, 2010

Overview

- Issue: To what extent are transmission constraints likely to impede access to resources to meet peak loads and to create near-term adequacy problems?
 - Look at subregions of NW rather than region as a whole
- Approach:
 - Review ATC availability
 - Review historical path flows, pre-recession data
 - Cold winter December 2008 and hot summer July 2006
- Summary: Some problems, especially Idaho and Portland area
 - Not generally an immediate problem
 - Likely to be a mid-term problem, being addressed in planning efforts, both transmission and new local generation

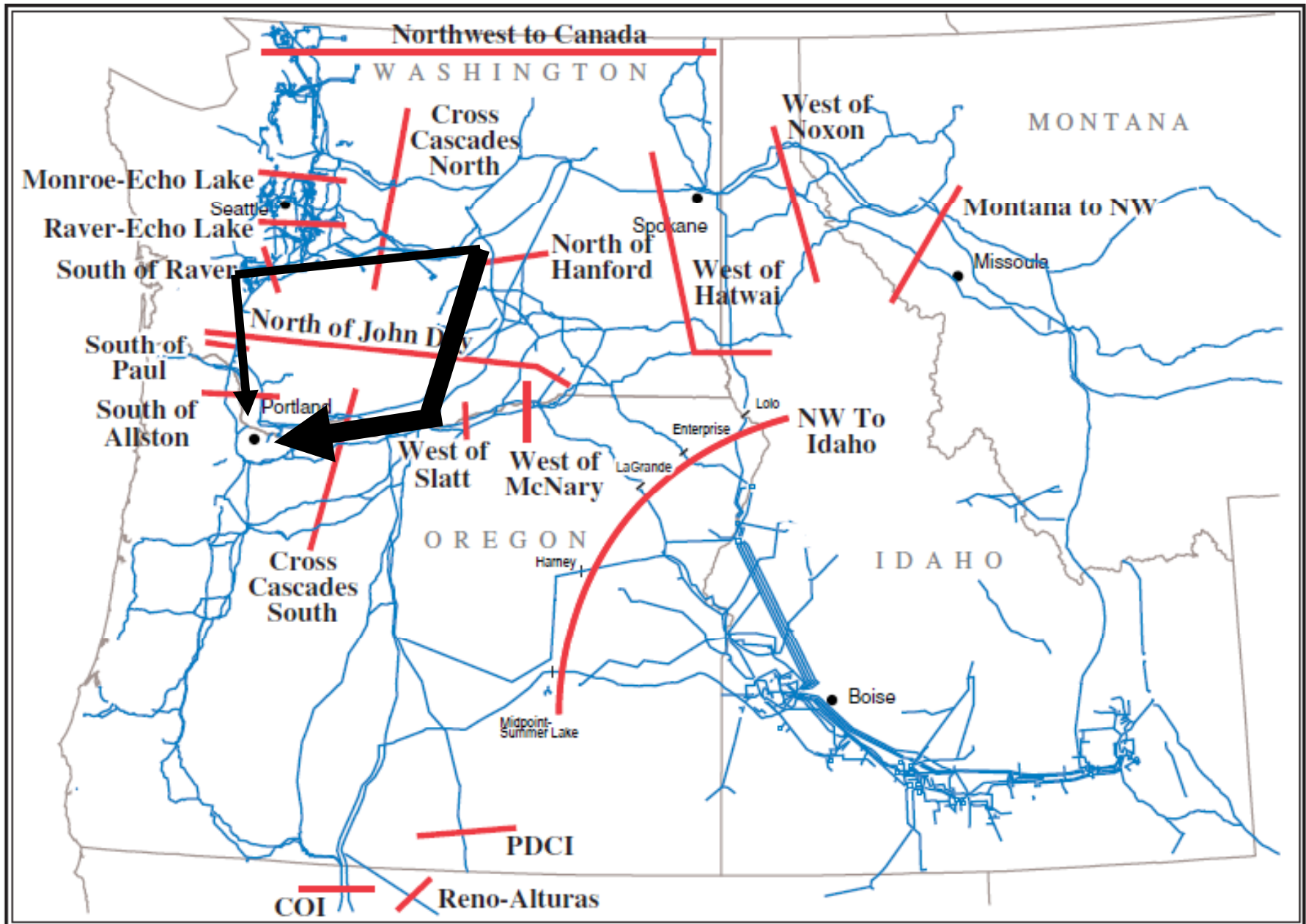
Transmission Congestion

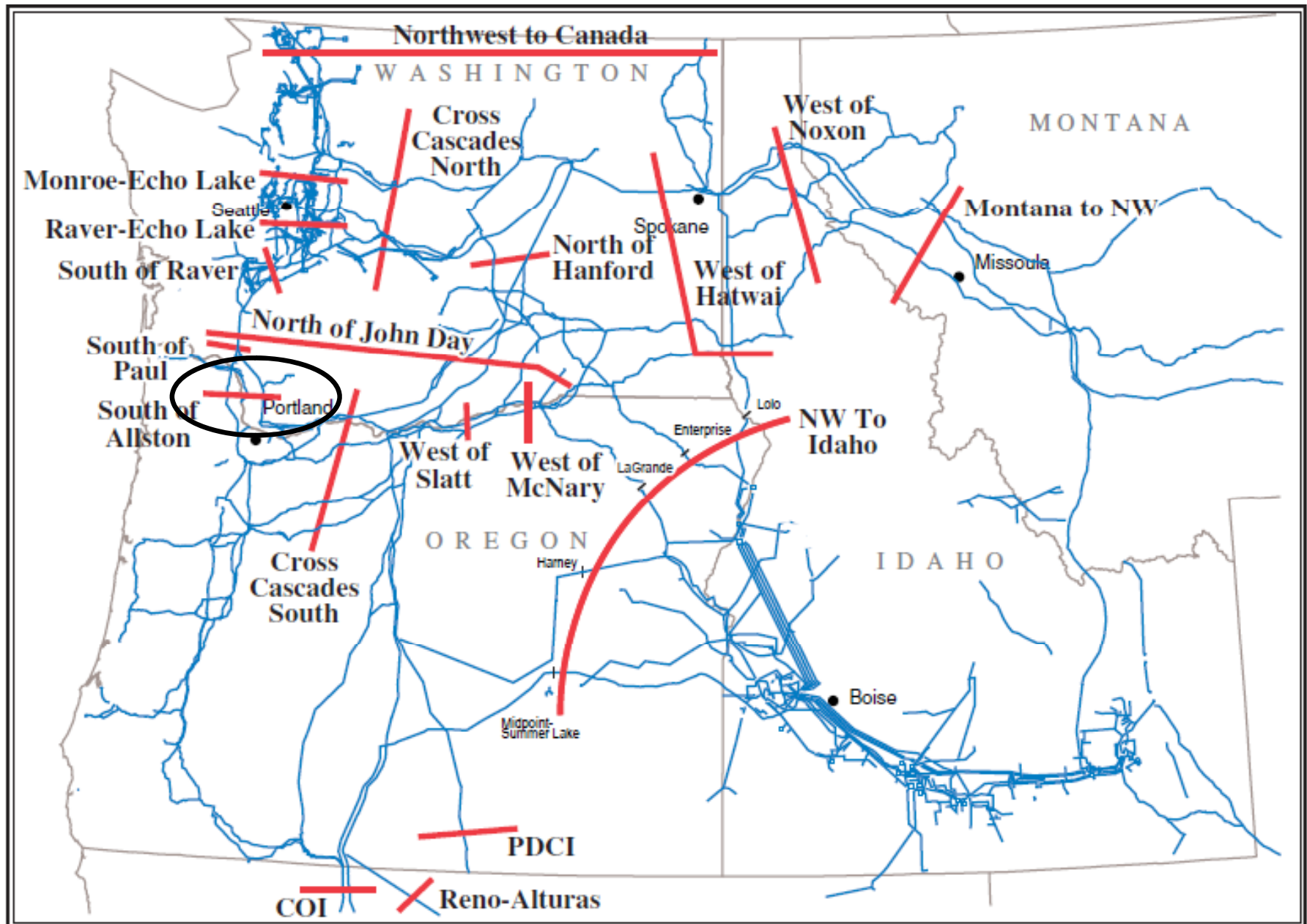
- Shows up in two ways
 - No Available Transmission Capacity (ATC)
 - ATC shows what capacity is available for sale
 - Power flows on paths near Operating Transfer Capability (OTC), a real time reliability limit
 - OTC often less than full rating, depending on conditions
 - Paths/flowgates/cutplanes: Limiting and monitored sets of lines, between balancing areas or internal to a balancing area
- Not all congestion relevant to NW load service and adequacy analysis, e.g., summer access to interties N>S not an adequacy problem



Available Transmission Capacity

- Sold in time increments: long-term (\geq year), shorter terms down to hourly
- Measured by looking at ability of transmission system to reliably carry more load
 - Generally, BPA looks at impacts of service between source and sink on all flowgates affected by power flow
 - Power flows across all lines in the system, not just the most direct link
 - Next slide illustrates power flow from Mid-C to Portland, arrow width \sim proportional to power flow
 - Implication: most-constrained flowgate on the system can limit ATC on other flowgates

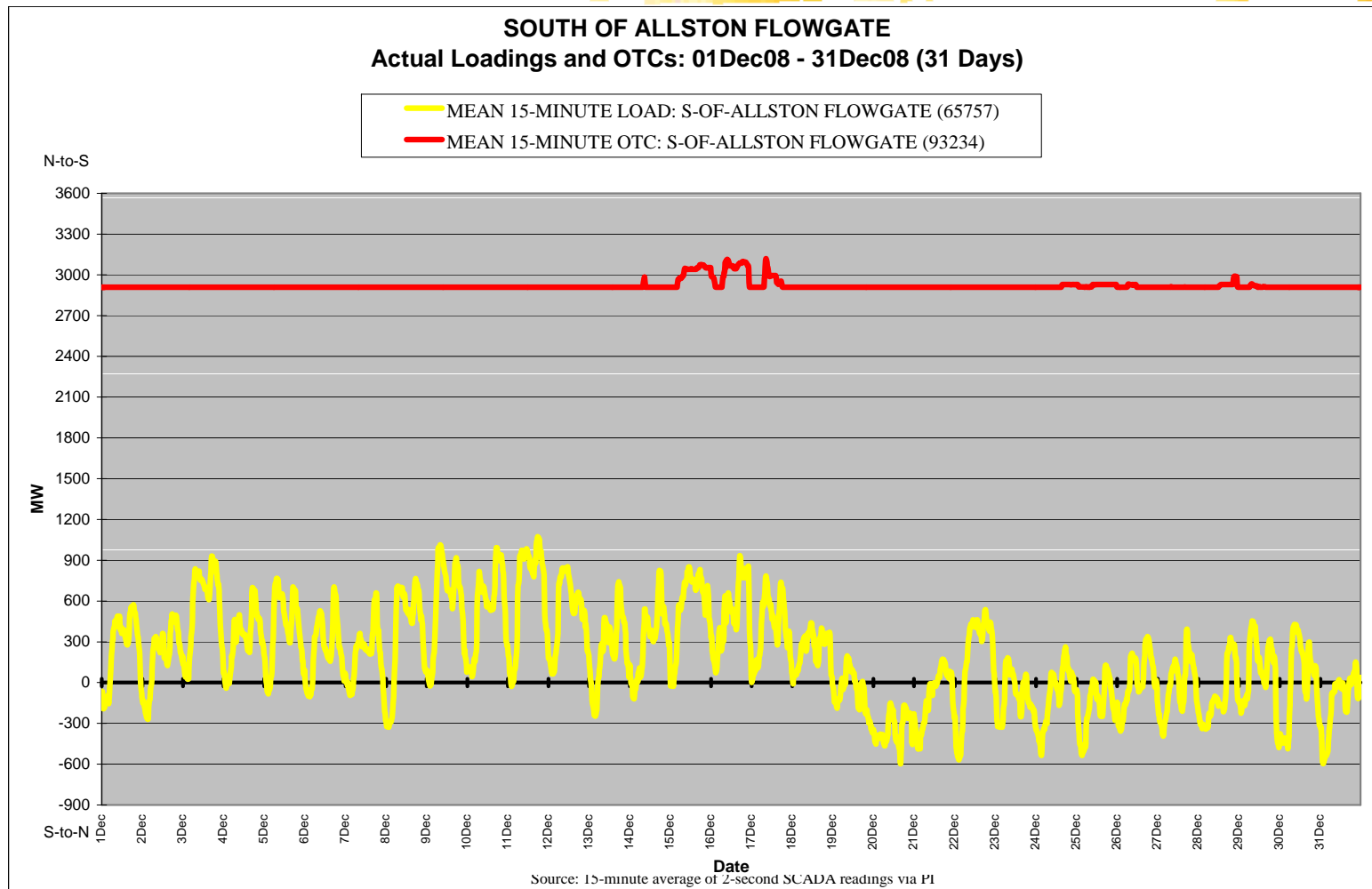




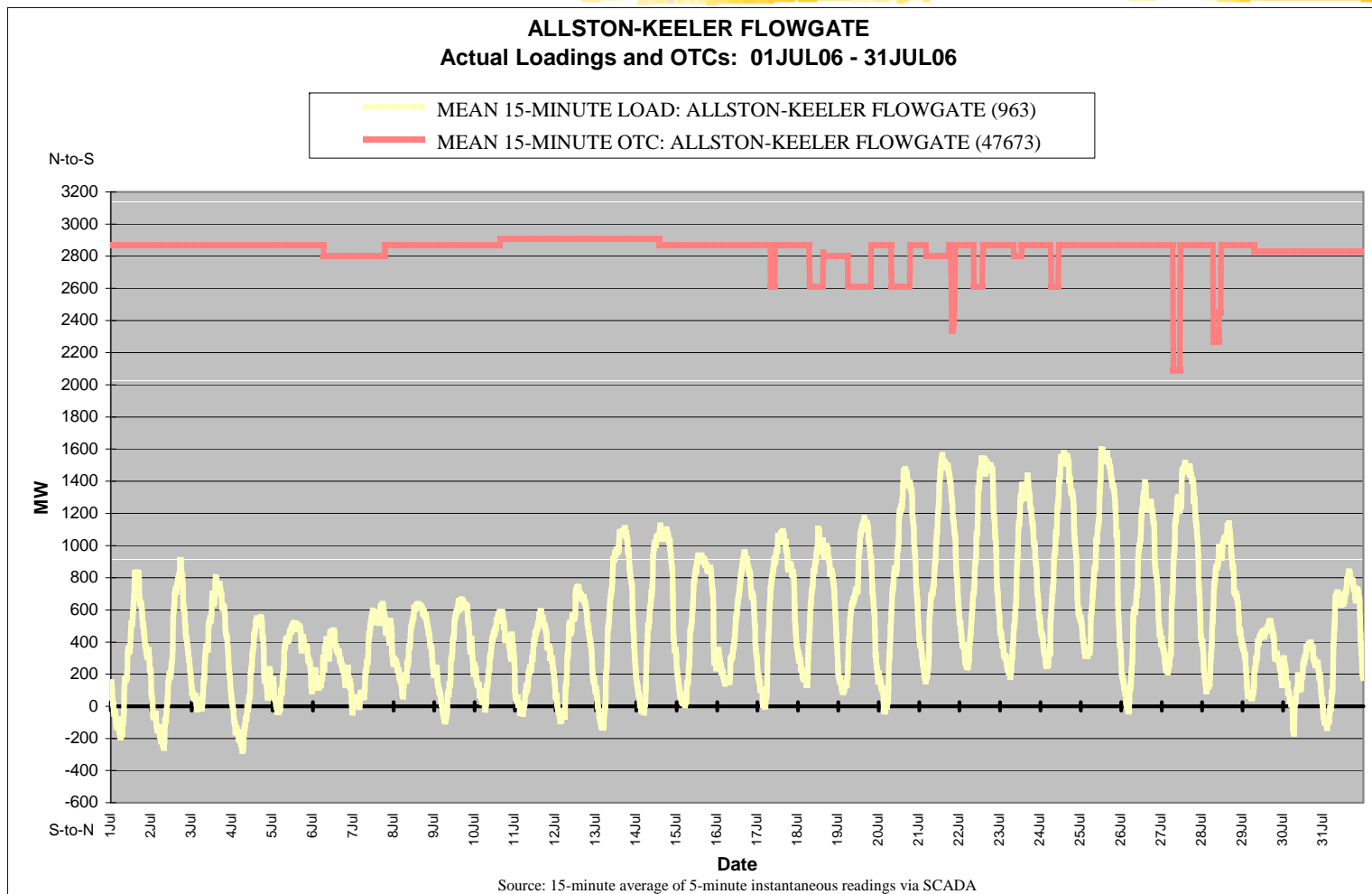
South of Allston

- Primarily constraining on summer power flows towards Portland area and towards the intertie
 - I-5 and Canadian generation loads the path
 - Upper Columbia (vs. lower Columbia) generation loads the path
- No long-term ATC available
 - Constraining on ATC availability on other flowgates, including east to west
- History of past congestion problems for Bonneville
 - New I-5 corridor gas generation 2007-08 : 1318 MW (1049 MW – PGE and IPP, 319 MW – PSE)
 - Relief projects: BPA I-5 Corridor project, PGE South of Allston 230 kV line (in proposal stage)

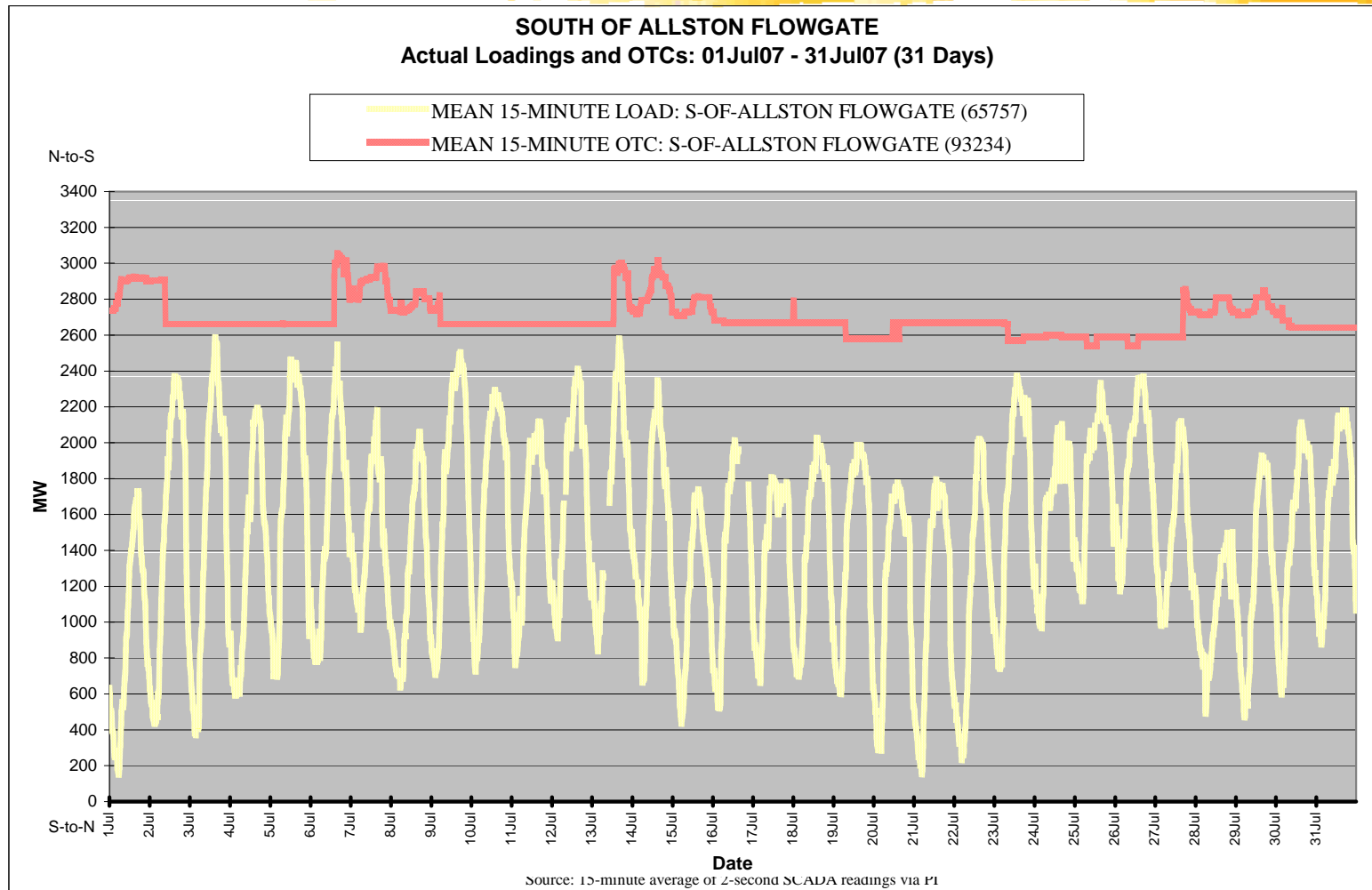
South of Allston - Cold Dec 2008



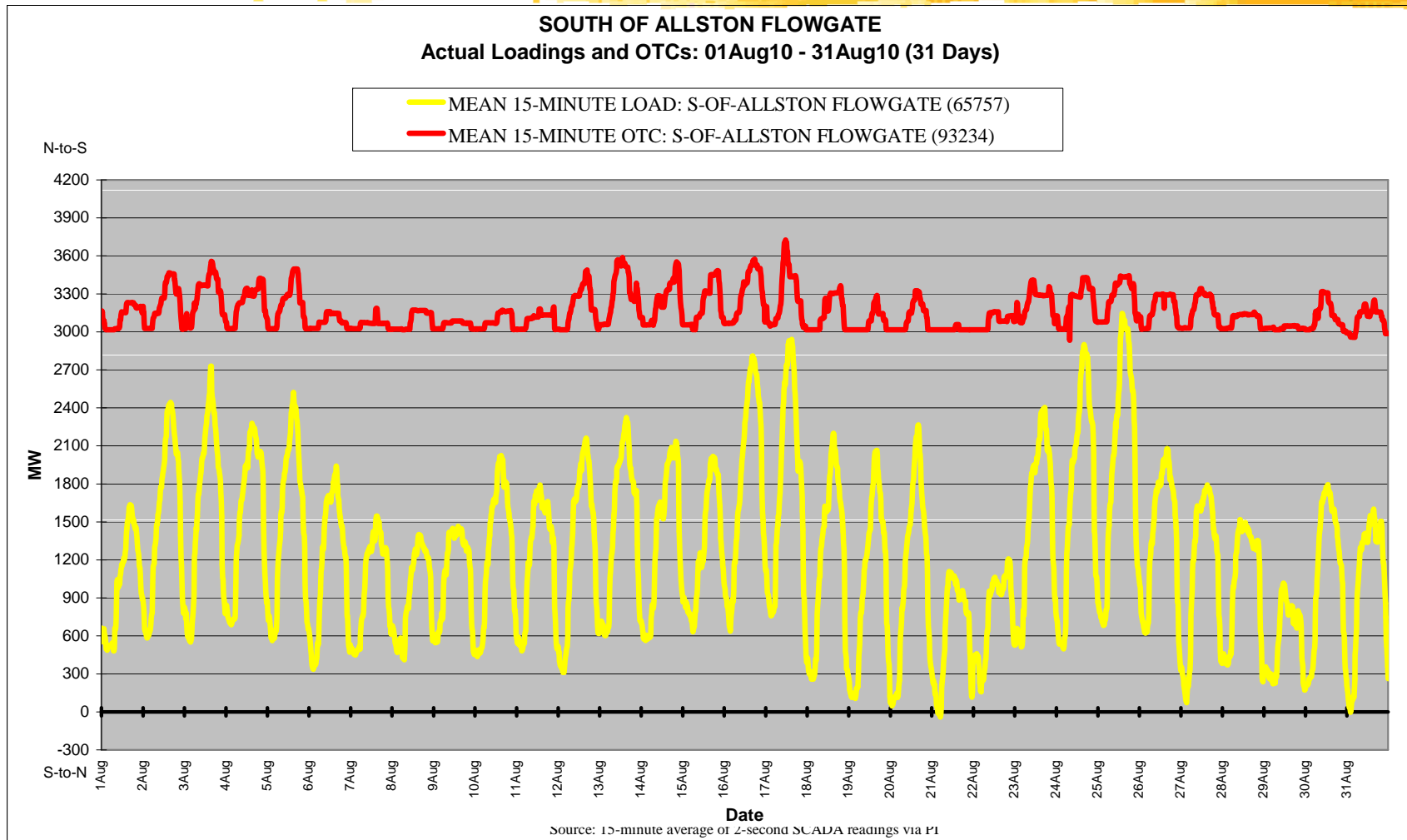
South of Allston - Hot Jul 2006



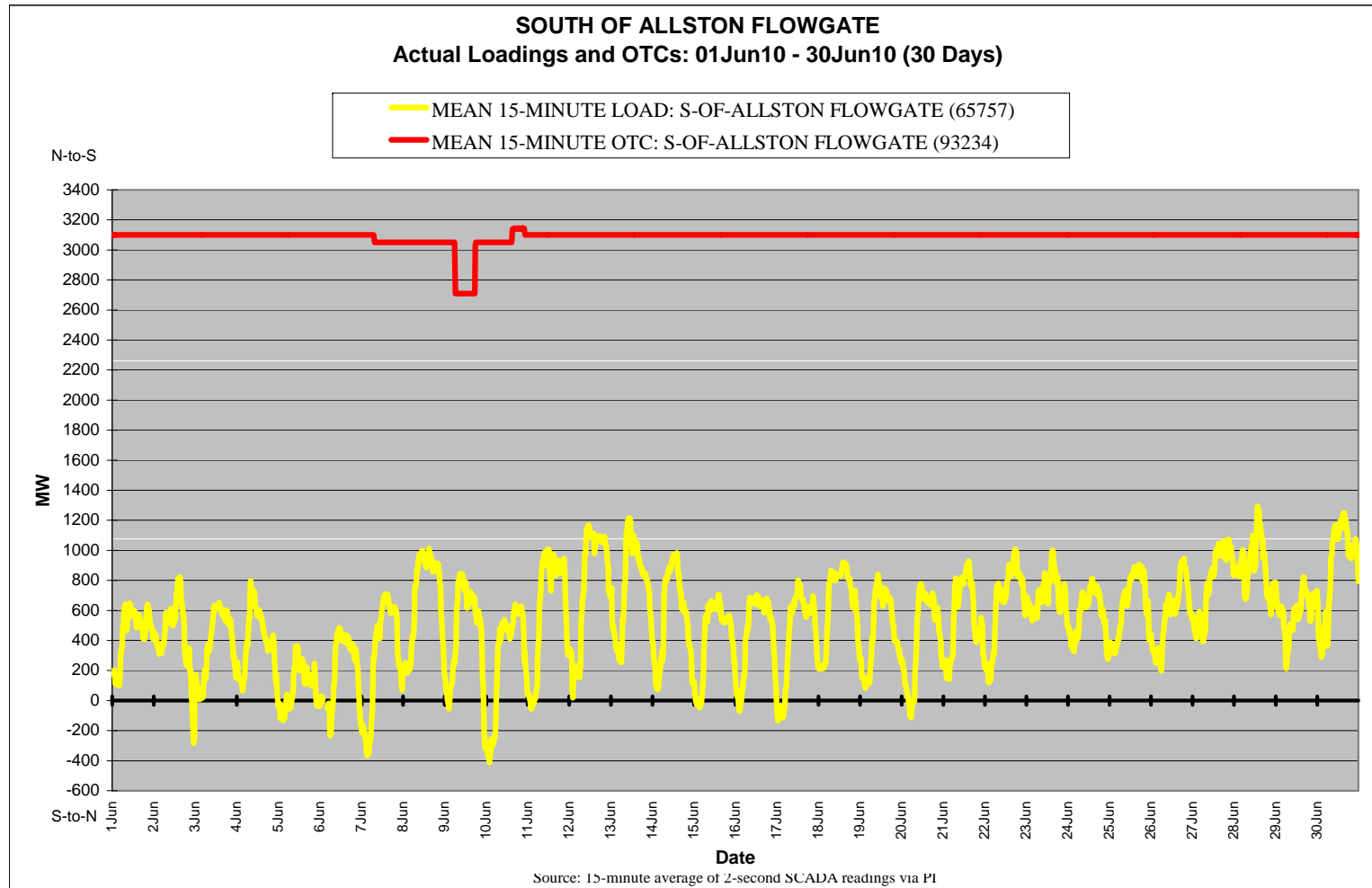
South of Allston - Jul 2007

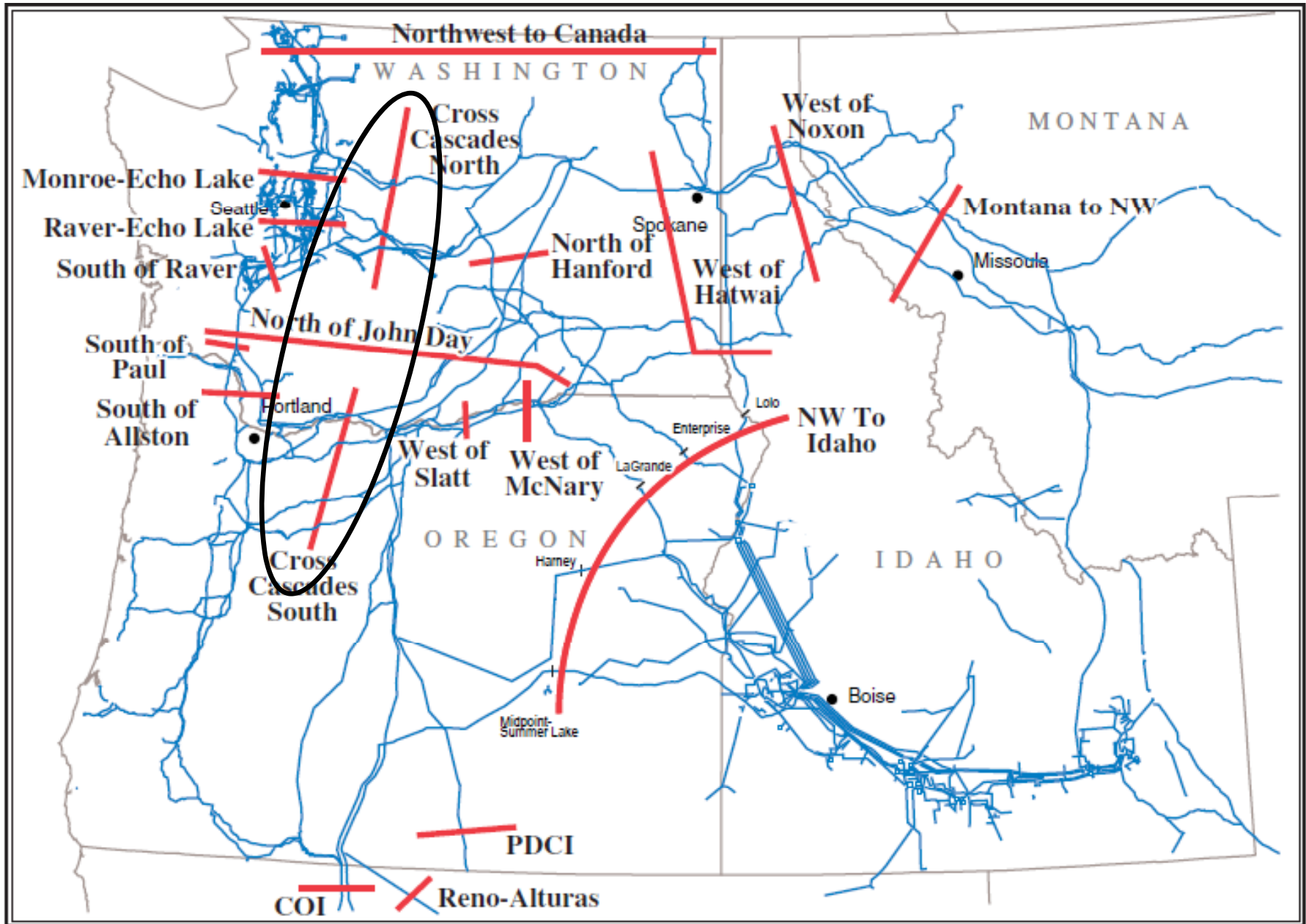


South of Allston – Hot Aug 2010



South of Allston - Cool with Low BC Summer Exports Jun 2010

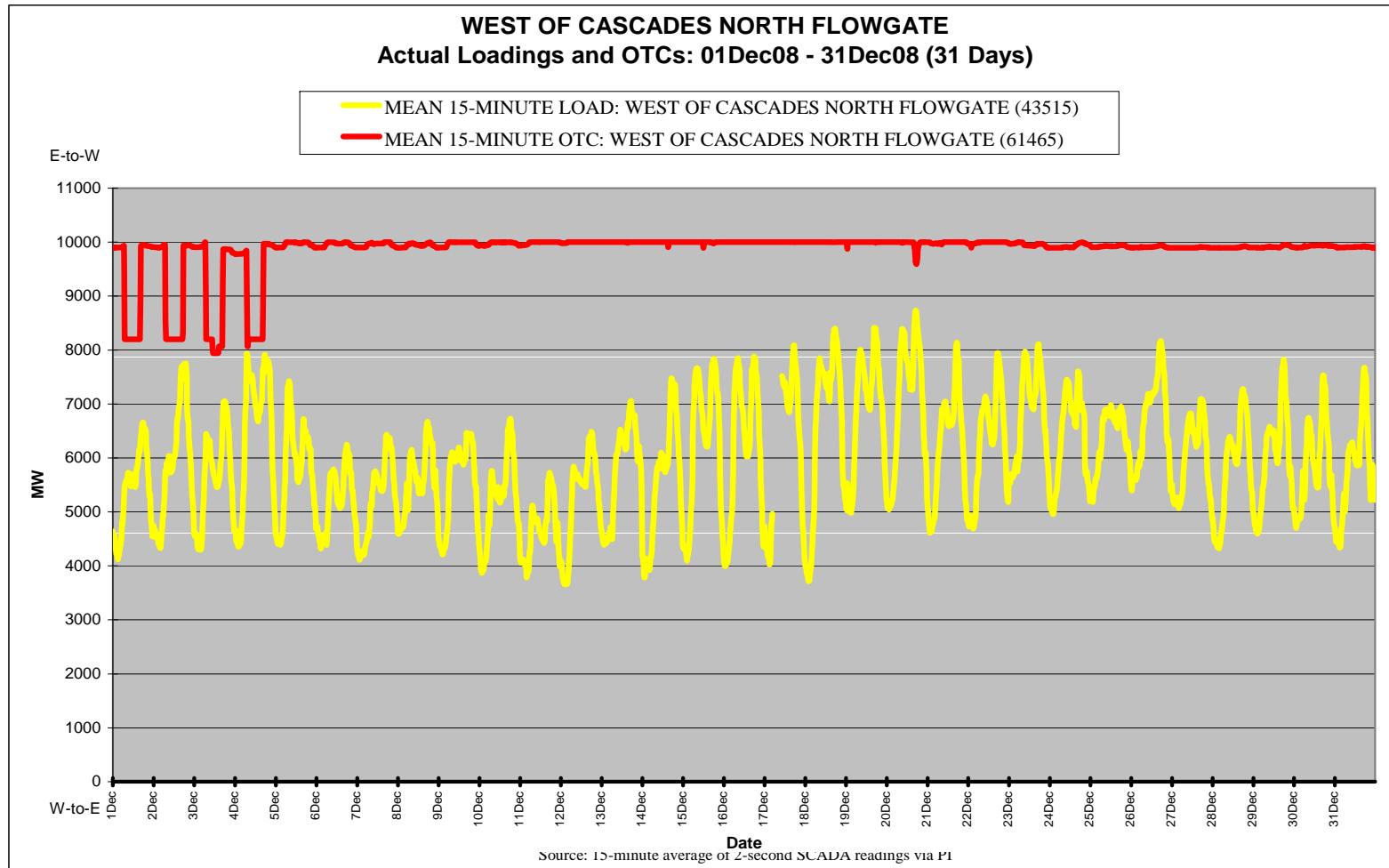




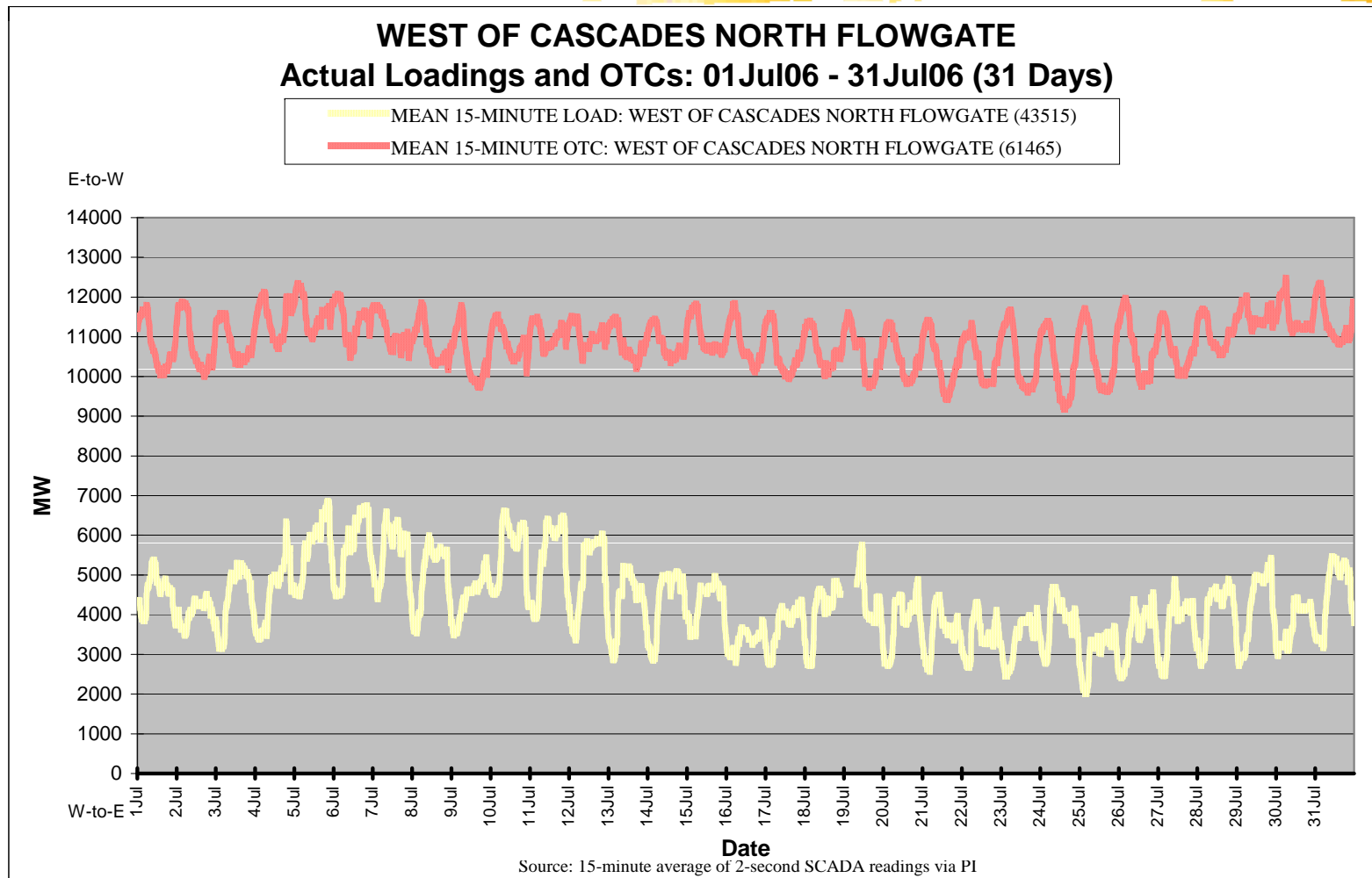
Cross-Cascades North and South

- Parallel paths, deliver east side generation to west side loads
 - Most stressed during heavy winter loads, especially if west side generation operating at low levels
- Studied by ColumbiaGrid (2010 Update to 2009 Biennial Plan)
 - Potential need for new transmission in 10-year time frame
 - Interim upgrades to capability can be made
- Long-term firm ATC available
 - North (rated 10,200 MW)
 - 2010 – 958 MW, ..., 2019 – 531 MW
 - South (rated 7000 MW)
 - 2010 – 1102 MW, ..., 2019 – 674 MW

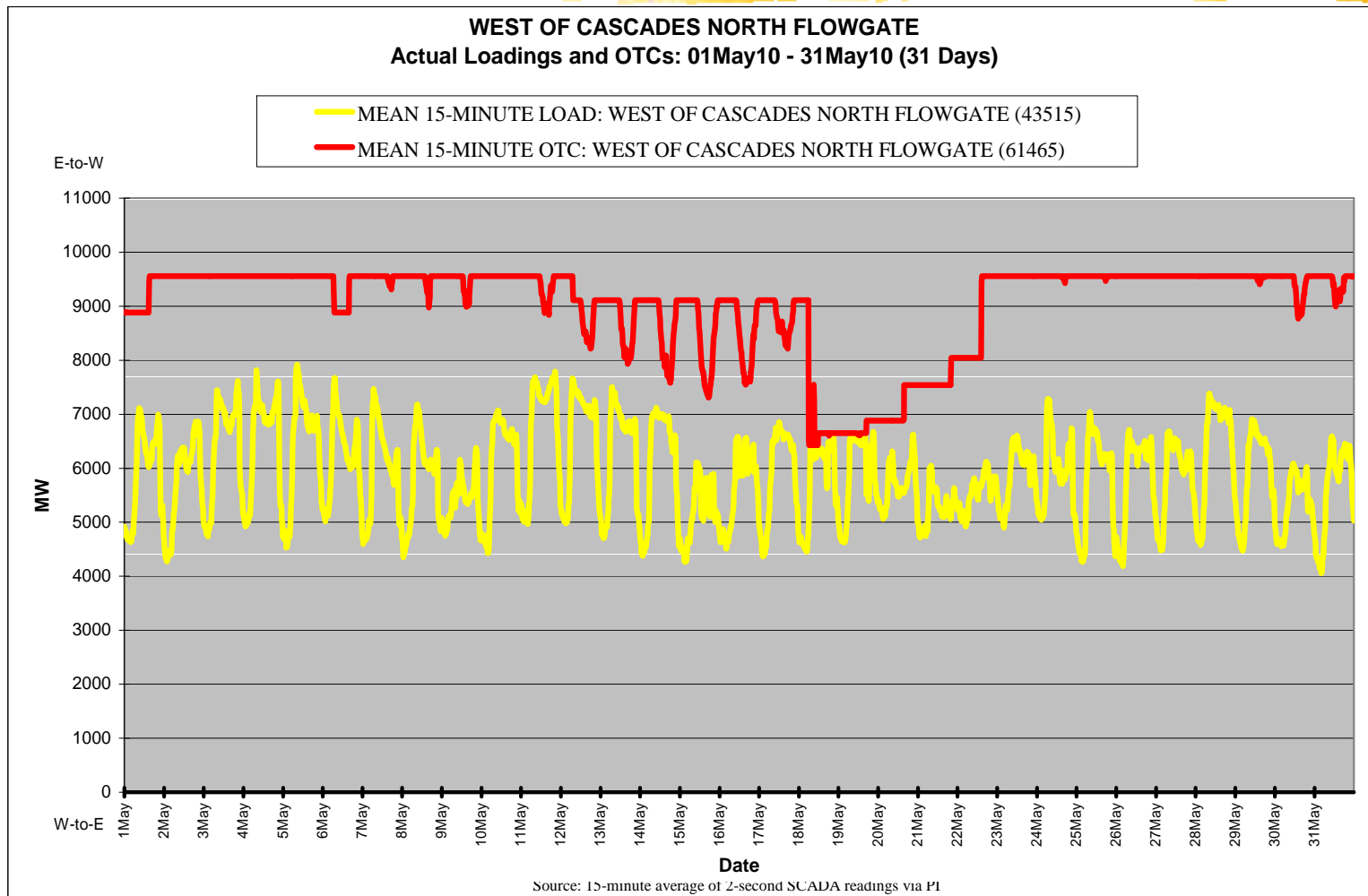
Cross-Cascades North – Cold Dec 2008



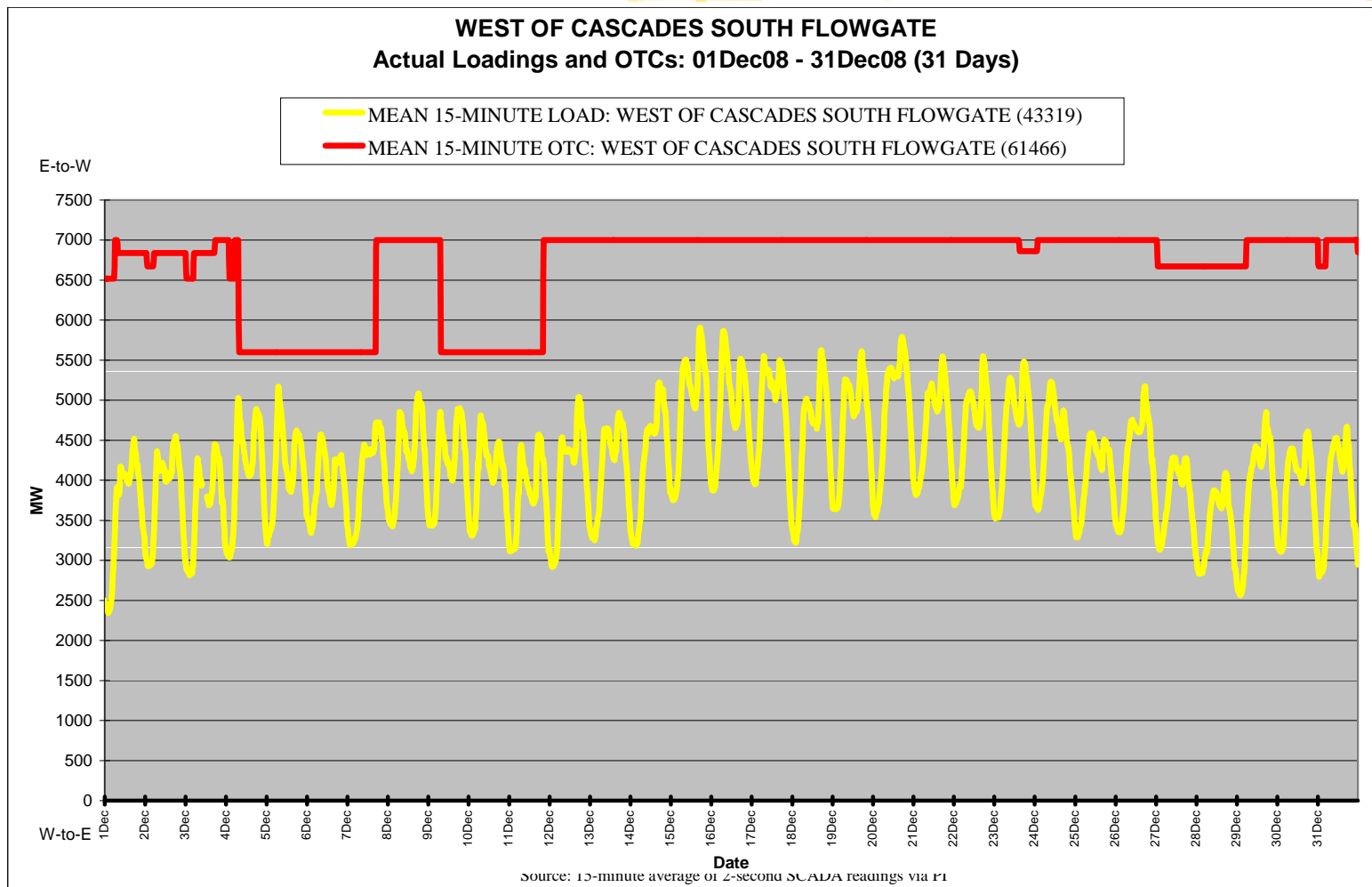
Cross-Cascades North - Hot Jul 2006



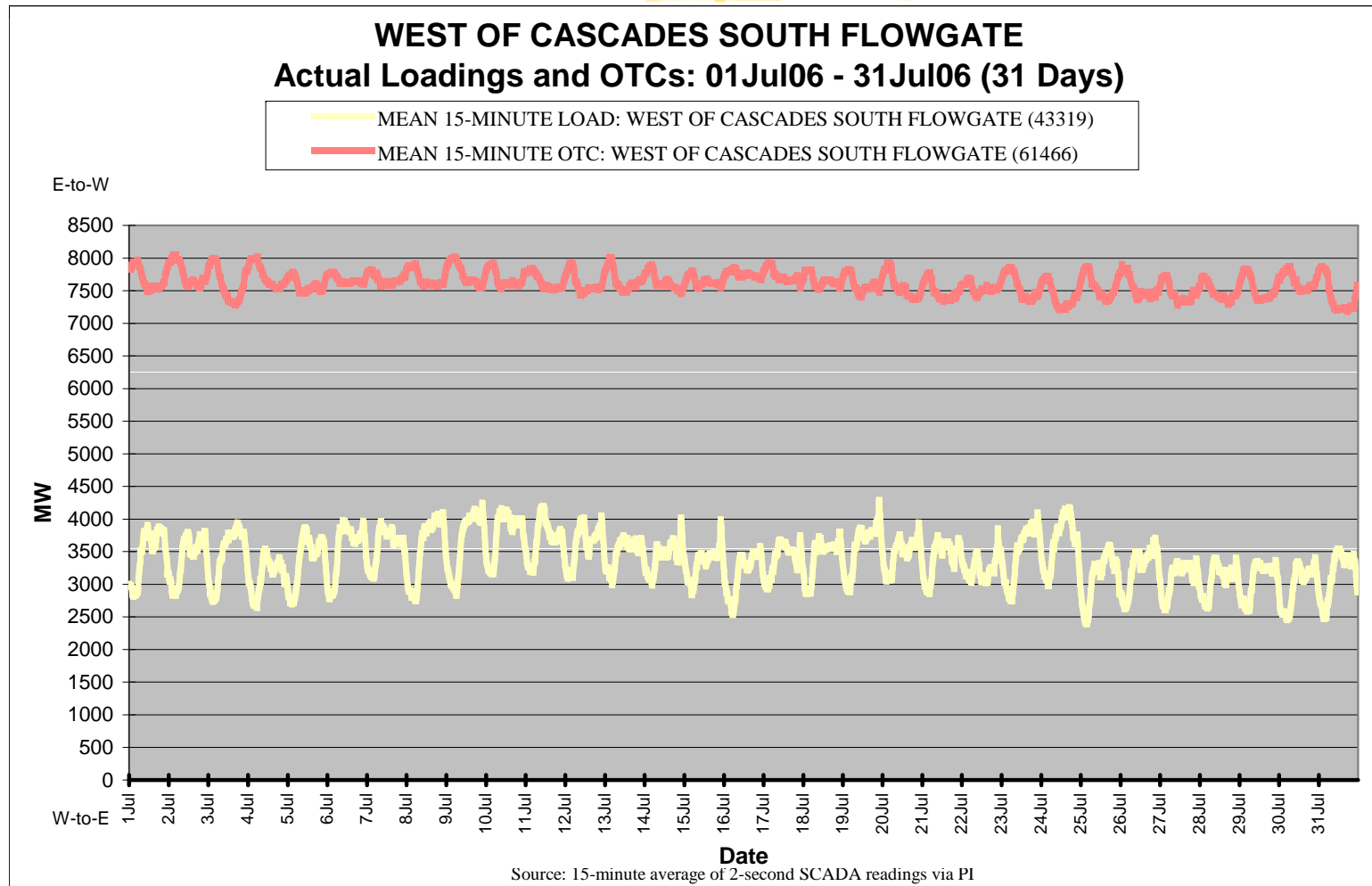
Cross-Cascades North - Outage May 2010

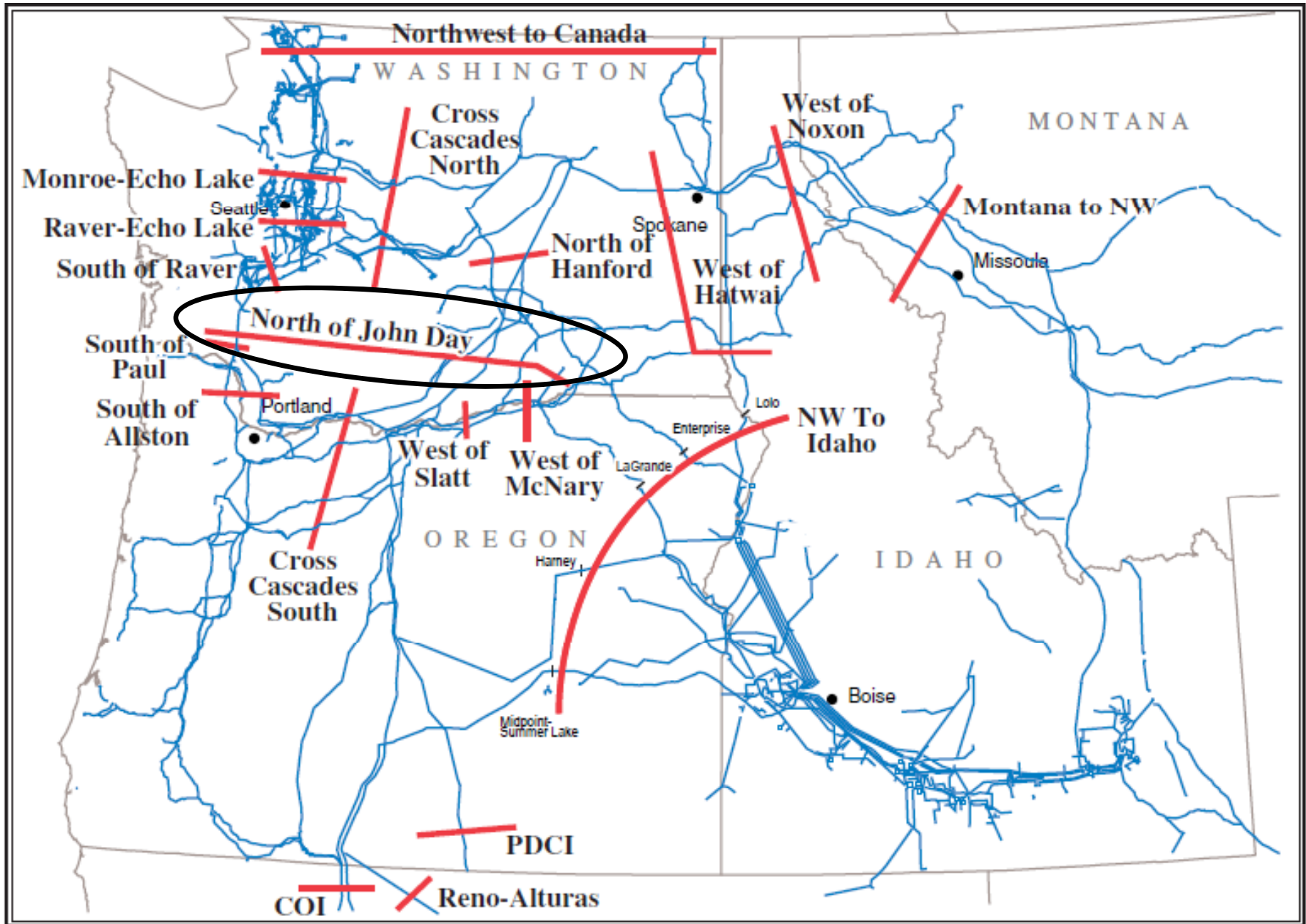


Cross-Cascades South – Cold Dec 2008



Cross-Cascades South – Hot Jul 2006

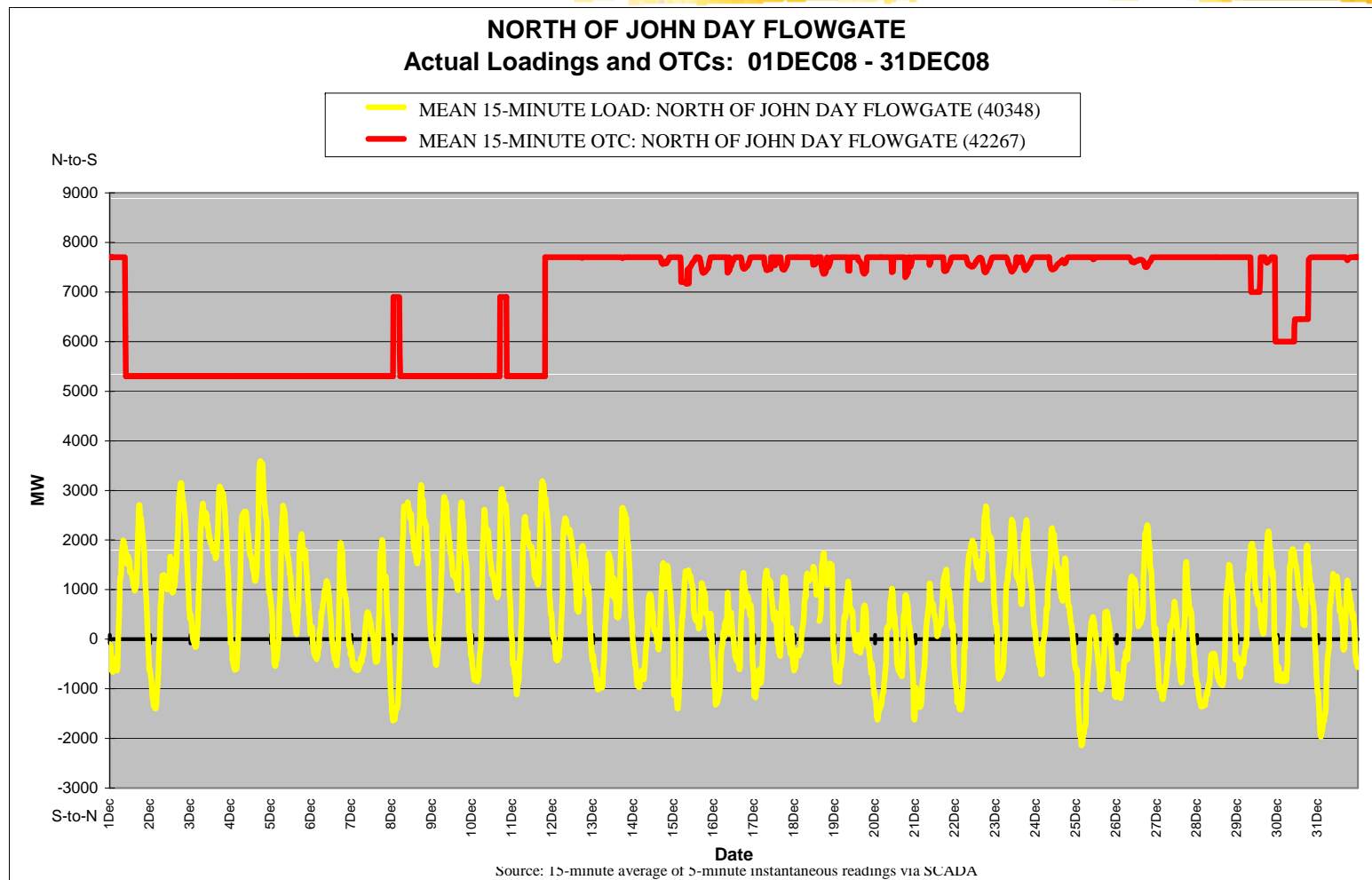




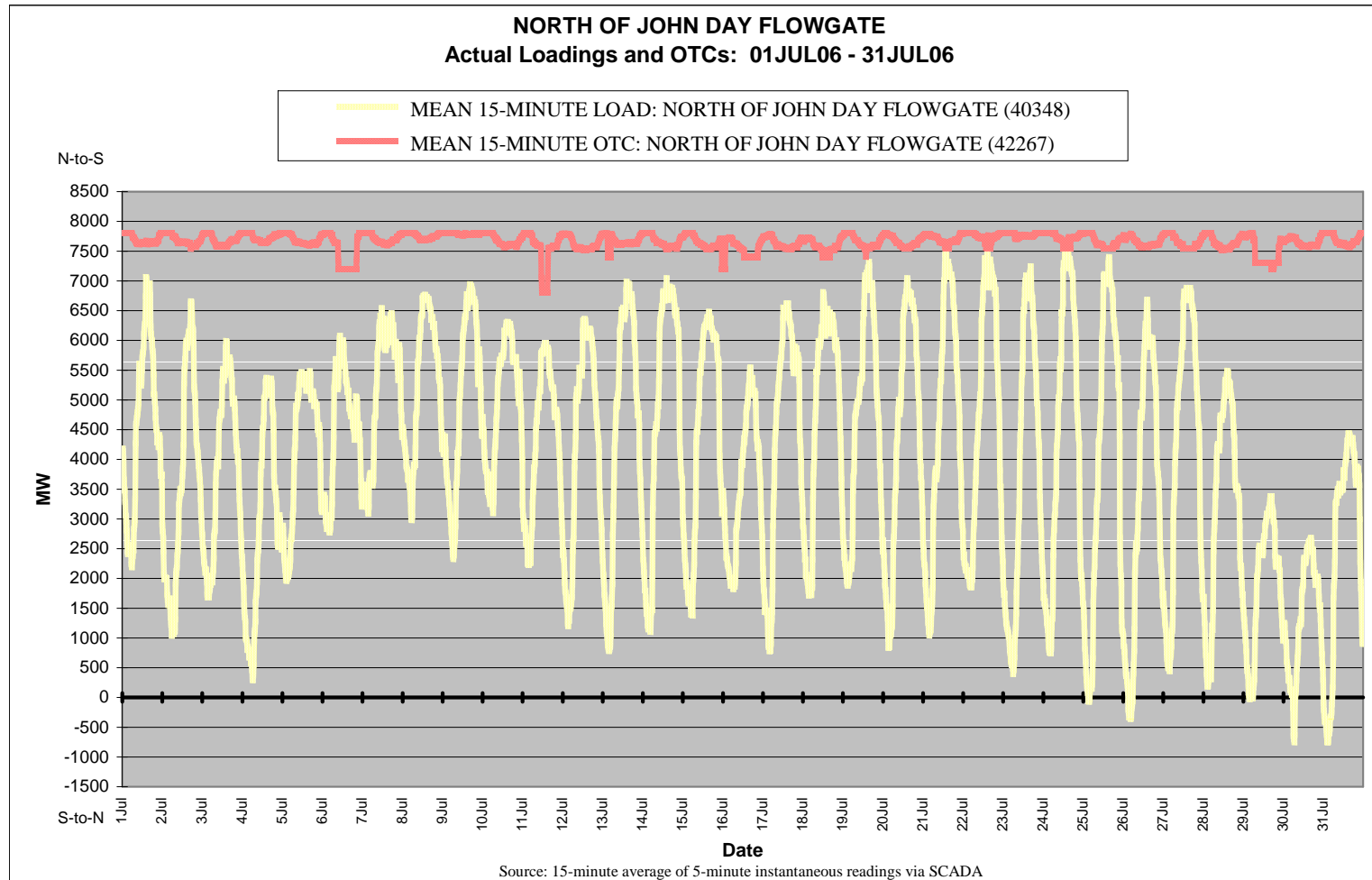
North of John Day

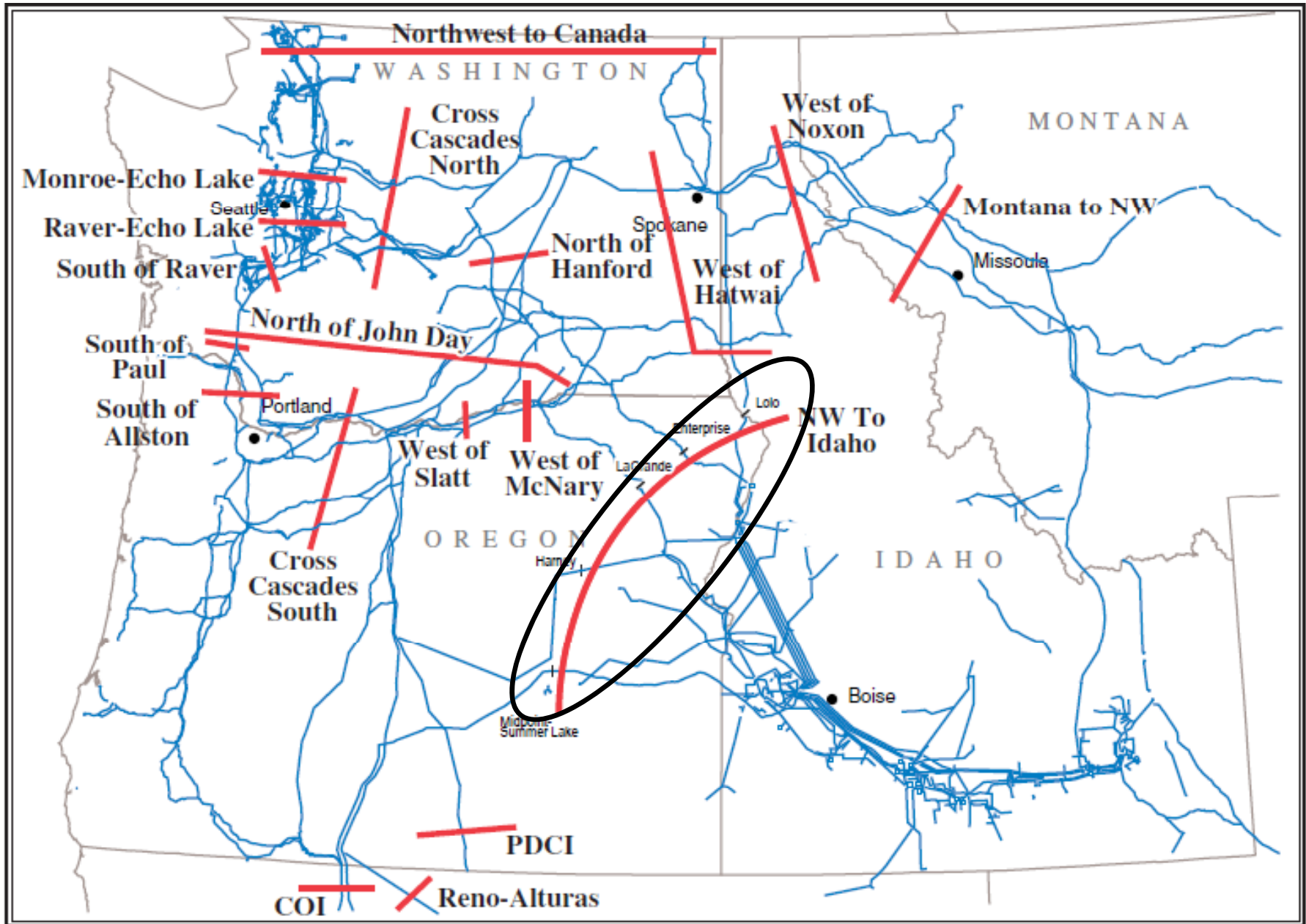
- Primarily constraining on summer power flows towards the intertie
 - Especially if Lower Columbia generation reduced for spill and Upper Columbia generation replaces it
- Not constraining on winter or summer load service in the NW
- Long-term ATC available, but no long-term ATC available on interties, perhaps limiting demand

North of John Day – Cold Dec 2008



North of John Day – Hot Jul 2006



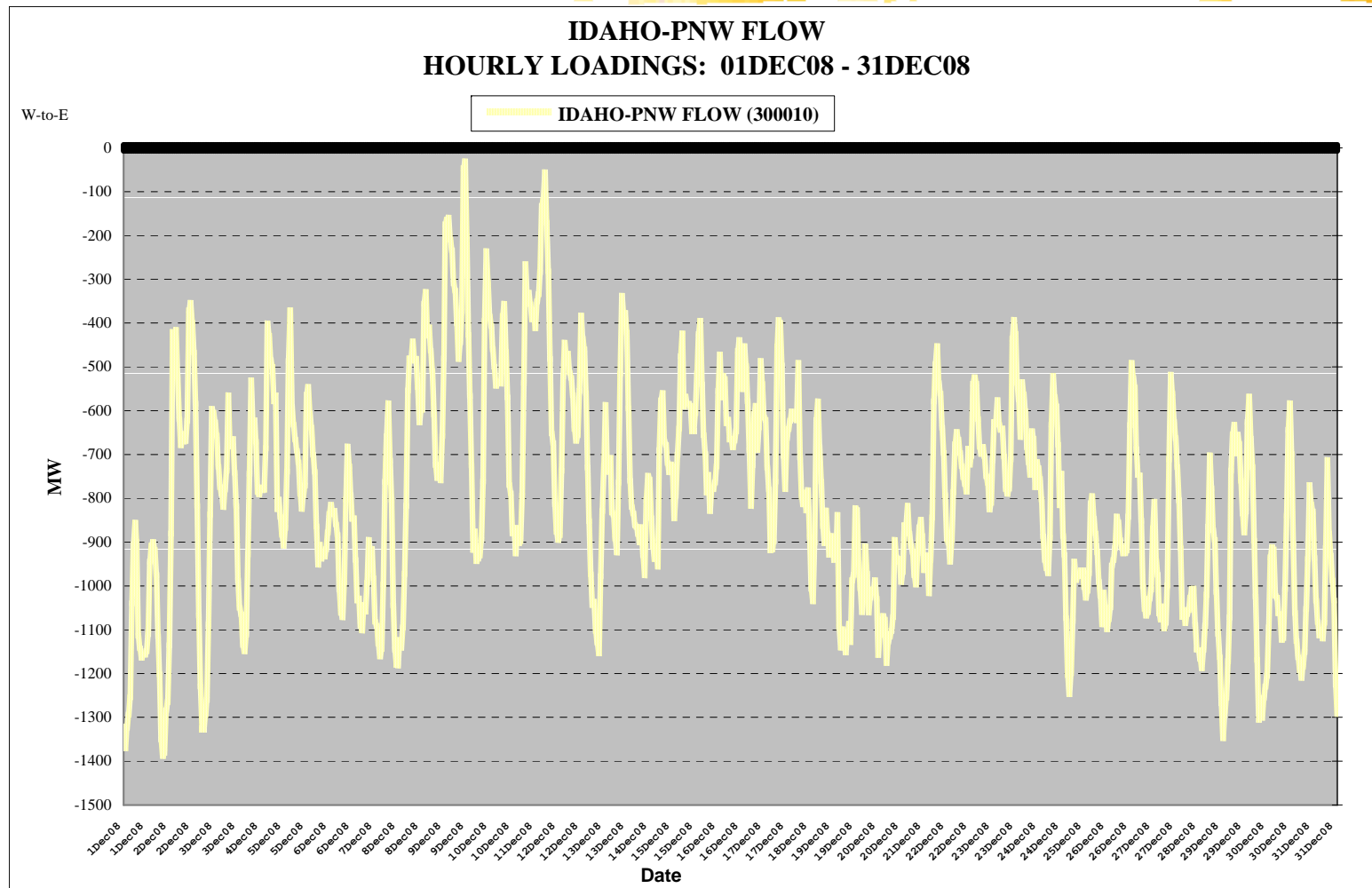


Northwest-Idaho

- Rated in both directions, W>E most important for Idaho load service
- No ATC available W>E, either on Idaho system or on BPA system directly to the west
- Relief project: Boardman to Hemmingway 500 kV project

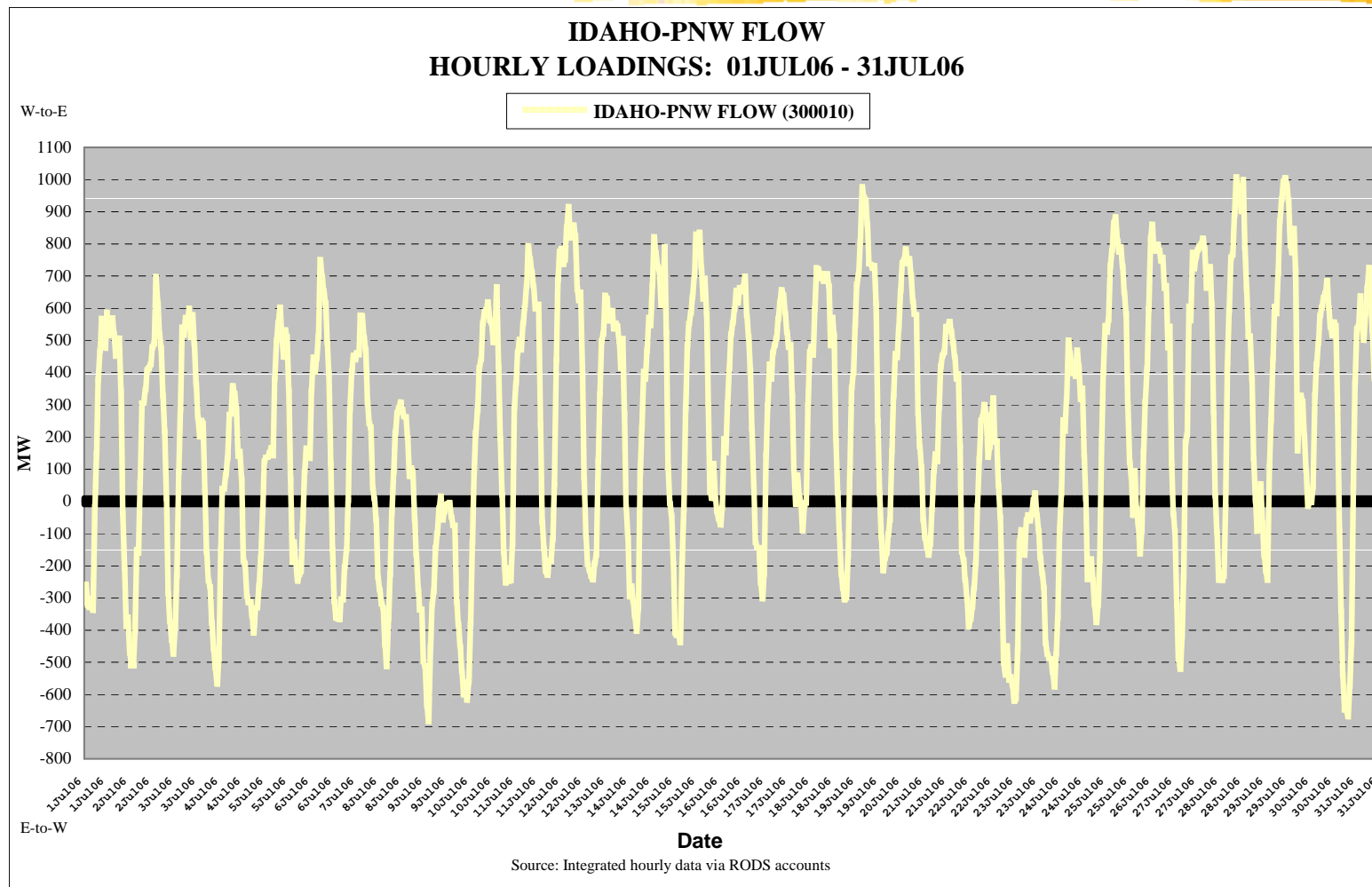
Northwest-Idaho – Cold Dec 2008

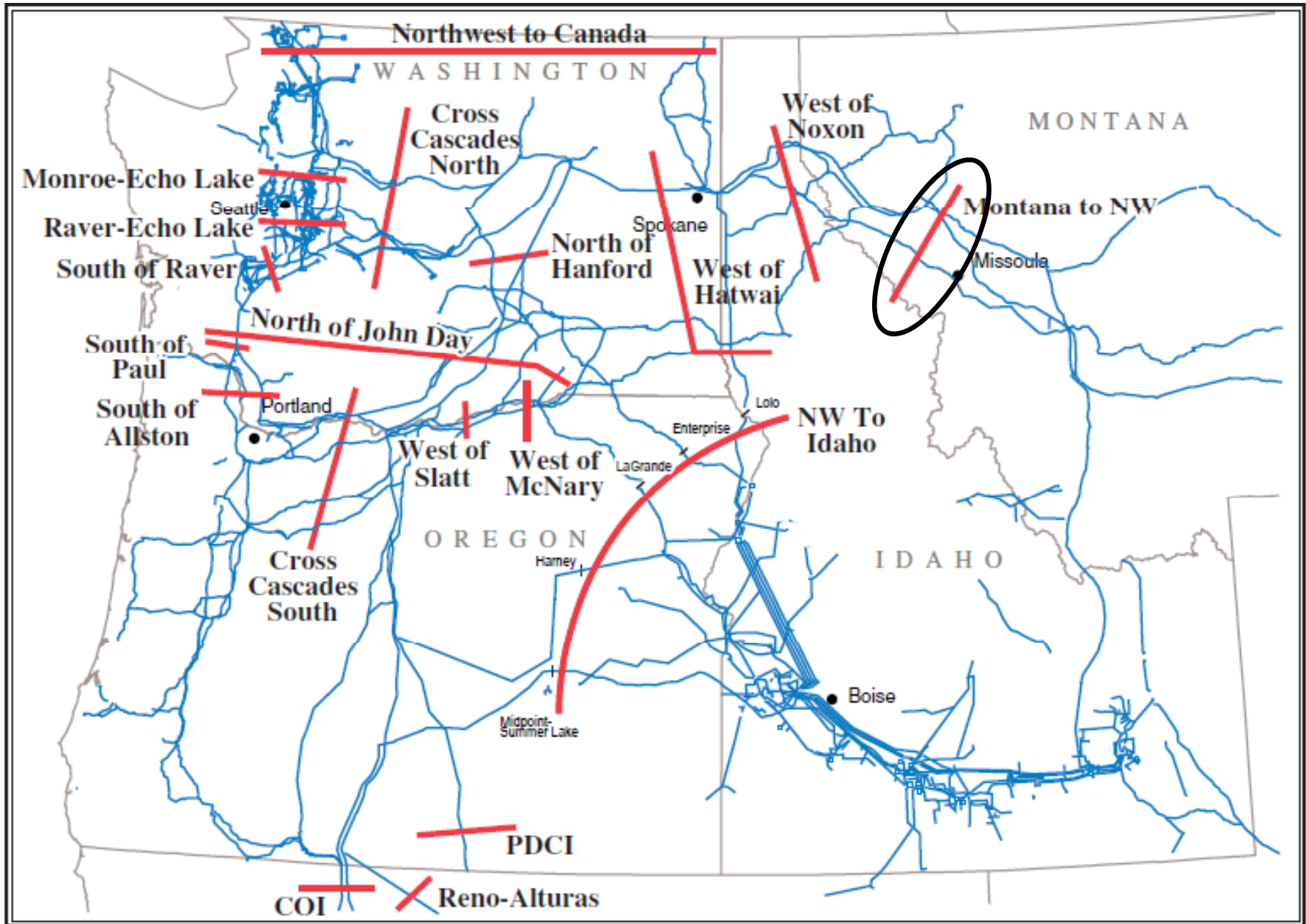
Negatives: E>W Flow (Rating 2400 MW)



Northwest-Idaho - Hot Jul 2006

On peak W>E, off-peak E>W (Rating W>E ~ 1100-1200 MW)



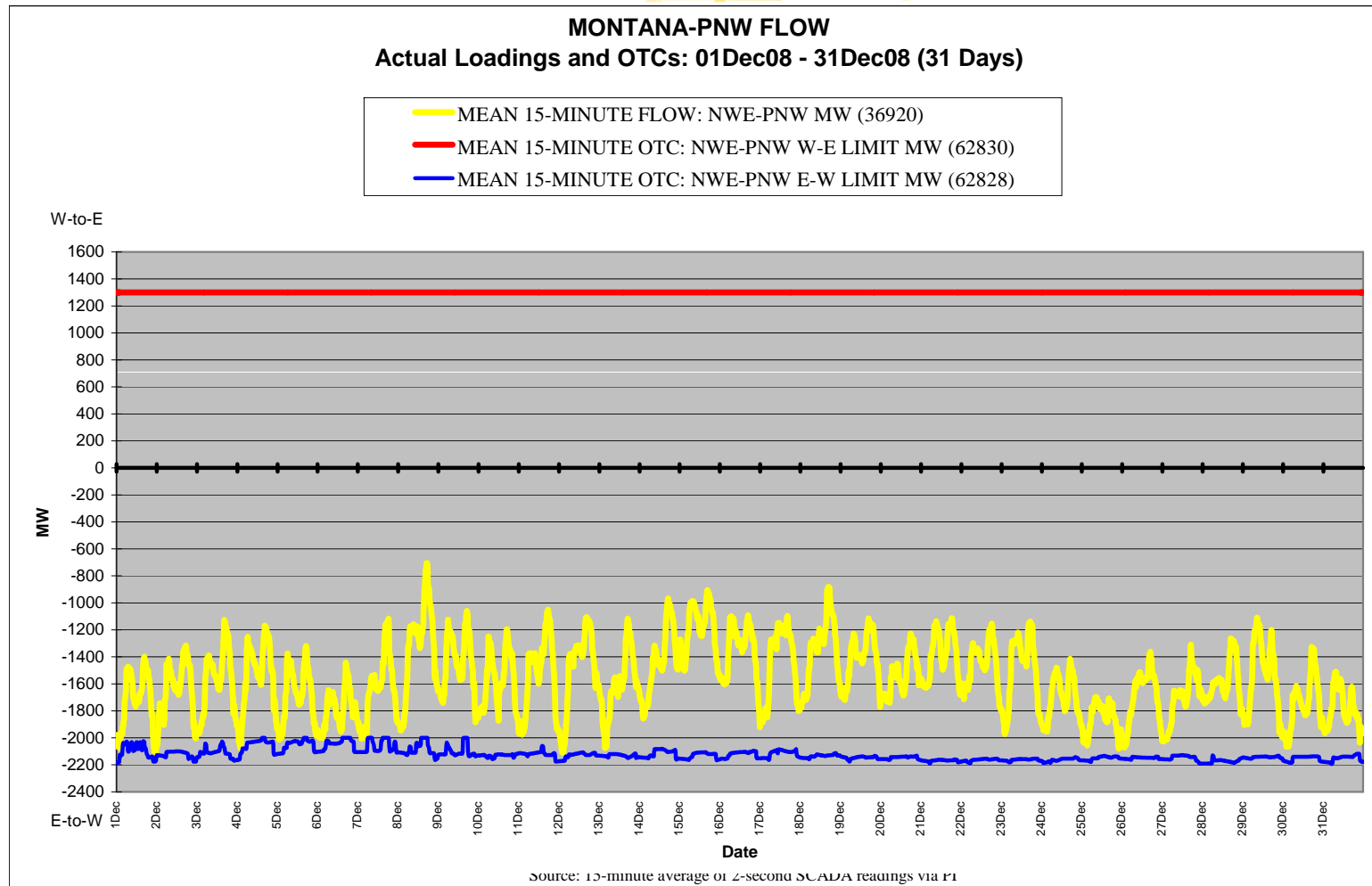


Montana-Northwest

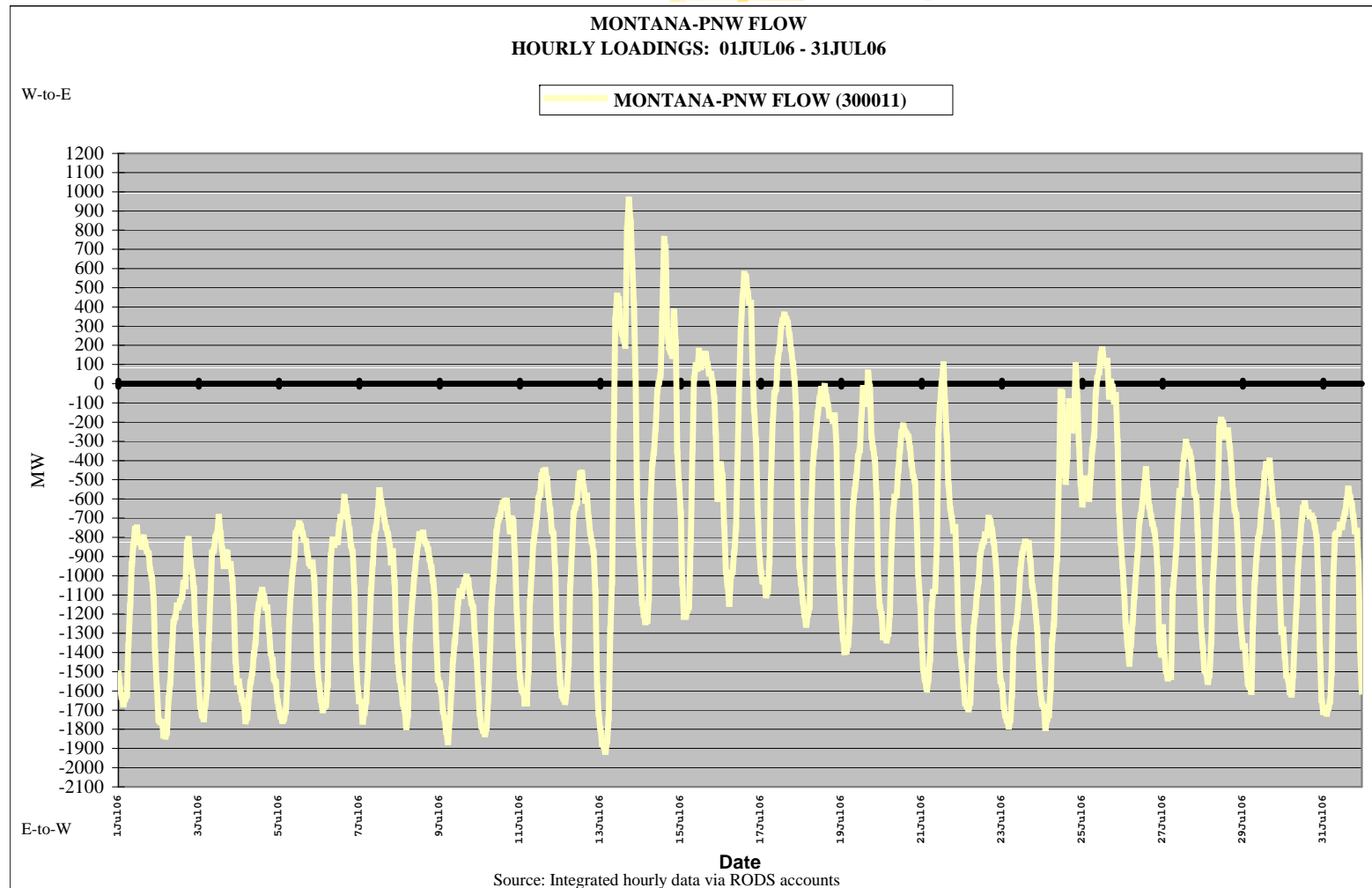


- Main flow and constraint E>W, small amount of ATC available
- Sized for existing generation – Colstrip, some Montana hydro

Montana-Northwest – Cold Dec 2008



Montana-Northwest – Hot Jul 2006



Questions?

