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UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

NATIONAL WILDLIFE FED'N, et al.,	)	
Plaintiffs,	)	Civ No. 01-00640-RE
v.	)	
NATIONAL MARINE FISHERIES SERVICE	)	Declaration of Michael R. Viles
and UNITED STATES ARMY CORPS OF	)	(Preliminary Injunction)
ENGINEERS,	)	
Defendants.	)	
	)	

I, Michael R. Viles, declare as follows:

1. I received a BS degree in Electrical Engineering from the University of Portland in 1978 and began working for the Bonneville Power Administration (BPA) that same year. I have worked as an electrical engineer in BPA's Transmission Technical Operations staff since 1979. I am responsible for the development of the transmission system operating limits and the operating procedures that are used by BPA's transmission

dispatchers to operate and deliver power over the Federal transmission system safely and reliably. I submit this Declaration to discuss the likely impacts on the transmission system from the operations proposed by the National Wildlife Federation plaintiffs on October 31, 2005, for the spring and summer of 2006.

<u>Introduction</u>

2. BPA owns and operates approximately 15,000 miles of high voltage (115 kiloVolt (kV) – 1000 kV) transmission lines used to deliver power to loads in BPA's service area, which includes Oregon, Washington, Idaho, western Montana and small portions of California, eastern Montana, Nevada, Utah and Wyoming. BPA's transmission system accounts for about 75% of the high voltage transmission facilities in the Pacific Northwest (PNW). BPA's transmission system also interconnects with major transmission systems delivering power between the PNW and California, Canada, Idaho, Montana and Nevada (external interties). BPA provides transmission service to certain large industrial customers who purchase wholesale power directly from BPA, public and private utilities, generators and power marketers.

3. BPA's transmission system includes the California-Oregon Intertie (COI) and the Pacific DC Intertie (PDCI), originally built between 1967 and 1970. These "Interties" allow for inter-regional exchanges of power between California and the PNW when one region experiences power shortages and the other has excess power to trade. Under ideal conditions, a maximum of 7900 megawatts (MW) (4800 MW on the COI and 3100 MW on the PDCI) could be exported from the PNW to California. 7900 MW represents the amount of power needed to serve the combined winter peak loads of the

Portland and Seattle areas. Operating conditions, however, often limit the export capability of the COI and PDCI to 6500-7000 MW.

Impacts of Plaintiffs' Proposed Operations

4. I have considered the effects on BPA's transmission system of plaintiffs' request for increased spill and drafting of reservoirs in 2006. I expect the effects to be similar to the effects actually experienced during the 2005 summer spill period ordered by the court, which I discuss in some detail in this declaration. The effects on the transmission system would include the following: (a) decreased generation at certain Federal hydroelectric projects; (b) corresponding increase in a north to south direction of power flows on BPA's transmission paths to replace the lost generation in some parts of the system; (c) reduced ability to transfer power (transfer capability) on the inter-regional interties (the COI and PDCI); (d) reduced voltage and stability support; and (e) increased transmission operating problems.

5. I discuss each of these impacts below, and will refer to Exhibits A-E. Note that Exhibit A-D summarize effects actually experienced during the increased spill ordered in the summer of 2005, and Exhibit E describes additional impacts from the increased spill and drafting of reservoirs requested by plaintiffs for 2006 compared to summer of 2005 operation.

(a) Decreased Generation at Certain Projects

6. Quite simply, water that is spilled at a particular project is not available to put through that project's hydroelectric generating units and therefore no power is generated. Providing additional spill and limiting drafting, over what is planned as part of the Action Agencies' operations, would mean that less power will be generated from

some parts of the FCRPS than would be generated under currently planned operations. This, in turn, leads to a number of impacts as discussed below.

(b) Increased North-South Flows and Strains on Network Transmission System

7. It is important that the court understand that the dynamics of a transmission system can change considerably as the operating conditions change. This is especially the case when generation patterns or load patterns change. During the 2005 spill period, there was a significant change in generation patterns (substantial reduction in power production in one area and a corresponding increase in production in other areas).

8. The reduction in generation in 2006 at the Lower Columbia (McNary, John Day, The Dalles, and Bonneville) and Lower Snake (Lower Granite, Little Goose, Lower Monumental and Ice Harbor) projects would again necessitate increased generation of power at generation plants further north. Deliveries of that more northerly generated power to loads formerly served from the Lower Columbia and Lower Snake projects will increase flows of power from the north to the south on BPA's transmission system.

9. **Exhibit A** shows that the north-south flow of power on the North-of-Hanford path increased significantly during the period of increased spill ordered by the court (2005 spill order). During this period, the North-of-Hanford path consisted of the Coulee-Hanford and Vantage-Hanford 500 kV transmission lines, which are located on the east side of the Cascade Mountains in central Washington. As shown in this exhibit, the flow of power on the North-of-Hanford path before the court-ordered spill began averaged between 2000 to 3000 megawatts. During the period that the 2005 spill order

was in effect, power flows over this path reached as high as 4000 megawatts. The power flow dropped back to 2000 megawatts or below immediately after the spill period ended.

10. **Exhibit B** shows why north-south flows on the transmission network increased as a result of the 2005 spill order.[1] Exhibit B compares flows during the six highest hours of generation at the Lower Columbia and Lower Snake projects to meet demands for power on Friday June 17, 2005 (before the 2005 spill order began) to the six highest hours of generation at these projects to meet demands for power on Tuesday June 21, 2005 (during the 2005 spill order period). The diagram shows that the results of the increased spill were to (1) reduce generation on the Lower Snake and Lower Columbia projects by 722 MW (shown in the lower right zone of the illustration) and (2) replace those lost sources of power with power generated further north, as shown in the upper left zone of the illustration. As the arrows indicate, the replacement power flowed from north to south, by 454 MW on the North of Hanford path and by 167 MW on the Keeler-Allston 500 kV path.

(c) <u>Reduced Transfer Capability/Increased Risk to the Transmission System</u>

11. To appreciate the significance of the changes in power flow resulting from the increased spill, one must understand that the ability of the transmission lines to carry power is limited. The transmission system is particularly dependent on constrained transmission paths, which are paths identified by operators as sensitive to transmission outages and/or operating conditions (generation patterns, load levels, etc.) and thus are monitored to make sure they are not operated outside safe operating conditions. To maintain reliability on the transmission system, transmission operators must limit actual

[1] Exhibit B has the following assumptions. The change in transmission flow is based on generation changes only and 86% of that change in power will flow on the 500 kV transmission facilities.

power flow on each constrained path to the operating transfer capability (OTC) of that particular path. OTC is a measure of the maximum level of transfer capability (i.e., the carrying capability) that a transmission path can operate to and still maintain industry safety and reliability standards. These standards were developed by national (North American Electric Reliability Council or NERC) and regional (Western Electric Coordinating Council or WECC) reliability councils comprised of electric utility industry representatives. Meeting these standards enable continued transmission reliability in the event of "critical contingencies," such as loss of generation or loss of a transmission line.

12. Exceeding a transmission path's OTC increases the risk that the path might fail to function as expected in the event of a critical contingency. If a critical contingency occurs while operating above an OTC, there are increased risks of cascading outages and loss of power deliveries. In August 1996, there was an electrical disturbance that originated in the PNW and is an example of an event that was triggered by an outage of a single line that cascaded into loss of the COI and other transmission lines. This resulted in a loss of approximately 28,000 MW of load. Lack of generation at the Lower Columbia projects due to increased spill for fish aggravated that August 1996 disturbance. This type of cascading outage is less likely to occur when transmission paths are operated below their OTC levels.

13. The increased north-south demands on the network transmission system that result when generation in one part of the FCRPS is limited and is replaced with power supplied from another part of the network contribute to exceedances of the OTC of transmission paths monitored by BPA. As shown in **Exhibit C**, these exceedances occurred significantly more often in the June-August 2005 period of increased spill, as

compared to the June-August 2004 period, which had lower spill levels on the Lower Snake projects and McNary. Each bar represents the number of occurrences when data that is sampled every 5 minutes indicated that the OTC of that path had been exceeded. Consecutive readings did not exceed 30 minutes. **Exhibit D** shows, on a cumulative basis over the June through August 2005 period, the amount of time the OTC for each of three paths was exceeded, as compared to the June through August 2004 period. It shows the cumulative time of exceedances during the 2005 court order spill period was much larger than the cumulative time of exceedances during the same period a year earlier.[2]

14. BPA took action to reduce actual flows on the critical paths to get below the path OTC limits within the 30 minute time limits for these paths allowed by NERC and WECC standards *However,* the fact that these excursions occurred so frequently during the Court-ordered spill operations raises significant concerns for the continued reliable operation of the transmission system. It also points to the increased level of concern that would arise if generation were further restricted at the Lower Columbia and Snake River projects (as would result from Plaintiffs' requested Spring and Summer 2006 operations), which I discuss in Section (e) below.

[2] In Exhibit D, during the period of court-ordered increased spill, transmission paths were sampled every five minutes, and each occurrence of exceedance of OTC was counted as five minutes above the OTC, since the sample rate was once every 5 minutes. I also compared this five-minute data to BPA's records of exceedances for ten-second periods, which BPA has maintained since August 1, 2005. The ten-second data samples the existence of exceedances of OTC every ten seconds and assumes a detected exceedance lasts ten seconds (until the transmission path is again monitored). This comparison showed that, during the period of increased spill in August 2005, the five-minute data showed a slightly lower cumulative time of exceedances than did the ten-second data. This comparison confirms that the data in Exhibit D accurately approximates the actual cumulative time of exceedances that occurred during the period of ordered increased spill.

(d) Reduced voltage and stability support

15. As I've discussed, the 2005 spill order reduced generation at the Lower Columbia and Lower Snake Projects. In addition to the consequences for transmission system reliability discussed above, reduced generation at these projects has an additional impact of reducing the voltage and stability support the hydroelectric projects can provide. This, consequently, can reduce the OTC on the interties between the PNW and California.

16. The effect of reducing voltage and stability support is similar to comparing the movement of a ball filled with air to the movement of the same ball filled with sand. The ball filled with air is lighter and easy to move. It represents a transmission path with fewer generators on-line. It does not take much of a disturbance to move it to an unstable condition, and as a result it must be operated at a lower OTC to maintain reliable operation of the path. In contrast, the ball filled with sand is much heavier and harder to move. It represents a transmission path with more generators on-line. It takes a much bigger disturbance to cause it to move to an unstable condition, and thus it can be operated at a higher OTC.

17. During the high north to south flows observed in summer 2005, the combined reduction of transfer capability on the two regional interties (COI and PDCI) varied from 0 - 400 MW, depending on the actual operating conditions. 400 MW is approximately equal to one third of the average load for Seattle City Light.

(e) Increased Impacts from Plaintiffs' Proposed 2006 Operations

18. The Plaintiffs' request for drafting of reservoirs and increasing spill for 2006, as shown in **Exhibit E**,[3] would make the above problems worse. The north-south flow on the North of Hanford path, under conditions like those existing on July 2, 2005 (McNary spill was increased on July 1, 2005), would *increase* by an estimated additional 217 MW (i.e., on top of the 454 MW observed in Exhibit B for a total increased flow of 671 MW), and the north-south flow on the Keeler-Allston path would increase by an additional 61 MW (i.e., on top of the 167 MW observed in Exhibit B for a total increased flow of 228 MW).

19. In addition, the impact on the combined COI and PDCI OTC under the 2006 proposal is expected to be almost as great as seen with the 2005 spill. The combined COI and PDCI OTC is expected to be reduced by 0 - 300 MW (i.e., on top of the 0-400 MW observed in 2005 for a cumulative impact of 0 - 700 MW) depending on the system conditions. These interties are more sensitive to the changes in generation at the Lower Columbia projects than at the Snake projects.

Conclusion

20. In summary, I would expect the plaintiffs' proposed changes in spill operation and drafting of reservoirs for the spring and summer of 2006 to further reduce generation on the Lower Columbia and Lower Snake projects over what was observed for the summer of 2005. Reducing the power generated at these Federal hydroelectric projects and replacing it with power elsewhere on the system, in turn, would have a

[3] Exhibit E has the following assumptions. 1. The Schultz-Wautoma 500 kV line is in service, as of December 2005. 2. The change in transmission flow is based on generation changes only and 90% of that change in power will flow on the 500 kV transmission facilities. 3. This line will help reduce the loading on the Paul-Allston and Keeler-Allston paths and increase the loading on the North of Hanford path.

number of impacts on the transmission system, including further increasing the north to south flows on the transmission system; reducing the operating transfer capability on the key regional interties (COI and PDCI) and limiting the ability to deliver power from one region to another to meet power needs. These impacts would cause the transmission system to operate closer to its reliability limits for longer periods of time, and increase the risk of transmission problems of the type described in Sections b through d actually occurring.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this 18th day of November, 2005, in Portland, Oregon.

Michael R. Viles

Michael R. Viles

EXHIBIT A

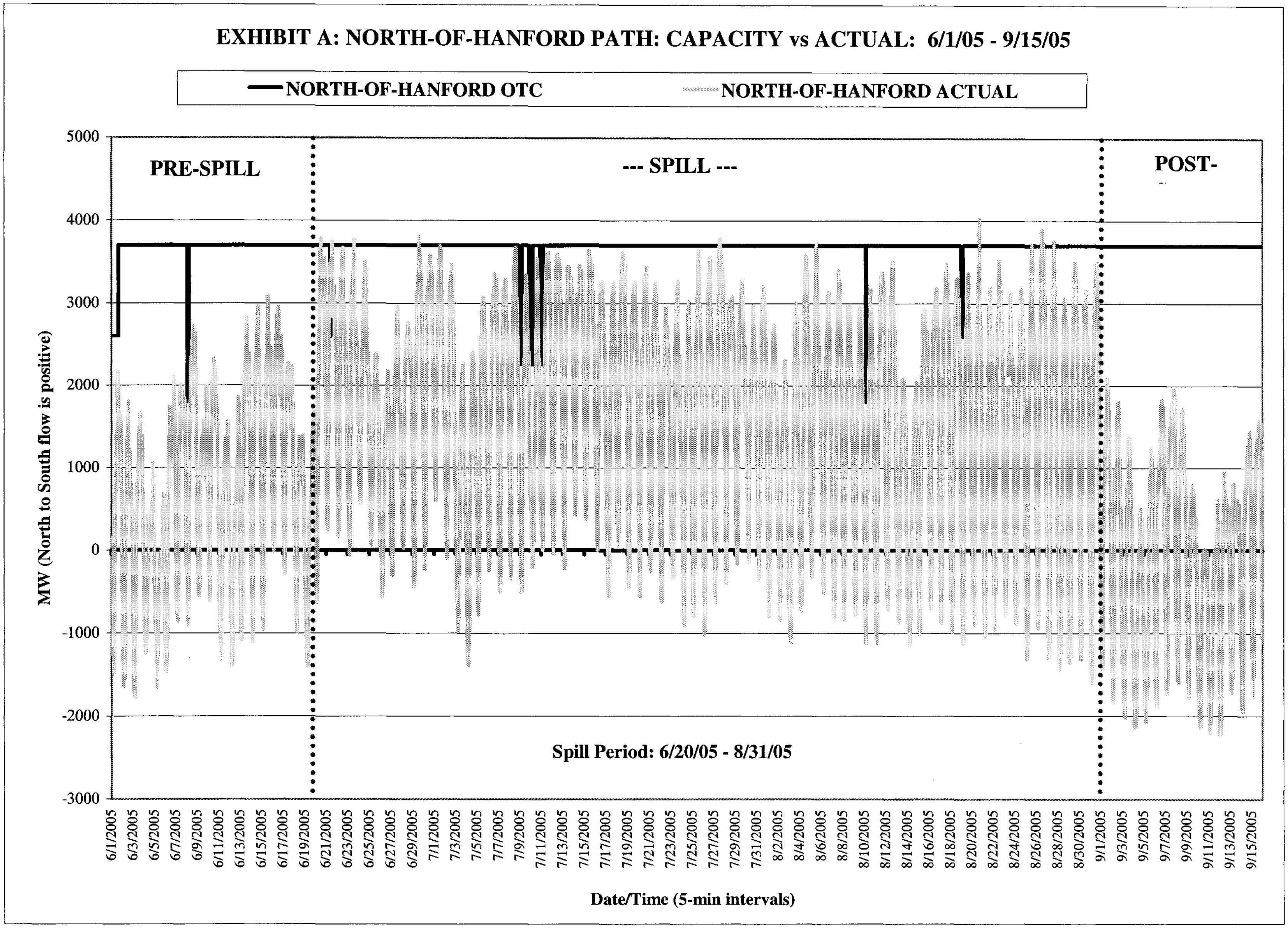
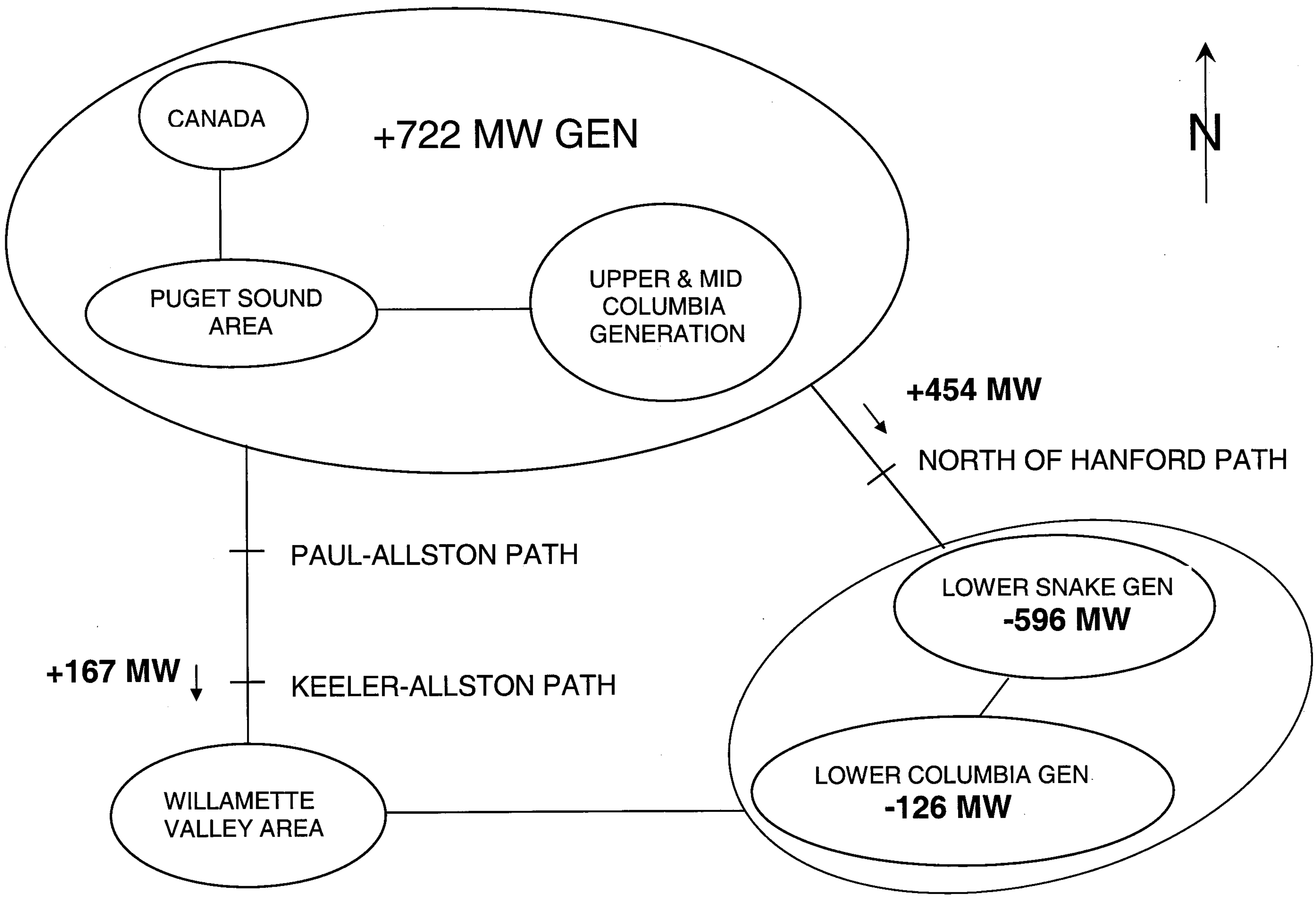


EXHIBIT A: NORTH-OF-HANFORD PATH: CAPACITY vs ACTUAL: 6/1/05 - 9/15/05
NORTH-OF-HANFORD OTC
NORTH-OF-HANFORD ACTUAL
PRE-SPILL
--- SPILL ---
POST-
Spill Period: 6/20/05 - 8/31/05
MW (North to South flow is positive)
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
6/1/2005
6/3/2005
6/5/2005
6/7/2005
6/9/2005
6/11/2005
6/13/2005
6/15/2005
6/17/2005
6/19/2005
6/21/2005
6/23/2005
6/25/2005
6/27/2005
6/29/2005
7/1/2005
7/3/2005
7/5/2005
7/7/2005
7/9/2005
7/11/2005
7/13/2005
7/15/2005
7/17/2005
7/19/2005
7/21/2005
7/23/2005
7/25/2005
7/27/2005
7/29/2005
7/31/2005
8/2/2005
8/4/2005
8/6/2005
8/8/2005
8/10/2005
8/12/2005
8/14/2005
8/16/2005
8/18/2005
8/20/2005
8/22/2005
8/24/2005
8/26/2005
8/28/2005
8/30/2005
9/1/2005
9/3/2005
9/5/2005
9/7/2005
9/9/2005
9/11/2005
9/13/2005
9/15/2005
Date/Time (5-min intervals)

EXHIBIT B

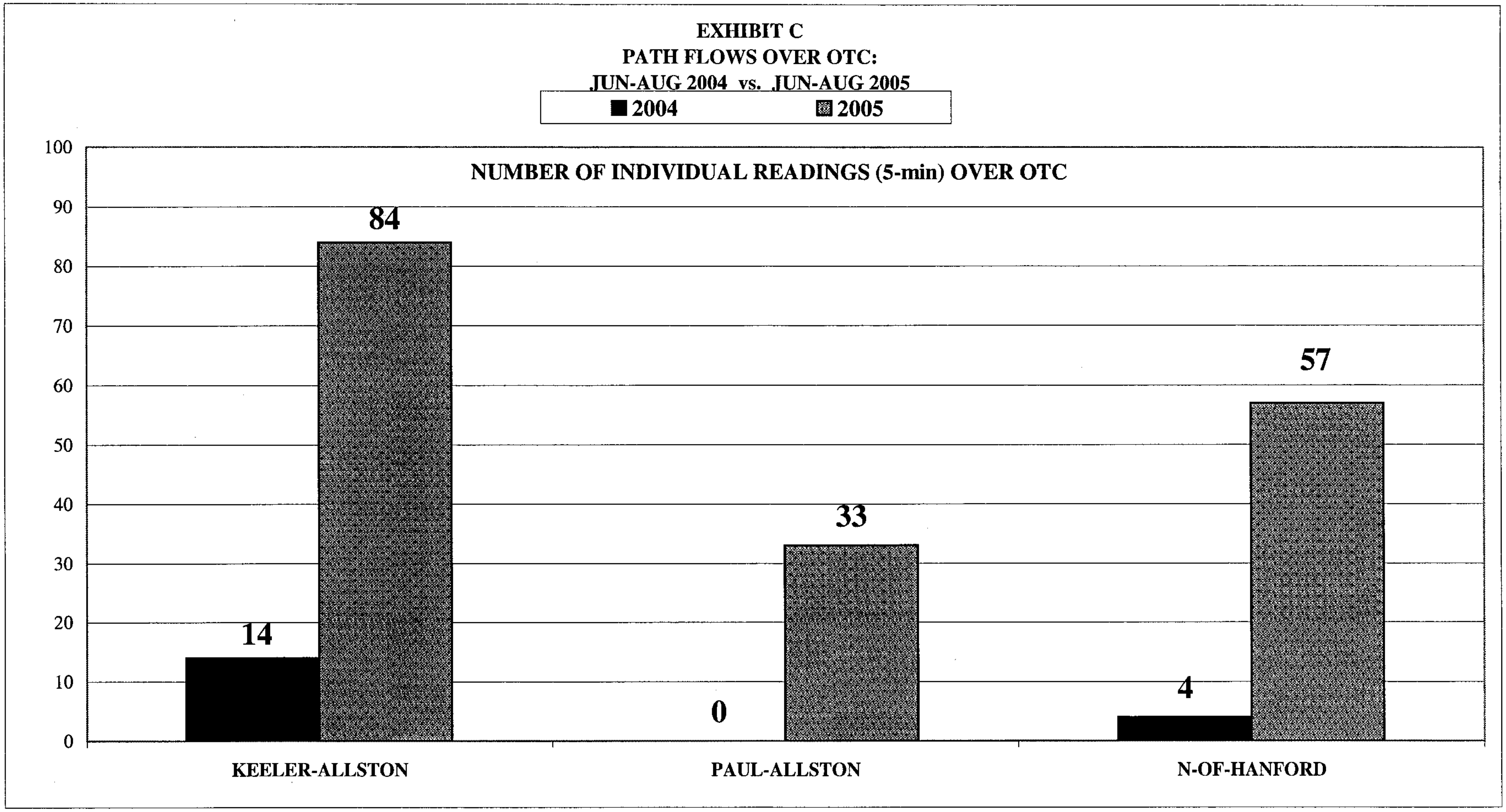
EXHIBIT B: 2005 SPILL IMPACTS ON TRANSMISSION SYSTEM



SUMMER 2005 INCREASED SPILL OPERATIONS RESULTED IN GREATLY INCREASED POWER FLOW FROM NORTH TO SOUTH OVER KEY CONSTRAINED TRANSMISSION PATHS

Declaration of Michael R. Viles

EXHIBIT C



Declaration of Michael R. Viles

EXHIBIT D

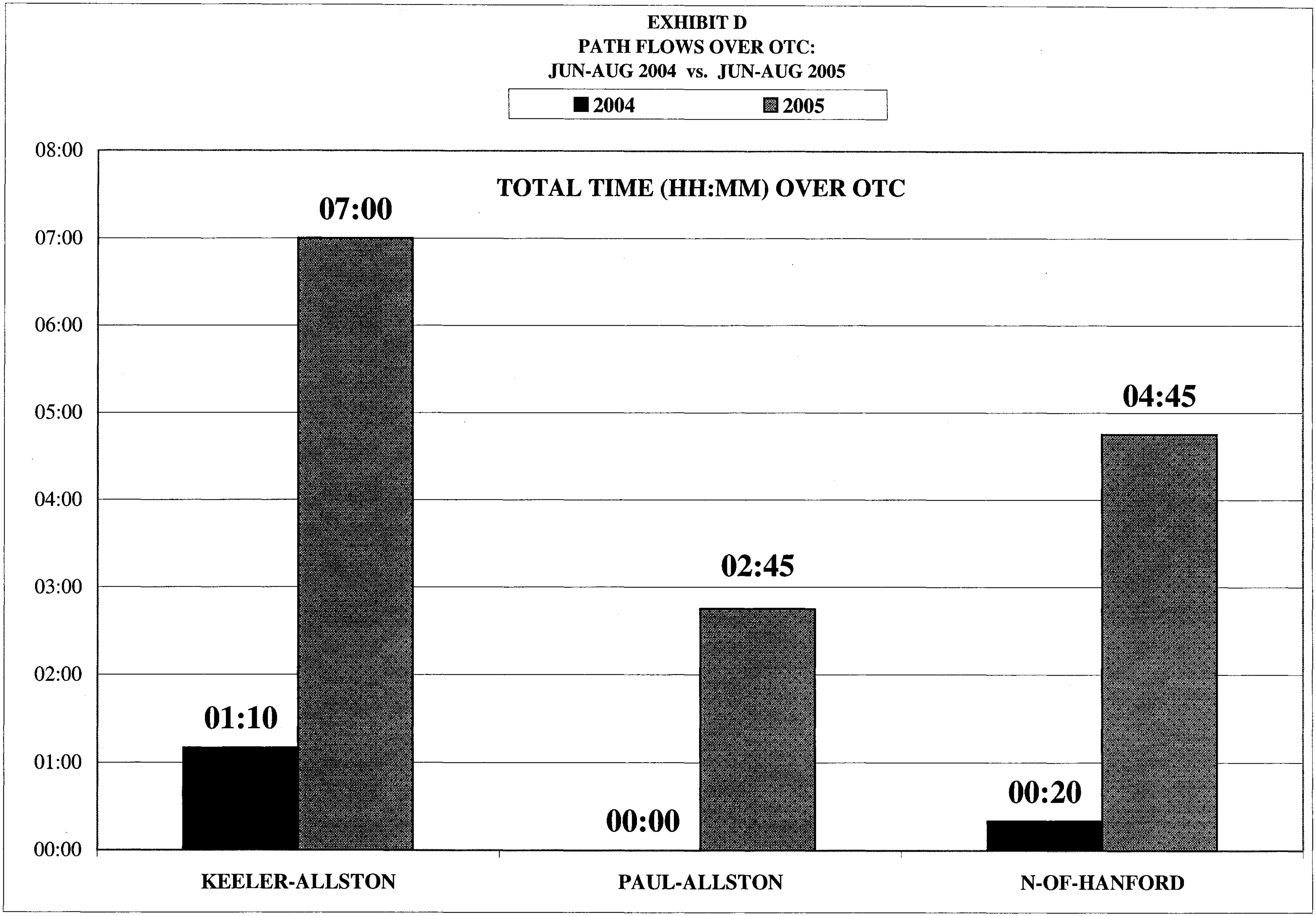
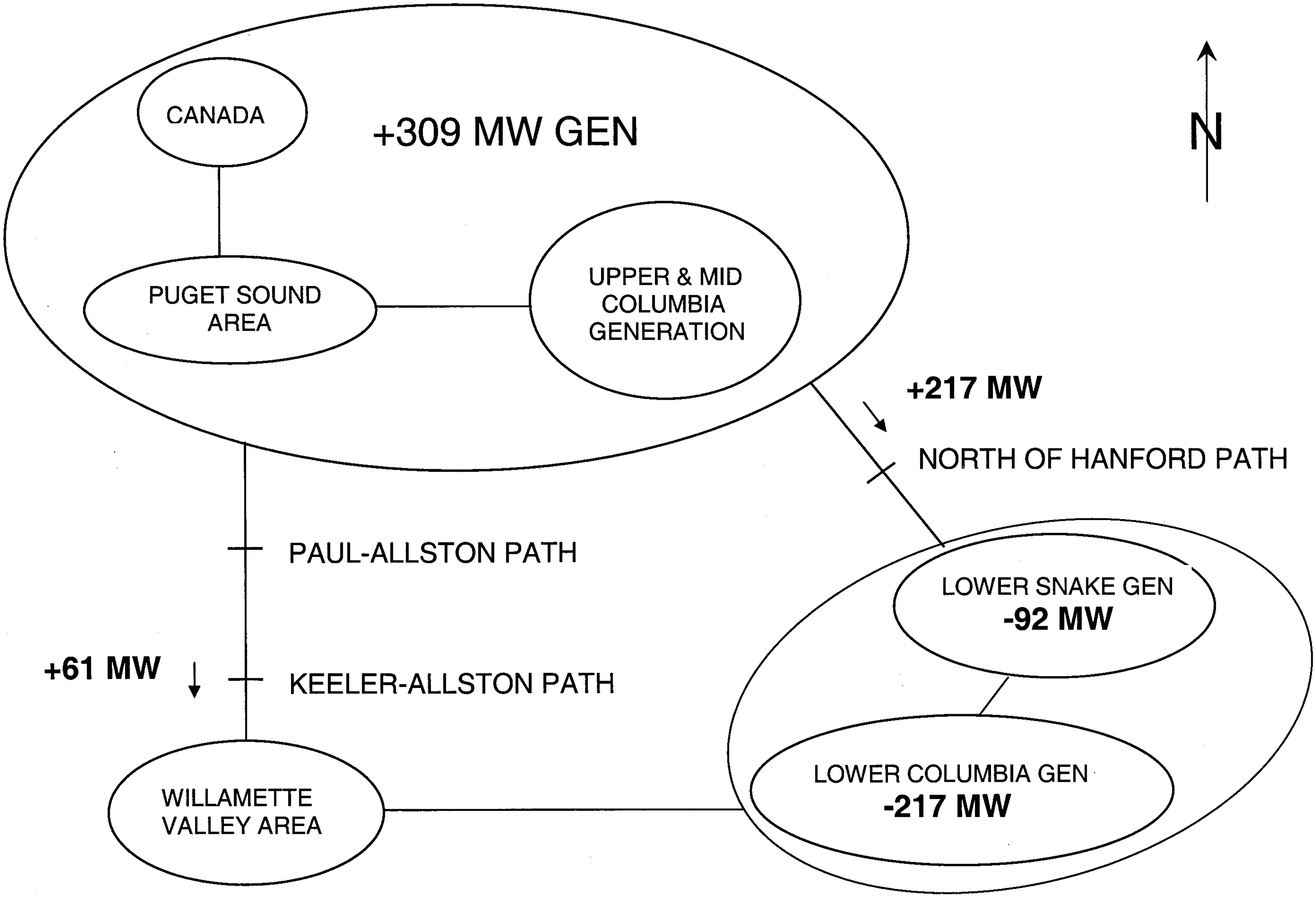


EXHIBIT D
PATH FLOWS OVER OTC:
JUN-AUG 2004 vs. JUN-AUG 2005
2004
2005
TOTAL TIME (HH:MM) OVER OTC
08:00
07:00
06:00
05:00
04:00
03:00
02:00
01:00
00:00
01:10
07:00
00:00
02:45
00:20
04:45
KEELER-ALLSTON
PAUL-ALLSTON
N-OF-HANFORD

EXHIBIT E

EXHIBIT E: PROPOSED 2006 SPILL IMPACTS ON TRANSMISSION SYSTEM



PROPOSED SUMMER 2006 SPILL OPERATIONS WILL RESULT IN INCREASED POWER FLOW FROM NORTH TO SOUTH OVER KEY CONSTRAINED TRANSMISSION PATHS

Declaration of Michael R. Viles