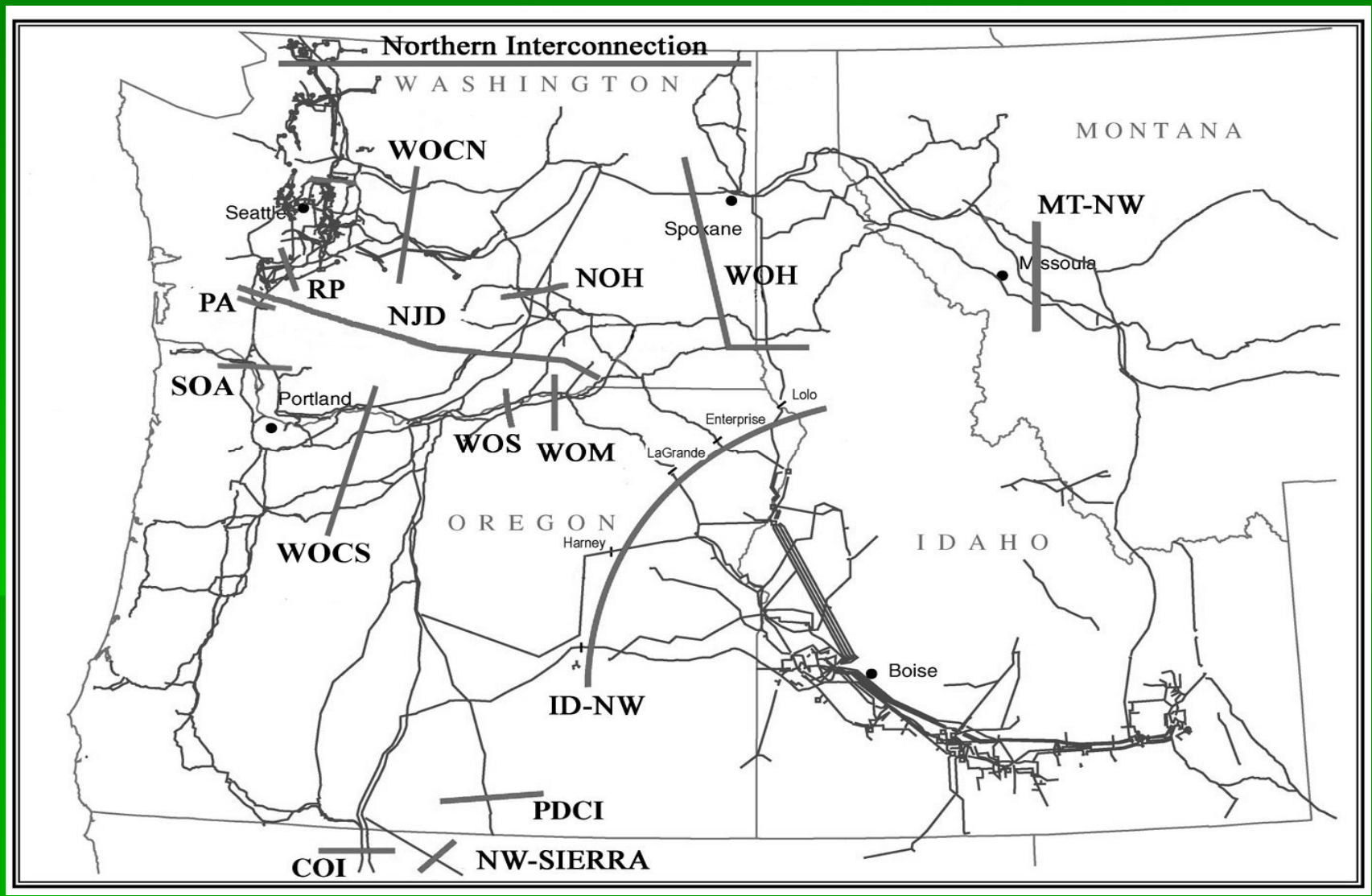
Outage Coordination and Business Practices

2007

Objectives

- What drove the need for developing a planning/coordination process.
- Why outage planning/coordination is crucial and important.
- Determining what equipment is significant and OB-19.
- Types of Outages.
- Embracing the NWPP Long Range and 45-Day Outage Planning Process.
- Seasonal impacts to the Northwest.

BPA Control Area



What drove the need.

- July and August 1996 system events
- Western Electric Coordinating Council gave the direction of not operating the system at a level that has not be studied.
- Significant or extreme impact to market with study results was only 72 hours ahead of the planned outage event.
- Methodology to provide safe working environment for work crews at the same time provide a safe & reliable power system and reduce economic impact.

Planning is crucial for outage coordination

1. Coordinate the outage(s) such that we can provide a work site that is safe.
2. Maintain a safe and reliable power system.
3. Maximize transfers on a given Path or flowgate avoiding outage combinations that would detrimental to transfers across one or more Path or flowgate.
4. Outside influences. NERC, WECC & NWPP compliance, agency target, customer agreements, generation concerns, fish & environmental issues or judgments, etc.

Why Outage Coordination is Important

- Planned outages - taken when they create the least impact on the transmission system
  - Historically we look at transmission loading and try to take outages when loading is lower to minimize risk.
  - April-May and September-October are the usually the preferred months to take outages from a loading stand point and minimizes risk.
  - Outages that require work outside:
    - June-July-August is best time for work conditions
    - Summer is the worst time due to higher transmission loading and higher temperatures –
      - reduced thermal capacity of equipment.
      - increased air conditioning & irrigation load.

Ideal Outage Times (from a systems stance)

- The shoulder months are ideal from a load perspective as they have historically lower demands, and lower temperatures (therefore lower thermal effects on the equipment ratings) meaning these major outages will not limit the transmission system as much.

Further Restrictions on "Shoulder Months"

- How much work can be "squeezed into these periods.
- Late winter storms at higher elevations can delay access to work sites in spring.
- Early winters storms at higher elevations can cancel work in October.
- Fish concerns affect spring outage planning.

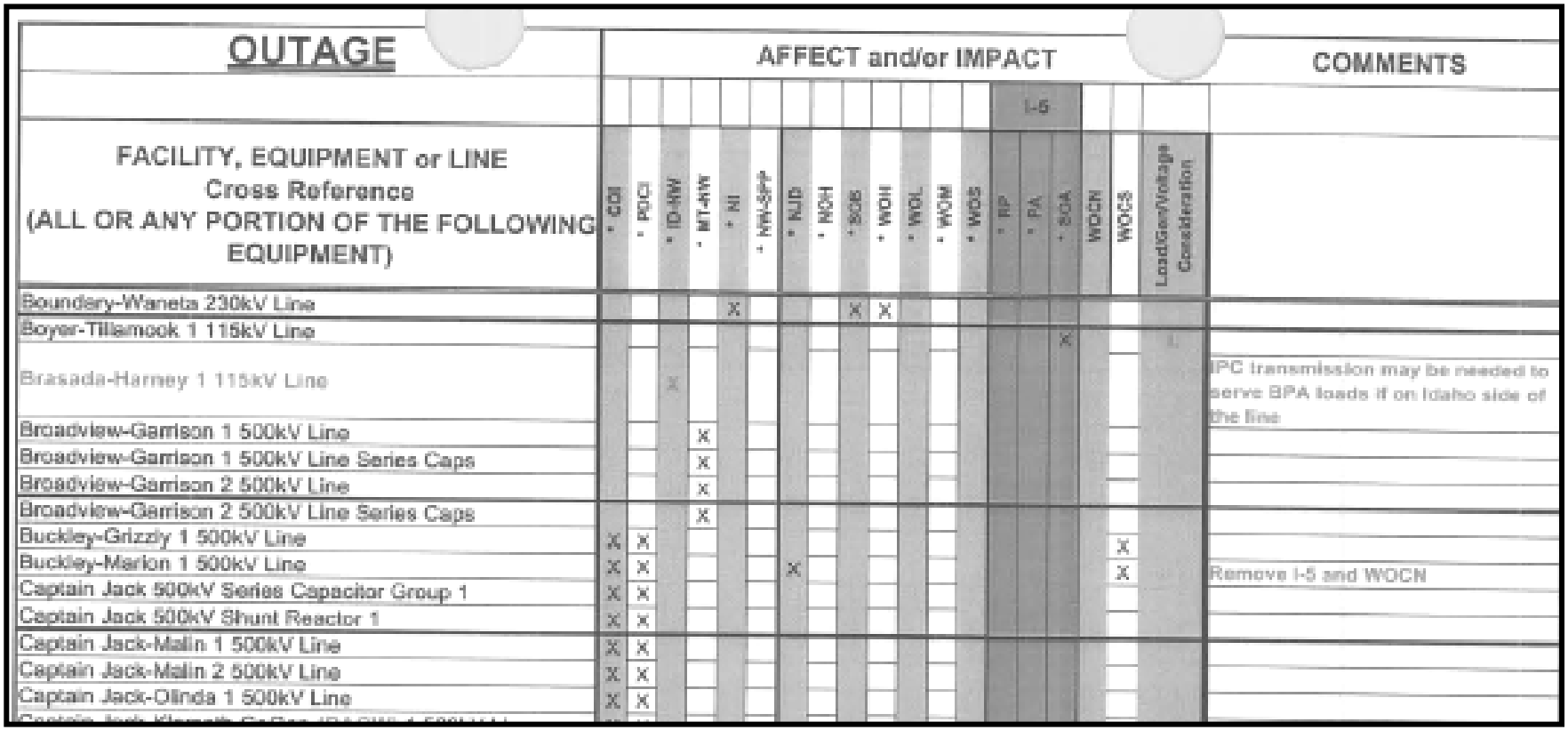
Need to determine if the equipment is significant or not

- Significant Equipment is identified in BPA Operating Bulletin 19 (OB-19.).
- OB-19 provide guidance for a variety of topics related to this equipment.
- Some equipment is not listed in OB-19 but has impact to local load service areas.

What is OB-19?

- Operating Bulletin OB-19 contains the list of BPA significant equipment which must be coordinated in the NWPP 45 day outage process.
- Equipment is considered significant if when it is taken out of service may require a capacity reduction to assure reliable operation on a constrained path. This includes outages that alone might not affect capacity, but under credible conditions, in combination with other outages, could have an affect.
- The goal is to plan the outages to minimize their impact.

Example of OB-19



OUTAGE	AFFECT and/or IMPACT																			COMMENTS
															I-5					
FACILITY, EQUIPMENT or LINE Cross Reference (ALL OR ANY PORTION OF THE FOLLOWING EQUIPMENT)	* CDI	* PDCI	* ID-NW	* MT-NW	* NI	* NW-SPP	* NJB	* NOH	* SOB	* WDH	* WDL	* WOM	* WOS	* IP	* PA	* SOA	WOCN	WOCS	Load/Gen/Voltage Consideration	
Boundary-Waneta 230kV Line					X				X	X										
Boyer-Tillamook 1 115kV Line																X			L	
Brasada-Harney 1 115kV Line			X																	IPC transmission may be needed to serve BPA loads if on Idaho side of the line
Broadview-Garrison 1 500kV Line				X																
Broadview-Garrison 1 500kV Line Series Caps				X																
Broadview-Garrison 2 500kV Line				X																
Broadview-Garrison 2 500kV Line Series Caps				X																
Buckley-Grizzly 1 500kV Line	X	X																X		
Buckley-Marion 1 500kV Line	X	X					X											X		Remove I-5 and WOCN
Captain Jack 500kV Series Capacitor Group 1	X	X																		
Captain Jack 500kV Shunt Reactor 1	X	X																		
Captain Jack-Malin 1 500kV Line	X	X																		
Captain Jack-Malin 2 500kV Line	X	X																		
Captain Jack-Olinda 1 500kV Line	X	X																		

Why Outage Coordination is Important (continued)

- Combine work that can be done in one outage instead of multiple outages
  - Eg. Line maintenance combined with line PCB maintenance
  - Caution: clearance boundaries, clearance holders
- Adequate study time to make sure outages do not create a reliability problem
  - Multiple planned outages may have bigger impact than expected. Better to find out earlier and adjust if possible or notify the market.
  - An outage in Montana may not seem like it would have an impact in Washington but the transmission system responds to changes in impedances that may not be geographically close in distance
- Adequate notice of transfer capability impacts created by an outage so the market has time to respond
  - NWPP process is two weeks prior to outage week

Three Types of Outages

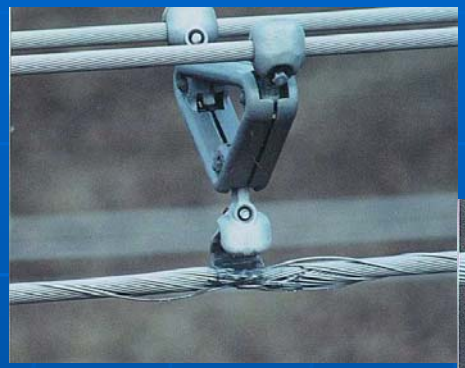
1. Maintenance outages
   - Older system requires more maintenance
2. Construction outages
   - Project energization important
     - May often be contract work and scheduled prior to outage requests
   - Often requires multiple outages and windows of opportunity may be very small or non-existent
3. Urgent and/or Emergency Repair
   - Failures or imminent failures

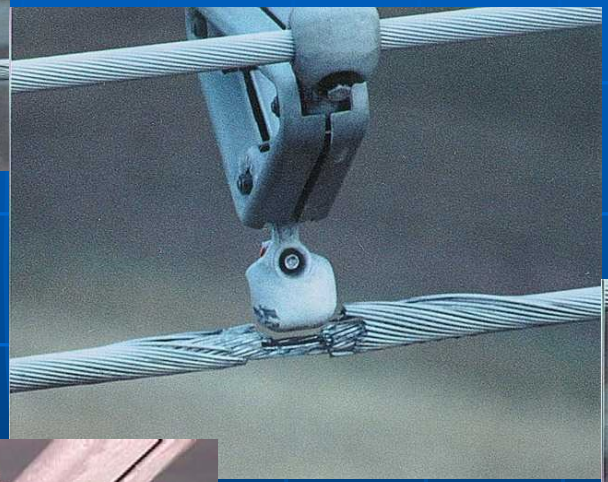
Need to identify work plan to minimize outage duration

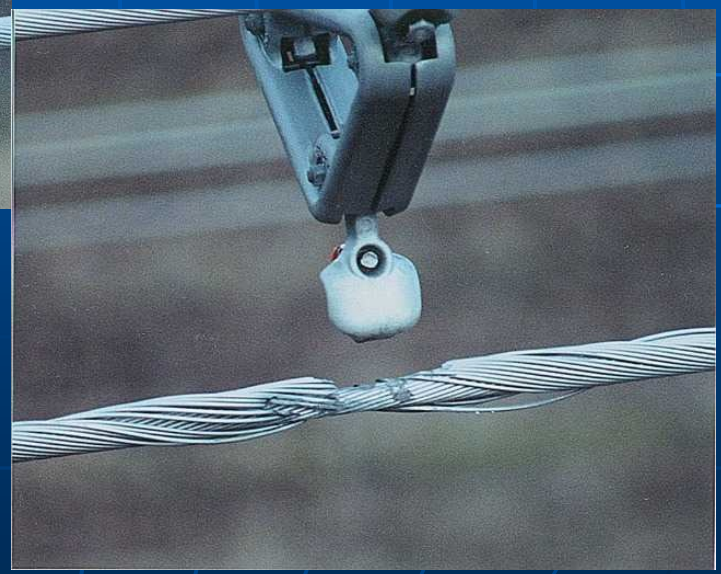
- Outage requests submitted as far in the future as possible.
- Duration the crew needs the equipment out-of-service.
- What other equipment is affected by the work required.
- Long outage durations are difficult to coordinate with other work. (An outage is considered long if is more than a week in duration.

Failed equipment – leads to…

Conductor damage, which leads to…







Lengthy outages and considerable cost

Issues

- Foreign utility assumes their outage will not have an impact
  - Outage by itself may not have an impact for their outages (since the system is interconnected.)
  - Outage combined with others does
  - Need comprehensive outage studies
- Potentially - studies show impacts greater than expected and outages need to be moved
- Which outage to move? Some compromising must be done.
- Northwest does not have an ISO or RTO so utilities work together (voluntarily.)
  - Northwest Power Pool members developed a process to aid in coordination of significant equipment.

NWPP Long Range Significant Outage Planning and 45-day Outage Planning Processes

- As member of the Northwest Power Pool (NWPP), BPA participates in both the Long Range Outage Planning and the 45-day Outage Planning processes.
  - Long Range Outage Planning meetings occur twice a year. February for July-Dec and September for Jan-Jun.
  - 45-day Outage Planning meetings occur monthly for the outage “Month”

NWPP Long Range Significant Outage Planning and 45-day Outage Planning Processes

1. The NWPP participant owner/operator uses the NWPP Outage Coordination Processes document.

2. Each NWPP participant owner/operator that is responsible for the construction, maintenance and operation of a Facility shall receive outage requests and accept or reject them based on:
   a. Conflicts with previously known planned outages (if it will cause additional path capacity reductions) and/or
   b. System reliability requirements (if it will result in a violation of WECC Operating Reliability Criteria and or NERC Reliability Standards).

3. The NWPP participant owner/operator responsible for the construction, maintenance and operation of a Facility shall enter proposed significant outage plans on the WECC Coordinated Outage System (COS) as soon as they are known for participation in the Long Range Significant Outage Planning (LRSOP), but at least 45 days prior to the calendar month in which the proposed outage is to occur (outage month).

The 45-day Outage Planning process

- Outages are due to the appropriate outage office by noon on the 15th of the month. An excel spreadsheet is built to reflect all the outages in that outage month.
- Transmission Path Capacity estimates are provided by TOT Technical Staff Engineers.
- At approximately day 45 the Initial Outage Plan is posted on BPA External web site for comments of the plan. http://www.transmission.bpa.gov/OASIS/BPAT/outagecoord/febout.htm
  - Email notification is sent to WECC RC, Path Operators, Coordinators and/or Owners, Transmission Operators to advise that the Initial Outage Plan has been posted for comments.
  - Email notification is sent via the BPA Transmission Email Capacity Forum advising its' members which include Marketers and the public that the Initial Outage Plan has been posted for comments.

45-day Outage Planning process (continued)

- At approximately day 37 an Outage Coordination meeting is held to review comments and make necessary adjustments to the plan.
  - The Coordinated Outage Plan is posted on BPA External web site for final comments of the plan. There is link from OASIS for visibility.
  - Email notification is sent to WECC RC, Path Operators, Coordinators and/or Owners, Transmission Operators to advise them that the Initial Outage Plan has been posted for comments.
  - Email notification is sent via the BPA Transmission Email Capacity Forum advising its' members which include Marketers and the public.
- At approximately day 30 a Final Outage Plan is posted before outage month. ("Final" is like freshly poured concrete.)
  - Email sent directly to WECC RC, Path Operators/Coordinators and/or Owners, Transmission Operators.
  - Email sent via BPA Transmission Capacity Forum advising its' members which include Marketers and the public.

Sample of the Equipment Appendix to the NWPP Outage Coordination Processes.

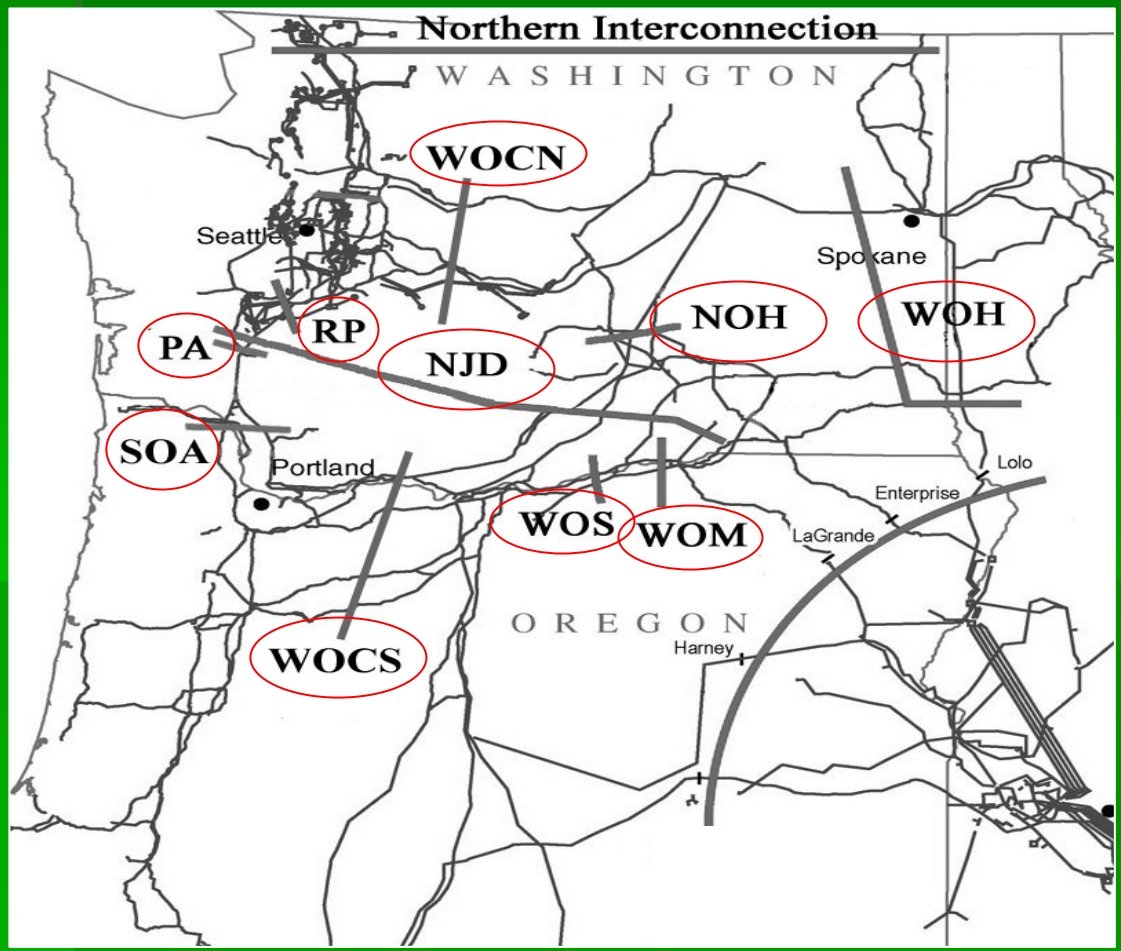
UTILITY	VOLTAGE kV	FACILITY	Paths Affected by Facility																																												
			1	3	4	5	6	#	9	#	11	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#										
			AIL-BC	NW-Can	W-C-N	W-C-S	W-H	MT-NW	[illegible]	W-C-I	[illegible]	ID-NW	ID-Si...	Borah W	ID-MT	Bridger W	Path C	4Corners	P-CNE-S	PPW-P-CN	I-M 345	I-G 230	[illegible]	[illegible]	TOT 2C	TOT 4A	TOT 4B	[illegible]	PDCI	COI	S-A	NJD	Mid-S...	Alt...	TOT 2B1	TOT 2B2	MT-SE	NW-SPP	NOH	SOB	WLM	WOH	WOS	R-P	P-A	GEN	IS
BPA	1000	Celilo-Sylmar 1000kV HVDC Line		X																									X																		
BPA	500	All Busses		X	X	X	X	X				X																	X	X	X	X						X	X	X	X	X	X	X	X	X	
BPA	500	All PCB's		X	X	X	X	X				X																	X	X	X	X						X	X	X	X	X	X	X	X	X	
BPA	500	Allston 500/230kV Bank 1 or 2																													X														X		
BPA	500	Alvey 500/230kV Bank 5																											X	X																	
BPA	500	Alvey 500kV Series Caps																											X	X																	
BPA	500	Alvey-Dixonville 1 500kV Line				X																							X	X																	
BPA	500	Ashe 500kV Reactors 1 or 2																											X	X		X															
BPA	500	Ashe-Hanford 1 500kV Line				X																							X	X																	
BPA	500	Ashe-Marion 2 500kV Line				X																							X	X		X															
BPA	500	Ashe-Slatt 1 500kV Line																											X	X		X										X	X			X	
BPA	500	Bell 500/230kV Bank 1					X	X																																						X	
BPA	500	Bell 500kV Reactor 1						X																																							
BPA	500	Big Eddy 500/230kV Bank 2 or 5																											X	X																X	
BPA	500	Big Eddy-Celilo 1 or 2 500kV Line																											X																		
BPA	500	Big Eddy-Ostrander 1 500kV Line				X																							X	X		X															
BPA	500	Broadview-Garrison 1 500kV Line						X																																							
BPA	500	Broadview-Garrison 1 500kV Line Series Caps						X																																							
BPA	500	Broadview-Garrison 2 500kV Line						X																																							
BPA	500	Broadview-Garrison 2 500kV Line Series Caps						X																																							
BPA	500	Buckley-Grizzly 1 500kV Line				X																							X	X																	
BPA	500	Buckley-Marion 1 500kV Line				X																							X	X		X															
BPA	500	Captain Jack 500kV Series Capacitor Group 1		X																									X	X																	
BPA	500	Captain Jack 500kV Shunt Reactor 1		X																									X	X																	

Schedule for 45-day NWPP outage coordination process

Revised: 14NOV08	**2009**											
Outage Month-->	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Dead line for submitting Significant Outage (by NOON)	11/14/08	12/15/08	01/15/09	02/13/08	03/16/09	04/15/09	05/15/09	06/15/09	07/15/09	08/14/09	09/15/09	10/15/09
Initial Outage Plan with capacity estimates posted on website for comment.	11/17/08	12/19/08	01/16/09	02/17/08	03/17/09	04/16/09	05/18/09	05/16/09	07/16/09	08/17/09	09/16/09	10/16/09
Comment period closes.	11/21/08	12/22/08	01/22/09	02/20/08	03/23/09	04/22/09	05/21/09	06/22/09	07/22/09	08/21/09	09/22/09	10/22/09
Outage Coordination group meets to develop Coordinated Outage Plan	11/27/08	12/23/08	01/23/09	02/23/09	03/24/09	04/23/09	05/22/09	06/23/09	07/23/09	08/24/09	09/23/09	10/23/09
Coordinated Outage Plan with capacity estimates posted on website for comment	11/25/08	12/24/08	01/26/09	02/24/09	03/25/09	04/24/09	05/26/09	06/24/09	07/24/09	08/25/09	09/24/09	10/26/09
Final comment period on Coordinated Outage Plan closes.	11/28/08	12/31/08	01/30/09	02/27/09	03/31/09	04/30/09	05/29/09	06/30/09	07/31/09	08/31/09	09/30/09	10/30/09
Final Outage Plan with capacity estimates posted on OASIS	12/01/08	01/02/09	02/02/09	03/02/09	04/01/09	05/01/09	06/01/09	07/01/09	08/03/09	09/01/09	10/01/09	11/02/09

Studies complete and path capacities listed on OASIS 13+ days ahead of each outage week.

Internal Flowgates in the BPA Control Area



WOCN – West of Cascades North

WOCS – West of Cascades South

RP – Raver-Paul

PA – Paul-Allston

SOA – South of Allston

NJD – North of John Day

NOH – North of Hanford

WOH – West of Hatwai

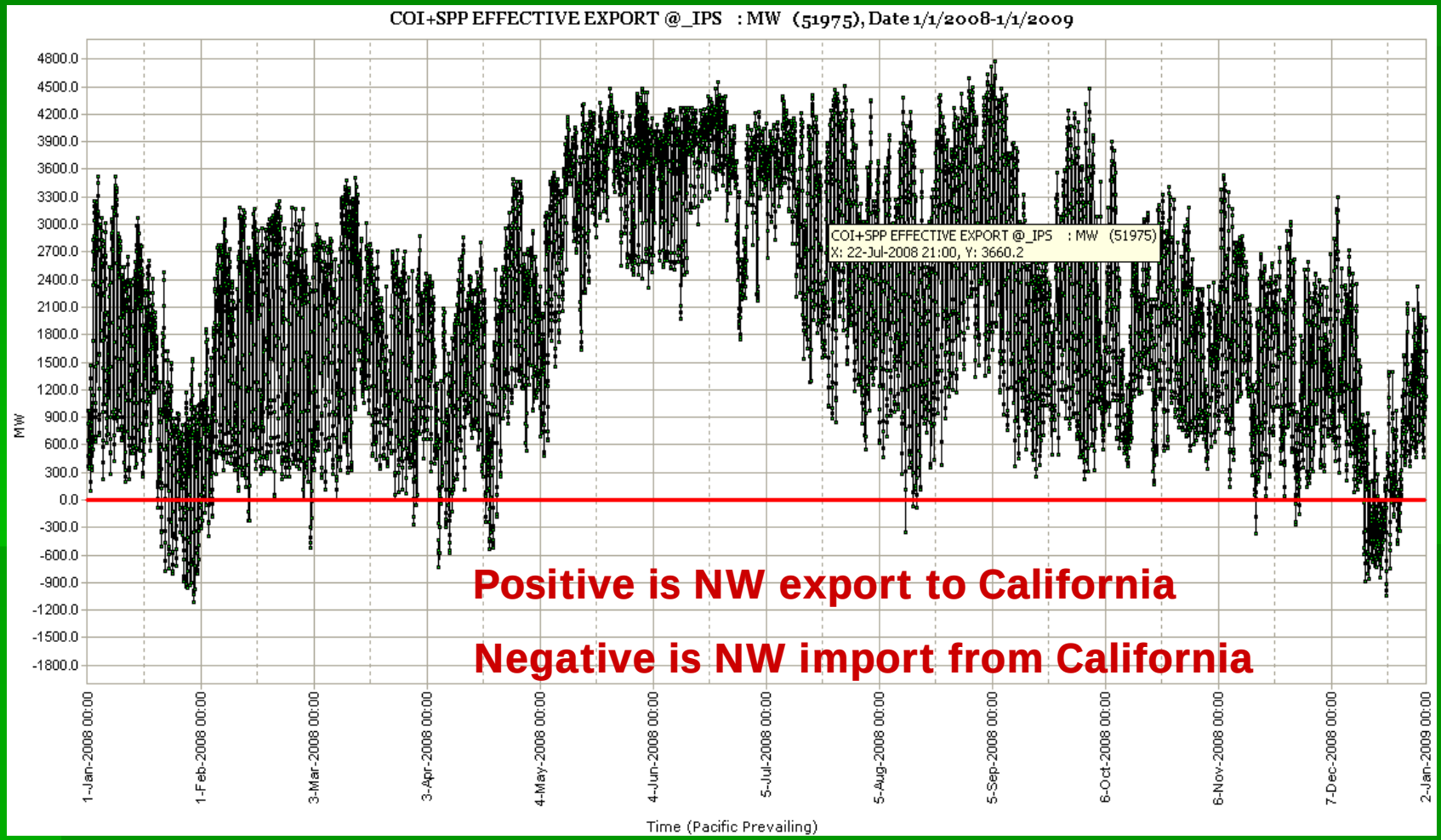
WOM – West of McNary

WOS – West of Slatt

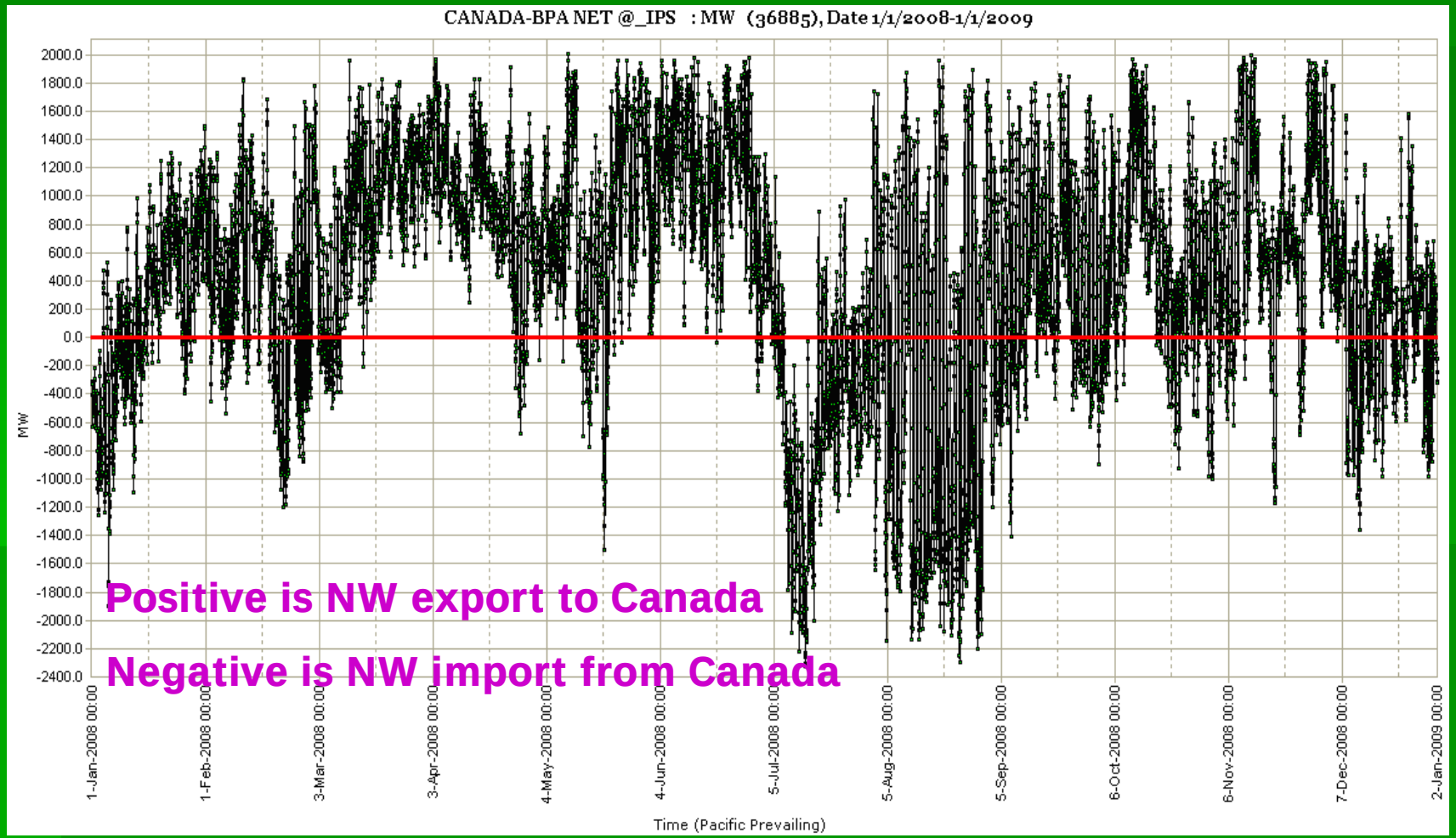
Northwest Seasonal Flow Pattern Impacts

- Fall, Winter, & Spring are typically high east to west flow
  - Fall and Spring are usually the best time to take outages that restrict North to South transfers
- Summer is typically high north to south flow
  - Summer is usually the best time to take outages that only impact East to West transfers

COI Annual MW Flow Trend



Northern Intertie MW Flow Trend



Conclusion

- **Outage coordination is**
  - **The effort of coordinating outages into the best possible outage window such that the power system is safe and reliable,**
  - **meeting the safety requirements and time needs of the crews who perform the work, and**
  - **offer the highest transmission capability possible taking into consideration all constraints.**

Outage Coordination and Business Practices – THE END

2009