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724-682-7773

September 6, 2005 L-05-140

U. S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit Nos. 1 and 2 BV-1 Docket No. 50-334, License No. DPR-66 BV-2 Docket No. 50-412, License No. NPF-73 Response to a Request for Additional Information (RAI dated August 2, 2005) in Support of License Amendment Request Nos. 302 and 173, Extended Power Uprate

By letter dated August 2, 2005, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) pertaining to FirstEnergy Nuclear Operating Company (FENOC) License Amendment Request (LAR) Nos. 302 and 173 (Reference 1). These LARs propose an Extended Power Uprate (EPU) for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2. The EPU LAR proposes increasing the licensed power level approximately 8 percent above the current licensed power level.

Enclosure 1 contains the non-proprietary FENOC responses to all of the August 2, 2005 RAI questions except question number 4. The response to question number 4 is not included in this enclosure because it contains proprietary information.

Enclosure 2 contains the proprietary FENOC response to question number 4 of the August 2, 2005 RAI. The proprietary information in Enclosure 2 has been identified with brackets.

Enclosure 3 contains the non-proprietary FENOC response to question number 4 of the August 2, 2005 RAI. The proprietary information in Enclosure 3 has been identified with brackets and deleted.

As the response to RAI question number 4 in Enclosure 2 contains information proprietary to Westinghouse Electric Company LLC, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission

APOI

Beaver Valley Power Station, Unit Nos. 1 and 2 Response to a Request for Additional Information in Support of License Amendment Request Nos. 302 and 173, Extended Power Uprate L-05-140 Page 2

and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference Westinghouse letter CAW-05-2046 and should be addressed to B. F. Maurer, Acting Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P. O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

No new regulatory commitments are contained in this submittal. If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Supervisor - Licensing, at 330-315-6944.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 4, 2005.

Sincerely, ames H. Lash

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Enclosures:

- 1. Non-Proprietary responses to all RAI questions except number 4
- 2. Proprietary response to RAI question number 4
- 3. Non-Proprietary response to RAI question number 4
- 4. Affidavit

References:

- 1. FENOC Letter L-04-125, License Amendment Request 302 and 173, dated October 4, 2004.
- c: Mr. T. G. Colburn, NRR Senior Project Manager Mr. P. C. Cataldo, NRC Senior Resident Inspector Mr. S. J. Collins, NRC Region I Administrator Mr. D. A. Allard, Director BRP/DEP Mr. L. E. Ryan (BRP/DEP)

L-05-140 Enclosure 1

REQUEST FOR ADDITIONAL INFORMATION RELATED TO

FIRSTENERGY NUCLEAR OPERATING COMPANY (FENOC)

BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2 (BVPS-1 AND 2)

EXTENDED POWER UPRATE (EPU)

DOCKET NOS. 50-334 AND 50-412

By letter dated October 4, 2004, as supplemented February 28, May 26, June 14, and July 8, 2005, Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML042920300, ML051530376, ML051670270, and ML051940575, FENOC (the licensee) proposed changes to the BVPS-1 and 2 operating licenses to increase the maximum authorized power level from 2689 to 2900 megawatts thermal rated thermal power or approximately 8 percent. The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's application against the guidelines in the EPU review standard (RS-001) and determined that it will need the additional information identified below to complete its review.

Question

- 1. Section 10.16.1.2 of the risk assessment (Reference 2), states: "A review of the engineering change packages associated with the EPU including containment conversion was performed to determine their effect on systems and associated equipment that are important to plant risk."
 - a. Are the BVPS-1 auxiliary feedwater cavitating venturis and main feedwater (MFW) fast-acting isolation valves related to EPU?

Response:

The BVPS-1 auxiliary feedwater cavitating venturis and main feedwater fast-acting isolation valves were installed to support the BVPS-1 containment conversion design modification License Amendment Requests (LAR 317 & 190), and these components are related to the extended power uprate (EPU).

As noted on page 1-4 of Enclosure 2 of LAR 302 & 173 (L-04-125), the containment conversion from a sub-atmospheric to an atmospheric containment design, including related modifications such as the addition of feedwater isolation valves and auxiliary feedwater flow limiting venturis for BVPS-1 are required to support the implementation of the EPU analyses.

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Question

b. For EPU-related change packages, please provide the details of these reviews for BVPS-1 and 2, including the effect of each modification on the probability risk assessment (PRA) model.

Response:

An evaluation was performed as a two-step screening process. The end result determined whether there is a significant impact on risk due to a plant modification. The two steps are outlined below and shown on Figure 1-1. In each step, if the criterion can be answered in the negative for a given component, that component can be eliminated from further consideration, as it is considered to have no impact or a negligible impact on risk.

Step 1: Is the modified system or component currently modeled in the PRA, or not modeled and considered potentially important to plant risk? – Modifications to components that are currently included in the PRA model will be evaluated for risk impact.

In the event a component is not included in the PRA model, yet the component is determined to be potentially important to plant risk, and therefore should be included in the PRA model, the component will be evaluated for risk impact. Potential risk impact for components not included in the PRA model are determined by engineering judgment.

Step 2: Modification meets guidelines in Standard Review Plan 19.0:

- Does the change impact the system performance in a potentially negative or nonconservative manner?
- Does the change impact the system design in such a way as to alter system reliability models?
- Does the change impact the support function of the system in such a way as to alter the dependencies in the model?

If the answer to all of these criteria is no, then there is no expected impact on system function or component reliability due to the plant modification.

The process resulted in the majority of the plant modifications being screened as not modeled in the PRA, or not important to risk. Only seven plant modifications passed the first screen. Those modifications are:

- BVPS-1 Installation of Main Feedwater (MFW) Fast Acting Feedwater Valves
- BVPS-1 Installation of Auxiliary Feedwater (AFW) Cavitating Venturis
- Extended Power Uprate Charging System Rethrottling (BVPS-1 and BVPS-2)
- Charging Pump Rotating Assembly Replacement (BVPS-1 and BVPS-2)
- Replacement Steam Generator Level Transmitters (BVPS-1)
- Feedwater Valve Replacement (BVPS-2)
- Replacement Steam Generators (BVPS-1)

A review of the above seven modifications was performed. It was determined that these modifications were to be made in order to maintain or improve the performance of equipment under EPU conditions. This will ensure that the plant systems and equipment will continue to be operated within their design constraints. Therefore, it was concluded that the failure rates of the affected components would not change with the implementation of EPU. A brief description of the evaluations performed for each of the seven modifications is provided below.

The MFW fast-acting feedwater valves and AFW cavitating venturis were considered to be potentially important to risk, as they were new components that were not modeled in the current PRA and may impact the function of the MFW and AFW systems, respectively. Thus, these components were added to the BVPS-1 PRA model. Since similar components were modeled in the BVPS-2 PRA model, their failure rates were assumed to be applicable to BVPS-1 also. Results from the re-evaluation, as addressed in response to RAI question 3, indicate that these components are not significant contributors to risk. The fast-acting feedwater valves have a Fussell-Vesely of 1.05E-07 each, and the cavitating venturis have a Fussell-Vesely of 1.90E-09 each.

The charging system modifications (rethrottling and rotating assembly replacement) were included in the thermal-hydraulic Modular Accident Analysis Program (MAAP) to evaluate their impact on the PRA model success criteria at EPU conditions. It was concluded that these modifications have no impact on the success criteria due to the EPU, as all the pre-EPU modeling success criteria remained valid for the post-EPU conditions (one auxiliary feedwater pump delivering flow to one steam generator provided enough heat removal capability at BVPS-1, even with the AFW cavitating venturis installed, to prevent core damage).

The replacement steam generator (RSG) level transmitters at BVPS-1 are not explicitly modeled in the PRA, and will not impact any modeled component or success criteria. The feedwater valve replacements at BVPS-2 are considered to be a one-for-one replacement for PRA modeling purposes, and also will not impact any modeled component or success criteria. Therefore, these modifications were not considered further.

The RSG was addressed by a re-calculation of the steam generator tube rupture (SGTR) initiating event frequency to account for the improved Alloy 690 material used for the replacement steam generator U-tubes. The methodology for this re-calculation is provided in the response to RAI question 4. The RSG SGTR initiating event frequency was calculated to be 6.96E-04 /year per steam generator versus 1.48E-03 per steam generator in the original steam generator model. The contribution to core damage frequency (CDF) due to SGTRs is 1.71E-07 /year per steam generator for the replacement steam generator EPU model. This contribution is based on the re-evaluation as addressed in RAI question 3. The contribution to CDF from SGTRs for the original steam generator EPU model is 3.93E-07 /year per steam generator. Thus, it can be seen that both the SGTR initiating frequency and the contribution to CDF decrease with the replacement steam generator.

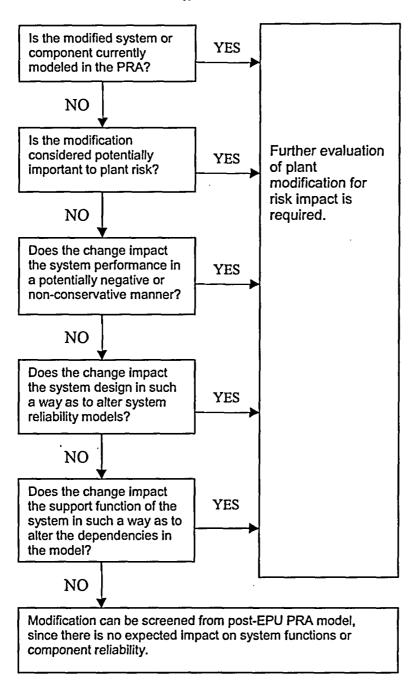


Figure 1-1

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Question

2. Section 10.16.1.4 of Reference 2, discusses the impact of EPU conversion on the human reliability analysis (HRA). The major impact is that the time available to perform some operator actions had decreased. In some cases, the base PRA model used a conservative estimate of the time available, which is taken in the analysis to bound the post-EPU time. The NRC staff notes that use of bounding times can mask the actual change in risk, although such practice should result in a bounding estimate of risk. The following clarifications and additional information are needed to facilitate determining the overall impact of EPU on the HRA.

Question

a. For both units, please provide the detailed HRA for all human interactions ("operator actions") that (1) have a Fussell-Vesely importance measure greater than 0.005 or a risk-achievement worth greater than 2, or (2) were modified to represent the post-EPU plant. Include whether the time available is considered "bounding" or is best estimate for pre- and post-EPU conditions.

Response:

The following tables provide the Fussell-Vesely importance measures, risk achievement worth, and basis for the time available to perform the operator action used in the HRA for all BVPS-1 and BVPS-2 human interactions that:

- (1) have a Fussell-Vesely importance measure greater than 0.005 or a risk achievement worth greater than 2.0 for the pre-EPU and post-EPU conditions, or
- (2) were modified to represent the post-EPU plant.

It should be noted that the post-EPU importance measures are based on the realistic human error probability (HEP) values that were reassessed using MAAP results to determine a best estimate of the time available, and the requantified PRA model used to address RAI question 3.

Table 2-1 identifies the BVPS-1 pre-EPU operator actions that have either a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. All of these pre-EPU human actions were evaluated using best estimate hand calculations to determine the time available to perform the action. L-05-140 Enclosure 1 Page 6 of 34

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	1. BVPS-1 Pre-EPU Risk Significan	Fussell-	Risk	Time
Basic	Description	Vesely	Achievement	Available
Event	Description	Importance	Worth	Basis
	Operators patur partable fana 8	Importance	Total	Dasis
OPRBV3	Operators setup portable fans &	1.38E-01	2.62E+00	Best
UPRBV3	open doors to cool Emergency	1.302-01	2.025+00	Estimate
	Switchgear.			
	Operator cools down &			
OPRCD3	depressurizes the RCS using	7.88E-03	2.54E+00	Best
	atmospheric steam dumps or			Estimate
	RHR valve during a SGTR.		<u> </u>	
	Operator depressurizes RCS to			
	LHSI entry conditions by using			Best
OPRCD6	pressurizer PORVs; given a	5.02E-02	1.96E+00	Estimate
	Small Break LOCA and failure of			Lounda
	HHSI.			
	Operator depressurizes RCS to			
	LHSI entry conditions by using			Best
OPRCD7	pressurizer PORVs; given a	4.76E-02	1.31E+00	Estimate
	Small Break LOCA and failure of			Lound
	HHSI and AC Orange power.			
	Operator initiates Bleed & Feed			
OPROB2	when AFW fails, given that	1.55E-02	2.13E+00	Best
OFRODZ	DAFW and MFW restoration was	1.000-02	2.102100	Estimate
	not attempted.			
OPROC1	Operator trips the RCPs during a	8.16E-03	2.70E+00	Best
	loss of all CCR.	0.102.00		Estimate
	Operator depressurizes RCS to		2.44E-03 2.53E+00	
OPROD1	RHR and LHSI entry conditions	2.44F-03		Best
0111021	by using pressurizer PORVs or	2.11.2.00		Estimate
·	sprays; cooldown is successful.		·	
OPROS6	Operator manually initiates safety	2.44E-03	3.99E+00	Best
	injection given failure of SSPS.			Estimate
OPRSL1	Operator identifies ruptured S/G	5.30E-03	2.54E+00	Best
	and initiates isolation.			Estimate
OPRSL3	Operator locally gags a stuck	2.35E-02	1.10E+00	Best
	open S/G safety relief valve.			Estimate
	Operator manually aligns			
OPRWA1	Auxiliary River Water pump when	5.17E-03	1.66E+00	Best
2	main RW pumps fail given that			Estimate
	Offsite Power is available.		- <u></u>	
	Operator aligns makeup to the			Best
OPRWM1	RWST, given a SGTR with	4.70E-02	6.75E+00	Estimate
	secondary leakage.			Loundu

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Table 2-2 identifies the BVPS-2 pre-EPU operator actions that have either a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. All of these pre-EPU human actions were evaluated using a hand calculation best estimate time available to perform the action.

Table 2-2	. BVPS-2 Pre-EPU Risk Significant	Operator Actio	on Importance M	leasures
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis
OPRCD3	Operator depressurizes RCS using atmospheric steam dumps - SGTR	1.50E-03	2.03E+00	Best Estimate
OPRCD6	Operator depressurizes RCS to LHSI entry conditions by using pressurizer PORVs given a Small Break LOCA and failure of HHSI.	2.48E-02	1.31E+00	Best Estimate
OPROB1	Operator initiates Bleed & Feed, after attempting to realign MFW	6.46E-02	1.66E+01	Best Estimate
OPROB2	Operator initiates Bleed & Feed, MFW restoration not attempted	3.28E-02	1.89E+00	Best Estimate
OPROD1	Operator depressurizes RCS to LHSI/RHS entry conditions	1.23E-03	2.03E+00	Best Estimate
OPROF2	Operator realigns main feedwater - no SI	1.38E-03	5.06E+00	Best Estimate
OPROS6	Operator manually actuates AFW following transient	4.24E-03	5.23E+00	Best Estimate
OPROT1	Operator manually trips reactor within 1 minute	2.36E-03	2.88E+00	Best Estimate
OPRSL1	Operator identifies ruptured S/G and initiates isolation	5.69E-03	2.03E+00	Best Estimate
OPRWM1	Operator aligns makeup to RWST - SGTR with secondary leakage	2.19E-02	4.61E+00	Best Estimate

Table 2-3 identifies the BVPS-1 post-EPU operator actions that have either a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. These importance measures are based on the reassessment of the HEP values and requantification of the post-EPU PRA model used to address the issues raised in RAI question 3. All of these post-EPU human actions were reassessed using the MAAP results for the time available to perform the action, and are considered best estimates.

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Table 2-3. BVPS-1 Post-EPU Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis	
OPRCD3	Operator depressurizes the RCS to 400 psig by dumping steam through the intact steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR).	1.05E-02	3.48E+00	Best Estimate	
OPRCD5	Operator depressurizes the RCS to 400 psig by locally manipulating the steam generator atmospheric steam dumps to relieve steam during a SBO.	5.90E-03	1.22E+00	Best Estimate	
OPRCD6	Operator depressurizes the RCS to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR with HHSI has failed).	1.43E-01	4.09E+00	Best Estimate	
OPRCD7	Operator depressurizes the RCS to 400 psig by locally manipulating the steam generator atmospheric steam dumps to relief steam, given HHSI failure and loss of emergency AC orange.	1.55E-01	2.14E+00	Best Estimate	
OPRMU5	Operators provide borated makeup water to the RWST initially from the spent fuel pool, and, in the long term, from blending operations following an ISLOCA.	1.02E-02	2.63E+00	Best Estimate	
OPROA1	Operator starts charging/HHSI pumps and aligns an appropriate flow path for boron injection after an ATWS event.	4.11E-04	2.06E+00	Best Estimate	
OPROC1	Operator trips RCP during loss of CCP.	2.12E-02	5.40E+00	Best Estimate	
OPROC2	Operator trips RCP during loss of all seal cooling.	5.30E-03	2.10E+00	Best Estimate	
OPROD1	Operator depressurizes RCS to RHS entry conditions using pressurizer spray/PORVs.	3.53E-03	3.48E+00	Best Estimate	

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Table 2-3. BVPS-1 Post-EPU Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis	
OPROF6	Operator starts diesel driven AFW pump and manually controls MFW bypass valve.	9.66E-03	1.49E+00	Best Estimate	
OPROP1	Operators protect RSS pumps by stopping them (QS failure) restarting when there is sufficient water in the sump.	1.27E-02	1.22E+00	Best Estimate	
OPROS1	Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of SSPS due to actuation relay failure given a transient initiating event that leads to SI conditions. On failure of manual safety injection actuation, the operator manually aligns the safety equipment.	8.78E-03	2.14E+00	Best Estimate	
OPROS6	Operator starts AFW given failure of SSPS for sequences in which there is no safety injection; e.g., turbine trip sequences.	1.21E-02	1.18E+01	Best Estimate	
OPRSL1	Operator identifies the ruptured steam generator, and isolates or verifies closed all flow paths to and from that steam generator, following an SGTR event.	8.58E-03	3.49E+00	Best Estimate	
OPRSL3	Operators locally gag the stuck- open steam relief valves during the SGTR event.	3.80E-02	1.17E+00	Best - Estimate	
OPRWA1	Operator manually starts and aligns auxiliary river water pumps to the required river water header given no LOSP.	3.03E-02	4.85E+00	Best Estimate	
OPRWM1	Operator supplies borated makeup water to the RWST initially from the spent fuel pool, and, in the long term, from blending operations during an SGTR event.	7.17E-02	1.03E+01	Best Estimate	

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Table 2-4 identifies the BVPS-2 post-EPU operator actions that have either a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. These importance measures are based on the reassessment of the HEP values and requantification of the post-EPU PRA model used to address the issues raised in RAI question 3. All of these post-EPU human actions were reassessed using the MAAP results for the time available to perform the action, and are considered best estimates.

Table 2-4. BVPS-2 Post-EPU Risk Significant Operator Action Importance Measures						
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis		
OPRCD3	Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the intact steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR).	1.22E-03	2.01E+00	Best Estimate		
OPRCD6	Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (small LOCA with HHSI failed). Not impacted by EPU.	2.51E-02	1.30E+00	Best Estimate		
OPRIC1	Operator cross-ties station instrument air to containment instrument air. Not impacted by EPU.	1.04E-02	1.20E+00	Best Estimate		
OPROB1	Operators initiate bleed-and-feed operation by initiating safety injection, opening the PORVs, reopening the PORV block valves, and verifying HHSI pump operation. Not impacted by EPU.	6.94E-02	1.69E+01	Best Estimate		
OPROB2	Operators initiate bleed-and-feed operation by initiating safety injection, opening the PORVs, reopening the PORV block valves, and verifying HHSI pump operation. Actions take place after the operators fail to attempt to restore MFW. Not impacted by EPU.	3.49E-02	1.88E+00	Best Estimate		

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Table 2-4. BVPS-2 Post-EPU Risk Significant Operator Action Importance Measures				
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis
OPROD1	Operator depressurizes RCS to Residual Heat Removal System (RHS) entry conditions after dumping steam via the atmospheric steam dumps to cool down the RCS, and to depressurize the RCS by using pressurizer spray/PORVs following a steam generator tube rupture (SGTR) event.	1.05E-03	2.00E+00	Best Estimate
OPROF2	Operator opens main feed bypass valves following a partial feedwater isolation event after a plant trip.	1.91E-03	5.29E+00	Best Estimate
OPROS6	Operator starts AFW given failure of SSPS for sequences in which there is no safety injection; for example, turbine trip sequences. Not impacted by EPU.	4.23E-03	5.23E+00	Best Estimate
OPROT1	Operator pushes the manual reactor trip buttons after the Solid State Protection System (SSPS) fails to automatically actuate reactor trip in response to a plant trip condition. Not impacted by EPU.	2.53E-03	2.87E+00	Best Estimate
OPRSL1	Operator identifies the ruptured steam generator, and isolates or verifies closed all flow paths to and from that steam generator, following an SGTR event.	3.73E-03	2.01E+00	Best Estimate
OPRSL3	Operators locally gag the stuck- open steam relief valves during an SGTR event.	1.48E-02	1.00E+00	Best Estimate
OPRWM1	Operator supplies borated makeup water to the RWST initially from the spent fuel pool, and in the long term, with makeup from service water during an SGTR event. Not impacted by EPU.	1.91E-02	4.19E+00	Best Estimate

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Table 2-5 identifies the remaining BVPS-1 post-EPU operator actions that were modified using realistic HEPs to represent the post-EPU plant, but did not have a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. These importance measures are based on the reassessment of the HEP values and requantification of the post-EPU PRA model used to address the issues raised in RAI question 3. All of these post-EPU human actions were reassessed using the MAAP results for the time available to perform the action, and are considered best estimates.

Table 2-5.	Table 2-5. BVPS-1 Post-EPU Non-Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis		
OPRCD4	Operator depressurizes the RCS to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR given AC orange power has failed, and operators have to locally manipulate the steam generator atmospheric steam dumps to cooldown.)	1.36E-04	1.00E+00	Best Estimate		
OPRHH1	Operator manually aligns power supply for the standby HHSI pump, starts and aligns the pump to provide the necessary flow after a small LOCA event.	1.52E-03	1.48E+00	Best Estimate		
OPRHH2	Operators fail to properly monitor plant parameters and prematurely secure the safety injection system.	N/A	1.00E+00	Best Estimate		
OPROF1	Operators align main feedwater or the dedicated auxiliary feed pump given the auxiliary feedwater was successful, but makeup to the PPDWST failed.	8.75E-05	1.66E+00	Best Estimate		
OPROR1	Operators manually initiate recirculation mode of operation by starting the RSS pumps, aligning power supplies to appropriate RSS equipment, resetting safety injection system and verifying RW flow to RSS headers, following a small LOCA event.	1.92E-06	1.00E+00	Best Estimate		
OPROR2	Operators align outside recirculation spray trains A or B to the LHSI flow path for high pressure recirculation, given that both LHSI supply trains fail.	5.49E-05	1.02E+00	Best Estimate		

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Table 2-5.	BVPS-1 Post-EPU Non-Risk Signific	cant Operator Ac	tion Importance	e Measures
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis
OPROS2	Operator manually actuates safety injection and verifies operation of certain safety equipment on small LOCA or steam line break. On failure of manual safety injection actuation, the operator manually aligns the safety equipment.	2.65E-03	1.34E+00	Best Estimate
OPROS3	Operator manually actuates safety injection and verifies operation of certain safety equipment on medium LOCA. On failure of manual safety injection actuation, the operator manually aligns the safety equipment.	2.17E-04	1.01E+00	Best Estimate
OPRSL2	Operators locally close the steam generator steam valves given that these valves cannot be closed remotely during an SGTR accident.	1.55E-04	1.03E+00	Best Estimate

Table 2-6 identifies the remaining BVPS-2 post-EPU operator actions that were modified using realistic HEPs to represent the post-EPU plant, but did not have a Fussell-Vesely importance greater than 0.005, or a risk achievement worth of greater than 2.0. These importance measures are based on the reassessment of the HEP values and requantification of the post-EPU PRA model used to address the issues raised in RAI question 3. All of these post-EPU human actions were reassessed using the MAAP results for the time available to perform the action, and are considered best estimates.

Table 2-6. BVPS-2 Post-EPU Non-Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis	
OPRCD1	Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (small LOCA).	2.77E-05	1.03E+00	Best Estimate	
OPRCD2	This is the same as CD1 except that AC Orange power has failed and operators have to locally manipulate the steam generator atmospheric steam dumps to cool down.	0.00E+00	1.00E+00	Best Estimate	

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Table 2-6. BVPS-2 Post-EPU Non-Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis	
OPRCD4	Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR, AC Orange power has failed, and operators have to locally manipulate the steam generator atmospheric steam dumps to cool down).	5.27E-06	1.00E+00	Best Estimate	
OPRHH1	Operator manually aligns power supply for the standby HHSI pump, and starts and aligns the pump to provide the necessary flow after a small LOCA event.	1.76E-04	1.07E+00	Best Estimate	
OPRHH2	Operators fail to properly monitor plant parameters and prematurely secure the safety injection system.	1.12E-04	1.25E+00	Best Estimate	
OPRMU1	Operators provide borated makeup water to the RWST initially from the spent fuel pool, and in the long term, with makeup from service water following a transient-initiated small LOCA or SGTR.	0.00E+00	1.00E+00	Best Estimate	
OPRMU2	This is the same as MU1 except that the actions follow a small LOCA event.	1.14E-03	1.21E+00	Best Estimate	
OPRMU3	This is the same as MU1 except that the actions follow a medium LOCA event.	1.37E-05	1.00E+00	Best Estimate	
OPROR1	Operators manually initiate recirculation mode of operation by starting the Recirculation Spray System (RSS) pumps, aligning power supplies to appropriate RSS equipment, resetting safety injection system, and verifying service water flow to RSS headers, following a small LOCA event.	1.39E-04	1.13E+00	Best Estimate	

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Table 2-6. BVPS-2 Post-EPU Non-Risk Significant Operator Action Importance Measures					
Basic Event	Description	Fussell- Vesely Importance	Risk Achievement Worth	Time Available Basis	
OPROS1	Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of both trains of SSPS due to actuation relay failure. On failure of manual safety injection actuation, the operator manually aligns the safety equipment. Though there is no LOCA present, a valid safety injection condition has occurred; for example, steamline break.	3.40E-03	1.25E+00	Best Estimate	
OPROS2	Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of both trains of SSPS due to actuation relay failure. On failure of manual safety injection actuation, the operator manually aligns the safety equipment. Following a small LOCA	9.46E-04	1.07E+00	Best Estimate	
OPROS3	Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of both trains of SSPS due to actuation relay failure. On failure of manual safety injection actuation, the operator manually aligns the safety equipment. Following a medium LOCA	4.17E-05	1.00E+00	Best Estimate	
OPRPR1	Operator secures safety injection before PORVs are challenged.	1.71E-03	1.00E+00	Best Estimate	
OPRSL2	Operators locally close the steam generator steam valves given that these valves cannot be closed remotely during an SGTR accident.	1.97E-04	1.06E+00	Best Estimate	

All of the operator actions identified in the Tables 2-1 through 2-6 meet the criteria of either having a Fussell-Vesely importance measure greater than 0.005 or a risk achievement worth greater than 2, or were modified to represent the post-EPU plant using best estimate times to develop realistic HEPs (see response to RAI question 3). The human reliability analysis for all of these operator actions used the success likelihood index methodology (SLIM). As such, the SLIM process evaluates groups of human actions. Therefore, all human actions contained in the SLIM grouping are included in with the details of the operator actions identified in Tables 2-1 through 2-6.

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The details of the HRA for the operator actions are provided in the attached SLIM worksheets (included as Attachments 1 – 4 to Enclosure 1), which provide the rankings, weightings, and HEP mean values for each human interaction within the group. For BVPS-1, all pre-EPU human action SLIM worksheets are provided in Attachment 1, while Attachment 2 provides the BVPS-1 post-EPU human action SLIM worksheets which were reassessed in response to RAI question 3. Attachments 3 and 4 provide the SLIM worksheets for the pre-EPU and post-EPU reassessed human actions for BVPS-2, respectively.

Question

b. Table 10.16-5 provides post-EPU importance measures for selected operator actions. (1) Which unit PRA model was used to generate these importance measures? (2) Are the operator actions in this table, which are of the form "OPR*," the same as the corresponding actions in Table 10.16-2, which are designated "ZHE*" (where "*" represents an alphanumeric string).

Response:

The first two sheets of Table 10.16-5 (L-05-104 Enclosure 1, pages 21 and 22 of 32) were generated using the BVPS-1 EPU PRA model. The second two sheets of Table 10.16-5 (L-05-104 Enclosure 1, pages 23 and 24 of 32) were generated using the BVPS-2 EPU PRA model.

The operator actions listed in Table 10.16-5 ("OPR*" designators) are the basic event identifiers used in the top event fault tree models. The operator actions listed in Table 10.16-2 ("ZHE*" designators) are the RISKMAN database HEP distribution identifiers used to quantify the basic events. Typically, these correspond directly to each other (OPRAF1 and ZHEAF1 are the same action). However, there are some cases where they do not correspond directly to each other. The following list includes the exceptions to the rule.

BVPS-1:

OPRCC3 is quantified using ZHECC1

OPRDF1 is quantified using ZHEOF1

OPRHH3 is quantified using ZHEHH1

OPRHH4 is quantified using 1.0

OPRNA1 is quantified using 1.00E-02

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BVPS-2:

OPRCC3 is quantified using ZHECC1

OPRHH3 is quantified using ZHEHH1

OPRPR2 is quantified using ZHEPI1

OPRMU4 is quantified using 1.0

OPROS4 is quantified using 1.0

OPRPR1 is quantified using 1.0

OPRRI2 is quantified using 1.0

OPRSL3 is quantified using 1.0

OPRXT3 is quantified using 1.0

Question

c. Table 10.16-1 gives pre- and post-EPU times to core damage for station blackout scenarios. Why does this time increase on BVPS-1 and decrease on BVPS-2 for the "182 gpm, successful cooldown/depressurization, primary plant demineralized water storage tank make-up available" case?

Response:

The increase in time to core damage for the BVPS-1, 182 gpm reactor coolant pump (RCP) seal LOCA with successful cooldown/depressurization and primary plant demineralized water storage tank (PPDWST) make-up available case is primarily due to changes in the primary system water mass used in the MAAP parameter file for the pre- to post-EPU/ replacement steam generators (RSG) conditions.

This key difference in the BVPS-1 MAAP inputs is that the initial primary system water mass (excluding the pressurizer) for the EPU model is 388,127 lbs. vs. 382,073 lbs. for the pre-EPU model MAAP analysis. Thus, the EPU model has about 1.5% more water mass in the primary system. This initial mass difference is due to a slightly larger primary side volume for the RSG's as compared to the original steam generators (OSG). The total primary side volume of one steam generator is 1136 ft³ for the RSG and 1087 ft³ for the OSG.

The impact of this change is subtle and does not appear to have a significant impact on thermal-hydraulic (T/H) behavior. Both the pre- and post- EPU cases behave similarly for the first 10 hours except for a time shift due to differences in time of seal binding failure (30 minutes for the pre-EPU case and 13 minutes for the post-EPU case). Around 10 hours, the two cases have different pressurizer behavior and the T/H results begin to diverge. Thus, there appears to be some beneficial impact from the RSGs due to an increased primary side initial inventory.

Moreover, the effects of the increased inventory are more pronounced for the 182 gpm with successful cooldown/depressurization and PPDWST make-up available case, where the RCS inventory loss out the RCP seal LOCA is the governing circumstance to core uncovery, as opposed to the 21 gpm break sizes and PPDWST depletion cases where decay heat removal capability governs the time to core uncovery.

As expected, since the BVPS-2 RCS volume remained essentially the same for the pre- to post-EPU MAAP analysis, all BVPS-2 EPU cases provided in Table 10.16-1 resulted in a decrease in the time to core damage, due to the increase in decay heat associated with the power uprate.

Question

d. Under the discussion of "general transients," it states: "Thus, with the RSG [replacement steam generators] there is less margin for successful completion of the plant-specific feed and bleed procedure ... initiated at 0.495 hours" Does the time available for this action change under EPU conditions? What is the human error probability (HEP) for this action, both pre- and post-EPU? Why was this action not included in Table 10.16-2 or 10.16-5?

Response:

The general transient success criteria discussion presented in LAR 302 & 173 (L-05-104) was based on a loss of all feedwater (both main and auxiliary), with credit for operators to initiate feed and bleed at 13% wide range SG level per the plant procedures. This stemmed from a Westinghouse Owner's Group issue regarding the required component success criteria for feed and bleed implementation (number of power operated relief valves (PORVs) and high head safety injection (HHSI) pumps). To address this concern for EPU conditions, a MAAP analysis was performed assuming that one HHSI pump injects and one PORV was opened once the replacement steam generator reached the 13% wide range level, which occurred at 0.495 hours. The results of this analysis showed that even at EPU conditions the feed and bleed component success criteria did not change from the current plant model (one HHSI pump and one PORV).

The timing used for the operator action to initiate feed and bleed developed for the human reliability analysis (HRA) was based on the maximum time that operators have available in order to successfully implement feed and bleed. In the thermal-hydraulic hand calculations developed for the Individual Plant Examination (IPE) human action accident scenarios, the time for feed and bleed implementation was based on the time for the PORVs to lift prior to steam generator dryout. This was estimated to occur 5 minutes prior to dryout, or at about 58 minutes following a reactor trip.

Since this time was shorter than the corresponding time of 63 minutes in a similar EPU MAAP analysis (a station blackout scenario with a 21 gpm RCP seal LOCA and loss of all feedwater), the IPE time value was bounding. Therefore, the HEPs used in the current PRA models (BVPS-1: 1.22E-03 for OPROB1, and 1.39E-02 for OPROB2; BVPS-2: 4.34E-03 for OB1, and 3.79E-02 for OB2) were bounding so the values were not changed for the EPU. As such, Tables 10.16-2 and 10.16-5, which listed operators actions that have changed for the EPU analyses, did not include these actions.

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Question

e. Note 2 of Table 10.16-2 explains that the reduction in time available for a number of the operator actions is due to adopting a new reactor coolant pump seal loss-of-coolant accident model. Is this considered an EPU change?

Response:

The RCP seal LOCA expected time of occurrence, due to seal popping or binding failures, was assumed to occur at 13 minutes in the post-EPU PRA models. This assumption was not a result of the EPU, but was made in order to have the PRA models reflect the most recent RCP seal LOCA issues that were approved by the NRC in their acceptance of WCAP-15603-A, Revision 1.

Question

f. Note 3 of Table 10.16-2 refers to changes in HRA because the pre-EPU model did not credit resetting containment isolation phase B. Is this considered an EPU change?

Response:

As noted in Note 3 of Table 10.16-2, the current (pre-EPU) HEP analyses takes credit for the operators resetting the containment isolation phase "B" (CIB) signal and stopping the quench spray pumps, whereas the post-EPU HEP analyses does not.

The assumption of not resetting the CIB signal is not considered part of the EPU change but was done in order to maximize the impact of the EPU on the HEP by minimizing the time to transfer to safety injection recirculation mode. This timing was of interest for operator actions ZHECD1 and ZHECD2, where the operators are trying to depressurize the RCS below 400 psig. If core damage occurs due to additional equipment failures during the recirculation phase, the RCS would be at low pressure at the time of vessel melt-through. It is also of interest for operator actions ZHEMU1 and ZHEMU2, where the time to deplete the refueling water storage tank (RWST) is of relevance.

The operators actions to reset the CIB signal and stop quench spray flow are in the current plant procedures and will continue to be in the respective post-EPU emergency operating procedures.

Question

g. Note 4 of Table 10.16-2 says that ZHEIA1 is considered a "guaranteed success since the diesel air compressor will auto-start." Is this change due to a change to the plant equipment? Is it related to the EPU?

Response:

The change in the diesel air compressor starting signal from manual to automatic was due to a physical plant modification that was implemented by ECP-02-0541. This modification installed a backup train of instrument air, comprised of a 1500 scfm diesel powered, oil free, rotary screw air compressor, which auto-starts upon a low system air pressure signal.

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This backup train of instrument air was not related to the EPU modifications, but rather was performed to increase the reliability of the station air supply.

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Question

 h. Table 10.16-5 shows the Fussell-Vesely importance of operator action OPRIA1, "Given LOSP [loss of offsite power], operators locally start the diesel air compressor," as 6.13E-04. Is this the same operator action as ZHEIA1 in Table 10.16-2? (It has the same description.) If "yes", how was the Fussell-Vesely determined, given that the HEP for ZHEIA1 is given as 0.0?

Response:

Operator action ZHEIA1 is the same operator action as OPRIA1. ZHEIA1 is the RISKMAN database variable for the HEP and OPRIA1 is the PRA basic event for the operator action. ZHEIA1 is the operator action to manually start the diesel air compressor, and was evaluated using the time of the first RCP seal damage, given a loss of all seal cooling. As discussed in the response to RAI question 2.e, and shown in Table 10.16-2, this timing was changed from 60 minutes to 13 minutes for the post-EPU HRA. As such, it resulted in an increase in the HEP from 5.87E-03 to 1.18E-02.

However, as noted in the response to RAI question 2.g, there was a currently installed non-EPU change to auto-start the diesel air compressor. To represent this change in the post-EPU PRA model, the database variable ZHEIA1 was to be set to "guaranteed success" to accurately reflect the current plant conditions that would also be present following the EPU. This was considered necessary, since the post-EPU condition would have resulted in an increase in the HEP for the operator action to manually start the diesel air compressor, had it not already been changed to an auto-start feature.

It was later discovered (post-submittal) that the change to make ZHEIA1 a "guaranteed success" was not incorporated into the post-EPU PRA model, and that the post-EPU adjusted value without the auto-start feature was used (1.18E-02). As such, a Fussell-Vesely importance value was calculated in the RISKMAN quantification and reported in Section 10.16 of Reference 2. However, as noted in the response to RAI question 2.g this change to the diesel air compressor starting circuit is not EPU related, so the HEP was set back to its pre-EPU normal value of 5.87E-03 used in the re-quantification to respond to RAI question 3.b.

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It was also noted during this subsequent review that some of the other numbers listed in Table 10.6-2 of L-05-104 Enclosure 1 were not correctly identified. These include the following:

- For BVPS-1, the true value of operator action ZHEIC2 that was used to quantify the pre-EPU (current) PRA model is 2.99E-03, not 2.73E-03.
- For BVPS-2, the correct time available to complete the operator action used in the evaluation of ZHECD1 was 5.95 hours, not 12.3 hours.
- For BVPS-2, the correct time available to complete the operator action used in the evaluation of ZHECD2 was 5.9 hours, not 12.3 hours.

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Question

i. Section 10.15 of Reference 1 states: "A review of operating procedures/ emergency operating procedures/training potentially impacted by EPU will be completed" How was the full impact of the EPU on the human reliability analysis determined if operating procedure changes have not yet been identified?

Response:

The full impact of the EPU on the human reliability analysis will be addressed during the PRA model update process following the EPU implementation. However, in order to address the impact of the EPU on the operator actions analyzed in the LAR, it was assumed that only the timings and stress levels could be significantly impacted by the EPU, and that the indications, proceduralized steps and operator actions would essentially remain unaffected. The basis for this assumption is provided below.

Application of the success likelihood index methodology (SLIM) to quantify the event-level dynamic operator actions in the plant response model of a PRA has been adopted at BVPS. It is based on the assumption that the HEP in a particular situation depends on the combined effects of a relatively small set of performance-shaping factors (PSF) that influence the operators' ability to perform the action successfully. The PSFs were selected to describe the range of problems that the operators face. They were chosen to relate the impact of the following:

- The scenario in which the action must be accomplished. These include plant/operator interface and indications from instrumentation; adequacy of time to accomplish the action; preceding and concurrent actions; and the complexity of the task.
- The psychological and cognitive condition of the operators during the scenario. This includes stress; training and experience relative to the action; and procedures or other operational aids available to the operators, and their performance up to the current point in the scenario.

Based on these PSFs, it was assumed that the scenario based plant/operator interface and indications, preceding and concurrent actions, and task complexity would not be significantly impacted enough by the EPU to warrant a change in their ranking. Additionally, for the psychological and cognitive condition of the operators during the scenario, it was assumed that only the stress rankings of the operator actions that had significantly less time to complete due to the EPU conditions would be impacted. L-05-140 Enclosure 1 Page 22 of 34

Question

j. Are there any additional operator actions that are considered in the model for estimating large early release frequency (LERF)? Please provide a listing of any operator actions unique to LERF and an assessment of the impact of the EPU on the corresponding HEPs.

Response:

All of the operator actions developed for the BVPS PRA models are contained in the plant model (Level 1) event trees used to calculate the core damage frequency, including actions for containment isolation and other actions important for estimating release frequencies. This approach, used in the BVPS PRA models, was selected for the following reasons:

- All active systems, including the containment engineered safeguards, are included in the plant model event tree because their dependencies on support systems, such as electrical power and service water, can be determined more easily in the plant model event trees. This avoids the dependency tracking problems associated with placing certain active containment systems into the Level 2 containment event trees (CETs).
- The prescribed boundary separates the phenomenological CET from the plant model event trees that deal only with active systems and operator actions with a well-defined interface.
- The prescribed boundary facilitates a clean separation between analyses of likelihood (as measured by frequency) and uncertainty (as measured by probability).

This clean separation between plant model and CETs allows an optimization of both the plant analysis and the containment analysis, while at the same time providing needed flexibility in the modeling process. However, in doing so, all of the plant model information on the operability status of active systems important to the timing and magnitude of the release of radioactive materials must be passed into the CET when linked to the Level 1 event trees. This required that, in addition to representing the systems and functions that are important to keeping the core cooled, the plant model event trees had to also address active systems and functions important to containment isolation, containment heat removal, and removal of radioactivity from the containment atmosphere.

As such, there are no additional operator actions considered in the PRA models for estimating large early release frequency (LERF), and the Level 2 analyses are strictly based on containment phenomenology or events that have occurred during the core damage process. However, the operator actions that are modeled would have different importance measures based on their contribution to either CDF or LERF. L-05-140 Enclosure 1 Page 23 of 34

Question

3. Please provide an assessment of the increase in risk if only the EPU is considered. For example, the impact of containment conversion, BVPS-1 replacement steam generators, BVPS-1 AFW cavitating venturis and MFW fast-acting isolation valves should not be included unless they are required for the EPU. Note that this can be done either by having non-EPU changes in both the base model and the post-EPU model or in neither.

The NRC staff would prefer that this assessment use realistic HEPs for both the pre-EPU and post-EPU analysis (where these would change) to avoid masking of the actual change in risk; refer to question 2, above. However, if bounding HEP numbers are employed, justify that the final risk metric is bounding with respect to those HEPs.

The following risk metrics should be provided for both BVPS-1 and 2:

- a. Internal events core damage frequency (CDF) and LERF.
- b. CDF and LERF from internal fires.

Response:

As noted in Section 1.1.2 of Enclosure 2 of LAR 302 & 173, L-04-125, the principal modifications planned to support implementation of the EPU LAR analyses include:

- Containment conversion from a sub-atmospheric to an atmospheric design basis including related modifications such as the addition of (fast-acting) feedwater isolation valves and auxiliary feedwater flow limiting (cavitating) venturis for BVPS-1
- Replacement charging/safety injection pump rotating assemblies
- Replacement steam generators for BVPS-1

Since the above modifications are required to support the EPU, they were considered necessary and either explicitly or implicitly included in the EPU risk analysis (as addressed in the response to RAI question 1.b) in order to accurately determine the risk impact associated with the EPU.

Consequently, the only changes that were made to the post-EPU PRA models that were not associated with the EPU, were changes to the HEPs resulting from:

- The change in timing of the RCP seal binding failure (see response to RAI question 2.e.)
- Using conservative times to SI recirculation phase or RWST depletion by not crediting the resetting the CIB signal and stopping quench spray flow (see response to RAI question 2.f.)
- Crediting the auto-start of the diesel air compressor by setting the HEP to zero (see response to RAI question 2.g.)

Since the first two bulleted items above are not associated with the EPU, the impacted HEPs were reanalyzed excluding these changes, and instead used the pre-EPU PRA model assumptions. That is, the start of the increased RCP seal LOCA was assumed to occur at 60 minutes (based on NUREG-1150) instead of the 13 minutes suggested in WCAP-15603-A, Revision 1, and credit was given for resetting the CIB signal and stopping quench spray flow.

As noted in the response to RAI question 2.h, the third bulleted item was not included in the post-EPU PRA model, so the operator action to manually start the diesel air compressor was evaluated in the LAR 302 and 173 submittal using the post-EPU HEP, which reflected the change in timing of the RCP seal binding failure. In response to this RAI, the HEP for this operator action was set back to the pre-EPU value, since it removed the effects of non-EPU changes, as addressed below.

All of the operator actions impacted by excluding these non-EPU changes and using realistic HEPs developed from the MAAP result best estimate timings, when considering only the EPU related modifications, are presented in Table 3-1. This table complements Table 10.16-2 of Reference 2 to complete the full post-EPU HRA. This re-evaluation resulted in several changes, as outlined below:

- In response to RAI question 2.e, since the new RCP seal LOCA model is not related to the EPU, all operator action times available were changed back to the pre-EPU model times available.
- In response to RAI question 2.f, the HRA for the post-EPU model will use the operator action times available while taking credit for resetting the CIB signal and securing the quench spray system, as was done in the pre-EPU model.
- In response to RAI question 2.g, the operator action OPRIA1 is no longer set to "guaranteed success," since the change to the diesel air compressor is not related to the EPU.
- The HRA no longer uses the "bounding" operator action time available. Realistic timings are used, which resulted in decreasing many of the human error rates.

Table 3-1:	Operator Ac	tion Human	Error Probal	oilities		
Human Action Description	Time Available pre-EPU	PSF - pre-EPU	HEP - pre-EPU	Time Available post-EPU	PSF - post- EPU	HEP - post- EPU
BVPS-1						
OPROS2 – Operator manually actuates safety injection and verifies operation of certain safety equipment on small LOCA or steam line break. On failure of manual safety injection actuation, the operator manually aligns the safety equipment.	0.67 hours	Time - 5	9.19E-03	0.94 hours	Time - 3	7.68E-03
OPROS3 – Operator manually actuates safety injection and verifies operation of certain safety equipment on medium LOCA. On failure of manual safety injection actuation, the operator manually aligns the safety equipment.	0.15 hours	Time - 6	2.77E-02	0.35 hours	Time - 4	1.90E-02

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			Error Probat			
Human Action Description	Time Available pre-EPU	PSF - pre-EPU	HEP - pre-EPU	Time Available post-EPU	PSF - post- EPU	HEP - post- EPU
OPRHH1 – Operator manually aligns power supply for the standby HHSI pump, starts and aligns the pump to provide the necessary flow after a small LOCA event.	0.67 hours	Time - 4	3.87E-03	0.94 hours	Time - 2	3.13E-03
OPRHH2 – Operators fail to properly monitor plant parameters and prematurely secure the safety injection system.	2.21 hours	Time - 3	7.15E-04	13.91 hours	Time - 1	5.77E-04
OPROF1 – Operators align main feedwater or the dedicated auxiliary feed pump given the auxiliary feedwater was successful, but makeup to the PPDWST failed.	6 hours	Time - 1	1.58E-04	10.34 hours	Time - 0	1.32E-04
OPROR1 - Operators manually initiate recirculation mode of operation by starting the RSS pumps, aligning power supplies to appropriate RSS equipment, resetting safety injection system and verifying RW flow to RSS headers, following a small LOCA event.	1.5 hours	Time - 2	2.01E-03	2.82 hours	Time - 1	1.88E-03
OPROR2 - Operators align outside recirculation spray trains A or B to the LHSI flow path for high pressure recirculation, given that both LHSI supply trains fail.	1.5 hours	Time - 2	2.85E-03	2.82 hours	Time - 1	2.60E-03
OPROD1 – Operator depressurizes RCS to RHS entry conditions using pressurizer spray/PORVs.	10 hours	Time - 1	1.58E-03	>24 hours	Time - 0	1.42E-03
OPRSL2 - Operators locally close the steam generator steam valves given that these valves cannot be closed remotely during an SGTR accident.	9.5 hours	Time - 2	5.52E-03	17.99 hours	Time - 1	4.96E-03
OPRCD3 - Operator depressurizes the RCS to 400 psig by dumping steam through the intact steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR)	11 hours	Time - 5	5.12E-03	> 24 hours	Time - 2	4.19E-03
OPRCD4 - Operator depressurizes the RCS to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR given AC orange power has failed, and operators have to locally manipulate the steam generator atmospheric steam dumps to cooldown.)	11 hours	Time - 5	8.29E-02	> 24 hours	Time - 1	5.10E-02

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Human Action Description	Time	PSF -	Error Probat	Time	PSF -	HEP - post-
	Available pre-EPU	pre-EPU	pre-EPU	Available post-EPU	post- EPU	EPU
OPRCD6 - Operator depressurizes the RCS to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR with HHSI has failed).	0.83 hours	Time - 3	4.99E-02	1.02 hours	Time - 2	4.40E-02
OPRCD7 - Operator depressurizes the RCS to 400 psig by locally manipulating the steam generator atmospheric steam dumps to relief steam, given HHSI failure and loss of emergency AC orange.	0.83 hours	Time - 5	1.35E-01	1.02 hours	Time - 4	1.20E-01
OPRWM1 - Operator supplies borated makeup water to the RWST initially from the spent fuel pool, and, in the long term, from blending operations during an SGTR event.	21 hours	Time - 1	8.40E-03	30.46 hours	Time - 0	7.68E-03
OPRWA1 - Operator manually starts and aligns auxiliary river water pumps to the required river water header given no LOSP.	1 hour	Time - 5	7.80E-03	1 hour (was 13 minutes due to RCP seal leakage)	Time - 5	7.80E-03
OPRIA1 - Given LOSP, operators locally start the diesel air compressor	1 hour	Time - 1	5.84E-03	1 hour	Time - 1	5.84E-03
OPRIC2 - Operators cross-tie station instrument air to containment instrument air by locally opening manual valve IA-90.	1 hour	Time - 5	2.99E-03	1 hour (was 13 minutes due to RCP seal leakage)	Time - 5	2.99E-03
OPRCD1 - Operator depressurizes the RCS to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (small LOCA).	5.95 hours	Time - 2	1.71E-03	6.63 hours (was 1.23 hours due to CIB setpoint)	Time - 2	1.71E-03 (time difference did not justify a change in PSF)
OPRCD2 - Same as OPRCD1 except that AC orange power has failed and operators have to locally manipulate the steam generator atmospheric steam dumps to cooldown.	5.9 hours	Time - 2	2.58E-03	11.6 hours (was 2.02 hours due to CIB setpoint)	Time - 2	2.58E-03 (time difference did not justify a change in PSF)
OPRMU1 - Operators provide borated makeup water to the RWST initially from the spent fuel pool, and, in the long term, from blending operations following a steam generator tube rupture event.	4.03 hours	Time - 1	8.40E-03	4.03 hours (was 0.46 hours due to CIB setpoint)	Time - 1	8.40E-03

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	Operator Ac					
Human Action Description	Time Available pre-EPU	PSF - pre-EPU	HEP - pre-EPU	Time Available post-EPU	PSF - post- EPU	HEP - post- EPU
OPRMU2 - Same as OPRMU1 except that the actions follow a small LOCA event.	1.9 hours	Time - 3	1.01E-02	1.9 hours (was 0.46 hours due to CIB setpoint)	Time - 3	1.01E-02
BVPS-2						
OPROS2 – Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of both trains of SSPS due to actuation relay failure. On failure of manual safety injection actuation, the operator manually aligns the safety equipment. Following a small LOCA	0.67 hours	Time - 4	1.71E-02	0.94 hours	Time - 2	1.33E-02
OPROS3 – Operator manually actuates safety injection and verifies operation of certain safety equipment on loss of both trains of SSPS due to actuation relay failure. On failure of manual safety injection actuation, the operator manually aligns the safety equipment. Following a medium LOCA	0.15 hours	Time - 5	2.20E-02	0.28 hours	Time - 3	1.71E-02
OPRHH1 – Operator manually aligns power supply for the standby HHSI pump, and starts and aligns the pump to provide the necessary flow after a small LOCA event.	0.67 hours	Time - 4	3.29E-03	0.94 hours	Time - 2	2.49E-03
OPRHH2 – Operators fail to properly monitor plant parameters and prematurely secure the safety injection system.	5.56 hours	Time - 3	5.87E-04	19.62 hours	Time - 1	4.44E-04
OPROR1 – Operators manually initiate recirculation mode of operation by starting the Recirculation Spray System (RSS) pumps, aligning power supplies to appropriate RSS equipment, resetting safety injection system, and verifying service water flow to RSS headers, following a small LOCA event.	0.95 hours	Time - 2	1.38E-03	9.5 hours	Time - 0	1.05E-03
OPROD1 – Operator depressurizes RCS to Residual Heat Removal System (RHS) entry conditions after dumping steam via the atmospheric steam dumps to cool down the RCS, and to depressurize the RCS by using pressurizer spray/PORVs following a steam generator tube rupture (SGTR) event.	14 hours	Time - 1	1.20E-03	> 24 hours	Time - 0	1.04E-03
OPRSL1 – Operator identifies the ruptured steam generator, and isolates or verifies closed all flow paths to and from that steam generator, following an SGTR event.	0.93 hours	Time - 7	5.25E-03	1.6 hours	Time - 5	3.63E-03

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Human Action Description	Time	PSF -	Error Probat	Time	PSF -	HEP - post-
	Available pre-EPU	pre-EPU	pre-EPU	Available post-EPU	post-EPU	EPU
OPRSL2– Operators locally close the steam generator steam valves given that these valves cannot be closed remotely during an SGTR accident.	11.2 hours	Time - 2	4.33E-03	> 24 hours	Time - 0	3.28E-03
OPRSL3 - Operators locally gag the stuck- open steam relief valves during an SGTR event.	11.2 hours	Time - 1	1.35E-01 (Assigned 1.0)	> 24 hours	Time - 0	1.18E-01 (Assigned 1.0)
OPRSL4– Operator isolates ruptured steam generator given HHSI failed. (Not used in PRA models)	0.83 hours	Time - 7	3.41E-02	1.22 hours	Time - 5	2.66E-02
OPRSL5 - Operator isolates ruptured steam generator given one train of emergency AC power and HHSI failed.	0.83 hours	Time - 8	1.09E-02	1.22 hours	Time - 6	7.53E-03
(Not used in PRA models) OPRCD3– Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the intact steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR).	14 hours	Time - 1	1.46E-03	> 24 hours	Time - 0	1.21E-03
OPRCD4 - Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (SGTR, AC Orange power has failed, and operators have to locally manipulate the steam generator atmospheric steam dumps to cool down).	14 hours	Time - 4	1.04E-02	> 24 hours	Time - 0	4.99E-03
OPRMU1 - Operators provide borated makeup water to the RWST initially from the spent fuel pool, and in the long term, with makeup from service water following a transient-initiated small LOCA or SGTR.	1.14 hours	Time - 3	5.97E-03	2.58 hours	Time - 2	5.45E-03
OPRMU2 - This is the same as OPRMU1 except that the actions follow a small LOCA event.	1.01 hours	Time - 3	5.97E-03	2.58 hours	Time - 2	5.45E-03
OPRMU3 - This is the same as OPRMU1 except that the actions follow a medium LOCA event.	1.3 hours	Time - 7	8.60E-03	2.67 hours	Time - 5	7.17E-03
OPRMU4 - This is the same as OPRMU1 except that the actions follow a large LOCA event.	0.54 hours	Time - 9	1.03E-02 (Assigned 1.0)	1.11 hours	Time - 7	8.60E-03 (Assigned 1.0)

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	Time	PSF -	Error Probab	Time	PSF -	
Human Action Description	Available	pre-EPU	pre-EPU	Available post-EPU	post- EPU	HEP - post- EPU
OPRPR1 – Operator secures safety injection before PORVs are challenged.	15 minutes	Time - 9	3.44E-02 (Assigned 1.0)	33 minutes	Time - 8	2.65E-02 (Assigned 1.0)
OPRCD1 - Operator depressurizes the Reactor Coolant System (RCS) to 400 psig by dumping steam through the steam generator atmospheric steam dumps to depressurize and cool down the secondary side (small LOCA).	5.95 hours	Time - 3	9.10E-04	6.63 hours (was 1.04 hours due to CIB setpoint)	Time - 1	6.88E-04
OPRCD2 - This is the same as OPRCD1 except that AC Orange power has failed and operators have to locally manipulate the steam generator atmospheric steam dumps to cool down.	5.9 hours	Time - 3	4.93E-03	11.6 hours (was 3.62 due to CIB setpoint)	Time - 1	3.73E-03
OPRWA1 - Operator manually stops the EDG and racks the spare service water (SWS) pump onto the bus prior to restarting the EDG during a loss of offsite power.	1 hour	Time - 6	7.93E-02	1 hour (was 13 minutes due to RCP seal leakage)	Time - 6	7.93E-02
OPRCC1 - Operator starts the manual standby component cooling pump (CCP) on loss of the operating and the automatic standby CCPs, to restore component cooling water (CCW) flow to the RCP thermal barriers.	1 hour	Time - 2	3.31E-03	1 hour (was 13 minutes due to RCP seal leakage)	Time - 2	3.31E-03
OPRTB1 - Operator cross-ties station instrument air to containment instrument air.	1 hour	Time - 1 	7.92E-04	1 hour (was 13 minutes due to RCP seal leakage)	Time - 1	7.92E-04
OPRTB2 - Operator resets containment isolation Phase A (CIA) and restores containment instrument air.	1 hour	Time - 1	1.12E-02	1 hour (was 13 minutes due to RCP seal leakage)	Time - 1	1.12E-02

The BVPS-1 and BVPS-2 post-EPU models were requantified using the above realistic operator action HEPs and removing the non-EPU associated modifications. The results from the requantification of the BVPS-1 and BVPS-2 post-EPU PRA models are presented in Tables 3-2 and 3-3, respectively.

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Table 3-2. BVPS-1 Pre-EPU and Post-EPU Core Damage Frequency					
	Pre-EPU CDF (/year)	Post-EPU CDF (/year)	Delta CDF (/year)		
Internal Events	7.45E-06	6.53E-06	-9.15E-07		
Fire	4.60E-06	4.59E-06	-1.44E-08		
External Events	1.63E-05	1.63E-05	-1.50E-08		
Total	2.37E-05	2.28E-05	-9.31E-07		

Table 3-3. BVPS-2 Pre-EPU and Post-EPU Core Damage Frequency						
	Pre-EPU CDF (/year)	Post-EPU CDF (/year)	Delta CDF (/year)			
Internal Events	2.01E-05	2.01E-05	-6.00E-09			
Fire	5.29E-06	5.29E-06	-1.20E-09			
External Events	1.48E-05	1.48E-05	-2.00E-09			
Total	3.49E-05	3.49E-05	-8.00E-09			

In many instances, the best-estimate HEPs improved (the HEP decreased) as a result of the new analyses using MAAP results versus hand calculations. As a result, the BVPS-1 and BVPS-2 post-EPU PRA models indicate a decrease or no change in CDF, as shown above in Tables 3-2 and 3-3. The HEPs did not impact the BVPS-1 and BVPS-2 LERF values. Therefore, LERF remains as reported in Section 10.16 of Reference 2.

In addition to the change in timing of the RCP seal binding failure affecting some of the above reanalyzed HEPs, the post-EPU station blackout (SBO) MAAP analyses also assumed that the start of the increased RCP seal leakage started at 13 minutes, as opposed to the 30 minutes used in the pre-EPU MAAP analyses (based on WCAP-15603, Revision 0). The time to core damage from these pre- and post-EPU SBO MAAP analyses were used in the electric power recovery models.

For the pre-EPU SBO MAAP analyses, the impact of the change in the onset of the increased seal LOCA from 30 minutes to 13 minutes on the time to core damage was evaluated to assess the NRC concerns in approving WCAP-15603, Revision 1A. The results of this sensitivity assessment did not lead to any significant changes in the time to core damage. Thus, it was concluded that the time to core damage provided in the current, pre-EPU seal LOCA sequences, using the 30-minute timing, was sufficient to access the electric power recovery models.

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The impact of this change on the post-EPU PRA model was also assessed by performing sensitivity analyses. For the post-EPU SBO MAAP sensitivity analyses, the onset of the increased seal LOCA changed from 13 minutes back to 30 minutes. The results of this sensitivity assessment did not lead to any significant changes in the time to core damage. Thus, it was concluded, over the spectrum of seal binding failure sizes, that the core damage timing difference between the pre-EPU and EPU models is due largely to the EPU design changes and not the start of the increased RCP seal leakage.

Moreover, there is an insignificant impact on CDF from the non-electric power recovery split fractions developed using the electric power recovery model whose time to core damage decreased by more than one minute from the change in timing of the RCP seal binding failure. All of these split fractions had Fussell-Vesely importance values less than 2E-04 and risk achievement worths less than 1.01. This shows that the impact of the time change in the RCP seal binding failure from 13 minutes to 30 minutes, or vice versa, on CDF is insignificant. Additionally, since over 99% of the LERF contribution is attributed to interfacing system LOCAs and SGTRs, the impact of this timing change on LERF is also expected to be insignificant.

Question

5. What is the expected impact of EPU on the probability of consequential loss of offsite power (LOOP)? For each unit, provide the contribution to the total CDF from consequential LOOP events in the current model. Provide the same information for operation at EPU conditions, or provide a sensitivity analysis showing how CDF would change assuming the probability of consequential LOOP increases after EPU.

Response:

The probability of a consequential LOOP is 2.66E-04 at both BVPS-1 and BVPS-2, and is not expected to be impacted by the EPU.

Studies were performed to evaluate the impact of BVPS EPU operation on the transmission system grid stability. The results of these studies yield generally comparable results to that obtained from the previous pre-EPU study. In addition, the 345 kV and 138 kV switchyards were also evaluated. This evaluation concluded equipment and components associated with the 345 kV and 138 kV overhead lines between the station and the switchyards are adequate under EPU conditions. The equipment and components in the 345 kV and 138 kV switchyards are also adequate under EPU conditions. As such, the plant response following a unit trip will be essentially the same following the EPU as it currently is modeled.

The contribution to the total CDF from consequential LOOP events for the current PRA models and EPU PRA models for both BVPS-1 and BVPS-2 are provided below:

BVPS-1:

Current PRA model = 2.62E-03 (0.26%)

EPU PRA model = 1.95E-03 (0.20%)

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BVPS-2:

Current PRA model = 1.22E-02 (1.22%)

EPU PRA model = 1.25E-02 (1.25%)

The slight decrease in the consequential LOOP contribution to the total CDF at BVPS-1 is attributed to the reduction in CDF due to the steam generator replacement, since there were several SGTR sequences involving consequential LOOPs. The consequential LOOP contributions to the total CDF at BVPS-2 remains essentially the same for both the current pre-EPU and post-EPU conditions.

Question

6. The PRA results in the EPU risk assessment (Reference 2) were compared with those provided in a response to the NRC staff's questions on a recent license amendment request for extending the emergency diesel generator (EDG) allowed outage time (AOT) (Reference 3). The table below compares the information.

	EDG AOT (Ref. 3)	EPU (Ref. 2)
	Beaver Valley Unit 1	
PRA Model Designator	BV1 REV3	BV1 REV3
Date Updated	9/2003	9/2003
CDF (per year)	2.34E-5	7.45E-6
LERF (per year)	1.03E-6	1.03E-6
· · · · · · · · · · · · · · · · · · ·	Beaver Valley Unit 2	
PRA Model Designator	BV2 REV3B	BV2 REV3D
Date Updated	5/2003	5/2003
CDF (per year)	3.27E-5	2.01E-5
LERF (per year)	1.12E-6	1.12E-6

Question

a. What has changed in the BVPS-1 and BVPS-2 PRA models since the Reference 3 letter?

Response:

The BVPS-1 and BVPS-2 baseline PRA models used in the EDG AOT analyses are the same as the BVPS-1 and BVPS-2 baseline PRA models used in the EPU analyses. There were some changes associated with the EDG AOT PRA models for Case 1, which were noted in LAR 306 and 176, L-04-072 (dated May 26, 2004), Section 4.3.2, Page 15. These consisted of the following:

"Case 1 modeled the current EDG unavailability. This sensitivity case was run by changing the EDG unavailability from 2.5%, which is the current value used in the BVPS-1 and BVPS-2 baseline PRA models, to the present mean unavailability of the EDG under the current AOT or 0.77% (Unit 1) and 0.348% (Unit 2)."

The EPU baseline PRA models used the 2.5% EDG unavailability value. Additionally, the EPU PRA model include all of the modifications identified in Section 10.16.1.6 of L-05-104 Enclosure 1 (page 17 of 32). It should also be noted that BV2REV3B is the current model revision of record at BVPS-2; however, BV2REV3D was used in both the EDG AOT and EPU analyses, which removed common cause failures from the 4KV transformers.

Question

b. Explain why BVPS-1 CDF has dropped significantly and BVPS-2 CDF has dropped somewhat compared to the Reference 3 values.

Response:

The EPU CDF values in the comparison table provided with this RAI question are incorrect.

As stated in Section 10.16.1.6 of L-05-104 Enclosure 1 (page 18 of 32), "...the effect of the BVPS-1 EPU was to decrease the internal events CDF from 7.45E-06 per year to 6.85E-06 per year. This section also states that "...the effect of the BVPS-2 EPU was to increase the internal events CDF from 2.01E-05 per year to 2.02E-05 per year..."

Moreover, the EPU CDF values provided in the comparison table are based on point estimate values and only include the core damage frequency associated with internal initiating events. The EDG AOT CDF values provided in the comparison table represents the total core damage frequency, including both internal and external initiating events.

Using the PRA baseline models and the information provided in Reference 3 for Case 1 (Tables 5 and 9 for BVPS-1 and BVPS-2, respectively), a better breakdown comparison between the Baseline PRA CDF, EDG AOT CDF, and EPU CDF are provided in Tables 6-1 and 6-2:

Table 6-1. BVPS-1						
BASELINE PRA EDG AOT MODELS (Ref. 3) EPU (Ref. 2)						
Internal Events CDF	7.45E-06	7.13E-06	6.85E-06			
Fire CDF	4.60E-06	4.69E-06	4.61E-06			
Seismic CDF	1.17E-05	1.17E-05	1.17E-05			
Total CDF	2.37E-05	2.35E-05	2.31E-05			

Table 6-2. BVPS-2						
BASELINE PRA EDG AOT MODELS (Ref. 3) EPU (Ref. 2)						
Internal Events CDF	2.01E-05	1.86E-05	2.02E-05			
Fire CDF	5.29E-06	4.71E-06	5.30E-06			
Seismic CDF	9.54E-06	9.58E-06	9.54E-06			
Total CDF	3.49E-05	3.29E-05	3.51E-05			

Based on the above tables, the reduction in BVPS-1 total EPU CDF is insignificant when compared to the total AOT CDF, and is mostly attributed to the reduction in the SGTR initiating event frequency.

It should also be mentioned that Reference 3, Case 1 modeled the current EDG unavailability, as opposed to the baseline PRA model unavailability of 2.5%. This sensitivity case was run by changing the EDG unavailability from 2.5%, to the present mean unavailability of the EDG under the current AOT or 0.77% (BVPS-1) and 0.348% (BVPS-2). These changes in EDG unavailability account for the differences in the internal events CDF as stated in Section 10.16.1.6 of L-05-104 Enclosure 1 (7.13E-06 vs. 7.45E-06 for BVPS-1, and 1.86E-05 vs. 2.01E-05 for BVPS-2).

REFERENCES:

- Letter from L. William Pearce, FirstEnergy Nuclear Operating Company, to U.S. Nuclear Regulatory Commission, "Beaver Valley Power Station, Unit No. 1 and No. 2 BV-1 Docket No. 50-334, License No. DPR-66 BV-2 Docket No. 50-412. License No. NPF-73 License Amendment Request Nos. 302 and 173," L-04-125, October 4, 2004. (ADAMS Accession No. ML042920300)
- Letter from L. William Pearce, FirstEnergy Nuclear Operating Company, to U.S. Nuclear Regulatory Commission, "Beaver Valley Power Station, Unit Nos. 1 and 2 BV-1 Docket No. 50-334, License No. DPR-66 BV-2 Docket No. 50-412, License No. NPF-73 Probabilistic Safety Review for License Amendment Request Nos. 302 and 173," L-05-104, June 14, 2005. (ADAMS Accession No. ML051670270)
- Letter from L. William Pearce, FirstEnergy Nuclear Operating Company, to U.S. Nuclear Regulatory Commission, "Beaver Valley Power Station, Unit No. 1 and No. 2 BV-1 Docket No. 50-334, License No. DPR-66 BV-2 Docket No. 50-412, License No. NPF-73 Response to Request for Additional Information in Support of LAR Nos. 306 and 176 Emergency Diesel Generator Allowed Outage Time Extension," L-04-141, October 29, 2004. (ADAMS Accession No. ML043070444)

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Attachment 1 to RAI 2.a.

BVPS-1 Pre-EPU SLIM Worksheets

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CHECO3	8	2	9	2	8	5	6	5.063	5.12E-03	-2.2911		ZHECD3	5	5	5			5		40	7.5	2.42E-03
CHEMUS	8	- 4	6	5	6	1	5	5.25	6.25E-03	-2.2042		ZHEMU5	5	5	5	10	5	0	5	35	7.5	2.95E-03
MINHER	0	0	0	0	0	0	0	0	2.29E-05	-4.6394												
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Figure 1: BVPS-1 Pre-EPU SLIM Worksheet Group 1

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HEMU2	8	6	8	5	2	3	4	5.75	1015-02	-19974		ZHEMU2	0	0	5	5	0	0	0	10	5	6 23E-0
HEOR2	7	1	8	3	5	2	5	4 583	2 85E-03	-2 5458		ZHEOR2	0	0	5	5	0	0	0	10	7.5	1345-0
HEVMI	8	5	8	5	2	1	4	5 583	8 40E-03	-2 0757		ZHEVM1	0	0	5	5	0	0	0	10	7.5	3 975-0
HEOSI	7	1	7	5	3	3	3	5.333	6415-03	-2.1932		ZHEOS 1	5	0	10	10	5	5	5	40 40	75 7.5	3 035-0
HEOSZ	7	1	7	5	3	5	5	5 667	9 196-03	-2 0365		ZHEOS2	5	0	10	10	3	5	5	40	7.9	4 34E-0
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Figure 2: BVPS-1 Pre-EPU SLIM Worksheet Group 2

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iorm. PSFWeights	0.12	0.12	0.10	0.10	0 07	0 24	0 24	100													INPUTTORISKMAN HERDISTRIBUTIO	
PERATOR ACTIONS			PSFRAM	KINGS				 FU	HER	LOQ(HER)		OPERATOR ACTIONS			PSFW	ЕСНТ	5				RANGEFACTOR	MEDIAN
AXHER	10	10	10	10	10	10	10	10	9 365-01	-0.0285												
HECD2	2	8	8	5	7	2	4	4 241	2 58E-03	-2 5886		ZHECD2	5	5	5	5	5	10	10	45	75	1225-03
HEHMI	2	1	2	2	4		8	3 948	1916-03	-2.7190		ZHEHM1	5	5	5	5	5	10	10	45	75	9 025-04
HEREB	1	2	8	9	9	7	7	6 121	177E-02	-17531		ZHEREB	5	5	5	5	5	10	10	45	5	1095-02
HEFL1	7	7	9	9	6	8	8	7 345	8.18E-02	-1.2069		ZHEFL1	5	5	5	5	0	10	10	40	5	3 835-02
HETL2	7	7	9	9	6	5	8	7,103	4 83E-02	-1.3152		ZHEFL2	5	5	5	5	0	10	10	40	5	2.99E-02
HEFL3	7	7	9	9	8	5		7.103	4 835-02	-13162		ZHEFLS	5	5	5	5	0	10	10	40	5	2 995-02
HEIC3	6	9	8	2	9	6	8	6 845	3 70E-02	-14312		ZHEIC3	5	5	0	0	5	10	10	35	5	2.305-02
IN HER	0	0	0	0	0	0	0	0	3 36E-05	-4 4743												
		*******										NORMALIZED PSF WEIGHTS	0 12	0.12	0.10	0.10	0 07	0 24	0 24	1		
ALIBRATION TASKS			PSFRAI	ik ings				ស	HER	LOG(HER)												
AXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
TP HEOS 01	4	3	6	10	10	6	3	5 362	1.60E-02	-17447												
ERMIRE7	6	7	8		6	5	8	6 569	1.326-02	-18794												
INHER	0	0	0	0	0	0	0	0	3 00E-05	-4 5229												
	******								Regression (` #n:#:												
								Constan	•		-4 47426											
								StdErro			0 338135											
								RSquar			0 978095											
									bservations		4											
									of Freedom		2											
								XCoeffi		0 444575												

Figure 3: BVPS-1 Pre-EPU SLIM Worksheet Group 3

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	PERFO	RMANCI	SHAPIN	IGFACT	ORS								PERF	ORMA	NCESH	APING	FACTO	RS				
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	т	E	P	С	R								T	E	P	C	R					
	E	C	L	Ε	•		8						ε	C	L	Ε			8			
	R	ε	E	Ð	1		т						R	Е	E	D	1		T			
	F	D	x	U	N	т	R						F	D	X	U	N	т	R			
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	с	N	T	ε	N	м	9	U					С	N	T	E	N	м	8	U		
	E	G	۲	5	G	E	5	M					E	G	Y	S	G	ε	8	м		
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OPERATOR ACTIONS			PSFRAM			****		FLI	HER	LOG(HER)		OPERATOR ACTIONS			PSFW	EGHTS	3				RANCEFACTOR	MEDIAN
AXHER	10	10	10	10	10	10	10	10	9.15E-01	-0 0387				_						_		
CHEHC1	2	1	2	2	4	0	5	2 83	2.58E-04	-3 5885		2HEHC1	0	0	0	0	0	0	5	5	10	9 685-05
HEPRI	2	2	2	2	3	0	6	3.106	3 535-04	-3 45 15		ZHEPR1	0	0	0	0	0	0	5	5	10	1335-04
HECD4	9	2	9		8	5	10	7.894	8 29E-02	+1 08 15		ZHECO4	5	5	5	5	5	5	10	40	5	5 HE-02
CHEMU3			8	5		5		6 553	180E-02	-17451		ZHEMUS	6	5	5	5	5	5	10	40	5	1 115-02
CHEMU4	8	8	8	5		7	8	7.362	4 52E-02	-13449		ZHEWU4	5	5	5	5	5	5	10	40	5	2 805-02
246081	2	6	3	2	4	1	7	4, 191	1226-03	-2 9144		ZHEOBI	5	5	5	5	5	5	10	40	7.5	5 75E-04
SHEOA1	2	0	2	0	3	2	7	3, 191	3 905-04	-3 4095		ZHEOA1	5	5	5	5	5	0	10	35	10	1465-04
2HEOT1	0	10	1	2	3	1	6	3 681	6 80E-04	-3 1672		ZHEOTI	5	0	5	0	5	5	10	30	10	2 556-04
win Her	0	0	0	0	0	0	0	0	1025-05	-4 9895						.						
						*******						NORMALIZED PSF WEIGHTS	0.13	0 11	0 13	0 11	0 13	0.11	0.30	1		
CALIBRATION TASKS			PSFRAM	ir ings				FLI	HER	log(her)												
MAXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
STP HERC4	2	6	3	5	6	1	6	4 681	9 82E-04	-3 0079												
FERMIHECT3	4	6	3	3	3	3	3	3,447	1 156-03	-2 9393												
MIN HER	0	0	0		0	0 	0		9 20E-06	-5 0362												
									Regression (ht out												
								Constan	-		-4 98954											
								StdErre			0.342488											
								RSquar			0 981802											
									bservations		4											
									s of Freedom		2											
								XCoeffi	icient(s)	0 4950857												

Figure 4: BVPS-1 Pre-EPU SLIM Worksheet Group 4

L-05-140 Enclosure 1, Attachment 1 Page 6 of 16

	PERFOR	MANC	SHAP	NGFACI	ORS								PERF	ORMA	NCESH	APIN	FACTO	RS				
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	т	E	P	¢	R								Ť	E	P	С	R					
	E	C	r	E	A		8						E	C	L	E	•		8			
	R	E	E	D		_	T						R	E	E	D	1		т			
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	E	ā	Ŷ	8	G	E	5	M					c	N	T	E	N	M	8	U		
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orm. PSFWeights	015	015	015	0 15	015	011	014	100			-	<u> </u>									INPUT TO RISKMAI HER DISTRIBUTIO	
PERATORACTIONS				NKINGS				FLI	HER	LCO(HER)		OPERATORACTIONS			PSF	WEIG	HTS				RANGEFACTOR	MEDIAN
AXHER	10	10	10	10	10	10	10	10	9 97E-01	-0 0012												
HECC1	2	6	6	7	2	2	5	4 37	4215-03	-2.3761		ZHECCI	5	5	5	5		5	5	35	75	1995-03
HECC2 HECI2	2		7	7	2	4	6	4 683	6 925-03	-2 1597		ZHECC2	5	5	-	5	-	5	6	35	75	3 276-03
HECIZ HENHI	+	27	4	1	3	3	3	2 403 4 285	8 225-04 3 875-03	-3.2061		ZHEC12	5	5		5	5	5	5	35	10	2 34E-04
HEI+12	2	ź	3	1	3	3	-	4 206	38/5-03	-24118		2HD#H1 2HD#42	5	5	5	5	5	5	5 5	35 35	7.5 10	183E-03 268E-04
HEMAI	;	ŝ	4	2			2	3 123	1255-03	-2 9021		2HBMA1	5	5	5	5	5	5	5	35	10 75	2 68E-04 5 92E-04
HEMAZ	2	3	1	2		ō	ŝ	3 104	1236.03	-29103		ZHEMA2	5	5	š	5	5		5	35	75	5815-04
HE001	2	3	5	2	5	1	5	3 364	1.58E-03	-2 8007		2118001	5	5	ŝ	5	5	5	5	35	75	7 475-04
HEPH	0	0	1	5	3	2	5	2.279	5 525 04	-3 2582		ZHEP11	5	5	5	5	5	5	5	35	10	2 07E-04
HEPKI	0	1	1	5	3	2	5	2.429	6 385 04	• 3 1952		2HEPK1	5	5		5	5	5	5	35	- 10	2.40E-04
HERES	1	2				2	5	5 206	1006-02	-19981		246855	5	5	-	5	-	5	5	35	5	\$ 225-03
HERR1 HESE1	2	2	5	5	4	2	2	3.195	1346-03	-2 8719		ZHERR1	5	5		5	5	5	5	35	75	6 34E-04
HESL2	2	2	2	3 5	1	4	4	3 403 4 649	1.645-03 5.525-03	-2 7843 -2 2584		2HESE1 2HESL2	5	5	-	5	5	5	5	35	75	7 76E-04
HESL3	;	10				1	10	8.26	5 525-03 184E-01	+2 2584 +0 7353		ZHESLZ	5	5	5	5	5	5	5	35 35	75	2 61E-03 1 47E-01
HEWA1	Ś	š	5		7	5	Ĩ.	5 006	7 805-03	-2 1077		ZHEWA1	5	5	5	5	5	*	5	35	3 7.5	3 695-03
HEAFI		6	2	5	5	ō	5	4 597	5 245-03	-2 2803		ZHEAFI	5	5	5	š	5	ő	5	30	7.5	2 486-03
HEDF1	6	1	5	2	6	1	6	3 955	2816-03	-2 55 15		2HEDF1	5	5	5	5	5	ő	5	30	7.5	1336-03
HEIAT		6	6	4	- 4	1	5	4 708	5 846 03	•2 2337		ZHBA1	5	5	5	5	5	0	5	30	75	2.76E-03
HEIAZ	4	6	5	4	4	1	5	4 26	3.786-03	-2 4227		ZHBA2	5	5	-	5	-	0	5	30	75	178E-03
HEIA4	7	7	6	3	4	1	3	4 422	4 425-03	-2 3542		ZHEA4	5	5		5		0	5	30	75	2 09E-03
HEOSE	2	4	2	5	3	0	2	2 675	8 115 04	-3 0911		216056	5	5		5	-	0	0	25	10	3 04E-04
hepna IIN her	8	9	8		8	7	9	8 331 0	1975-01	-0 7052		ZHEPNA	5	5	5	5	5	5	5	35	3	1.586-01
									6 035 05	-4 2196	-	NORMLAIZEDPSF WEIGHTS	0 15	0 15	0 15	0 15	0 15	0 11	0 14	1		
ALIBRATION TASKS			PSFRA	NIKINGS				FU	HER	LOG(HER)		escrum to										
AXHER	10	10	10	10	10	10	10	10	1.00E+00	0 0000												
TP HEODO3 TP HEOSL1	6	5 4		6	6	6	9	6 578	4 385-02	-13585												
TP HEOCOI	3	3	5	3	3	4	6	3 967 3 779	2 136-03	-2 6716 -2 6364												
INHER	ő	0	ő			ó		3//3	8 906-05	-4 1612												
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Figure 5: BVPS-1 Pre-EPU SLIM Worksheet Group 5

P R E C E D I N G	SHAPINK C O M P L E X I T	P R O C E D V R E	T R A I N I	Ŧ	S T						i N T	P R E	C O M P	P R O C	FACTO T R					
R E C E D I N	0 M P L E X I T	R O C E D V R	R A I N	Ŧ							i N T	R	O M	R O	•					
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3		-	N	M	8	U					С	N	т	E	N	M	S	U		
	Y	5	8	ε	8	м					ε	G	Y	5	G	E	5	м		
																			INPUTTORISKMAP	
0 50	0 00	0 00	0 00	0 50	0.00	1.00														1
F	SFRAN	KINGS				FU	HER	LOQ(HER)		OPERATOR ACTIONS			PSF	WEIG	ITS				RANGEFACTOR	MEDIAN
10	10	10	10	10	10	10	9 985-01													
6	6	5	3	3	5	45	3 38E-03	-2.4715		ZHESL1	0	5	0			5	0	10	75	1.595-03
5	2	3	3	7	5	6	-			ZHETT1	0	5	0	0	0	5	0	10	5	9 875-03
0	C	0	0	0	0	0	7 3 216-05	-4 4930												
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	F 10 6 5 0 P 10 4	PSFRAN 10 10 6 6 5 2 0 0 PSFRAN 10 10 4 5 6 6	PSFRANKINGS 10 10 10 6 6 5 5 2 3 0 0 0 PSFRANKINGS 10 10 10 4 5 3 8 6 5	PSFRANKINGS 10 10 10 10 6 6 5 3 5 2 3 3 0 0 0 0 PSFRANKINGS 10 10 10 10 4 5 3 3 6 6 5 3	PSFRANKINGS 10 10 10 10 10 6 6 5 3 3 5 2 3 3 7 0 0 0 0 0 PSFRANKINGS 10 10 10 10 10 4 5 3 3 4 6 6 5 3 3	PSFRANKINGS 10 10 10 10 10 10 6 6 5 3 3 5 5 2 3 3 7 5 0 0 0 0 0 0 PSFRANKINGS 10 10 10 10 10 10 4 5 3 3 4 6 6 6 5 3 3 5	PSFRANKINGS FLI 10 10 10 10 10 6 6 5 3 3 5 45 5 2 3 7 5 6 0 0 0 0 PSFRANKINGS FLI 10 10 10 10 10 10 10 10 </td <td>PSFRANKINGS FLI HER 10</td> <td>PSFRANKINGS FLI HCR LOQ(HER) 10 10 10 10 10 986-01 -0.0007 6 6 5 3 3 5 4.5 3386-03 -2.4715 5 2 3 7 5 6 1556-02 -17976 0 0 0 0 0 0 1 3216-05 -4.4930 PSFRANKINGS FLI HER LOC(HER) 10 10 10 10 100 0.0000 4 6 4 2.13E-03 -2.6718 8 6 5 3 3 5 4.5 3206-03 -2.6718</td> <td>PSFRANKINGS FLI HER LOQ(HER) 10 12 11</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 985-01 -0.0007 6 6 5 3 5 4.5 3385-03 -2.4715 2HESL1 5 2 3 7 5 6 1595-02 -17976 2HETT1 0 0 0 0 0 0 1 3275-05 -4.4930 NORMALIZED PSF PSFRANKINGS FLI HER LOQ(HER) NORMALIZED PSF 70 10 10 10 10 100 0.0000 4 5 3 3 5 4.5 3205-03 -2.6715 8 8 9 9 9 9 9 9 10 100 10 100 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 10 10 00 00007 00007 6 6 5 3 5 4 3386.03 -24175 2HESL1 0 5 2 3 7 5 6 1595.02 -17976 2HET1 0 0 0 0 0 0 10<td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 98E-01 -0.0007 6 6 5 3 5 45 33E.01 -2.0007 5 2 3 7 5 6 159E.02 -17976 2.4ESL1 0 5 0 0 0 0 0 0 1 32E.05 -4.4930 NORMALIZED.PSF 0.00 0 0 5 0 0 0 0 0 0 0 5 NORMALIZED.PSF 0.00 0 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td><td>PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF 10 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-02 -17976 2HESL1 0 5 0 0 0 0 0 0 0 5 0 NORMALIZED PSF 0.00 0.50 0.00 PSFRANKINGS FLI HER LOQ(HER) NORMALIZED PSF 0.00 0.50 0.00 10 10 100E+00 0.0000 4 5 3 3 5 4.5 3.20E-03 -2.6718 8 6 5 3 3 5 4.5 3.20E-05 -4.4949 4.4949<</td><td>PSFRANKINGS FLI HCR LOQ(HER) OPERATORACTIONS PSF WEG 10</td><td>PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF WEIGHTS 10 10 10 10 10 10 10 9985-01 -00007 6 6 5 3 3 5 45 338-03 -24175 2HESL1 0 5 0 0 5 2 3 3 7 5 6 1595-02 -17976 2HESL1 0 5 0</td><td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2HESL1 0 5 0 0 5 6 5 3 3 5 45 338E.02 -11976 2HESL1 0 5 0 0 5 0 0 0 0 0 0 1327E.05 -44930 NORMALIZED PSF 0.00<td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2415 2451 0 0 5 0</td><td>PSFRAMKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS 10 10 10 10 10 10 10 10 9985-01 -0.0007 6 6 5 3 3 5 45 338-03 -2475 2HESL1 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0</td><td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS RANGEFACTOR 10 10 10 10 10 10 10 10 10 10 10 10 10 10 985-01 -0.0007 0 0 0 0 0 0 10 10 995-01 -0.0007 2475 2451 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 0 0 0 0 0 0 0</td></td></td>	PSFRANKINGS FLI HER 10	PSFRANKINGS FLI HCR LOQ(HER) 10 10 10 10 10 986-01 -0.0007 6 6 5 3 3 5 4.5 3386-03 -2.4715 5 2 3 7 5 6 1556-02 -17976 0 0 0 0 0 0 1 3216-05 -4.4930 PSFRANKINGS FLI HER LOC(HER) 10 10 10 10 100 0.0000 4 6 4 2.13E-03 -2.6718 8 6 5 3 3 5 4.5 3206-03 -2.6718	PSFRANKINGS FLI HER LOQ(HER) 10 12 11	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 985-01 -0.0007 6 6 5 3 5 4.5 3385-03 -2.4715 2HESL1 5 2 3 7 5 6 1595-02 -17976 2HETT1 0 0 0 0 0 0 1 3275-05 -4.4930 NORMALIZED PSF PSFRANKINGS FLI HER LOQ(HER) NORMALIZED PSF 70 10 10 10 10 100 0.0000 4 5 3 3 5 4.5 3205-03 -2.6715 8 8 9 9 9 9 9 9 10 100 10 100 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 10 10 00 00007 00007 6 6 5 3 5 4 3386.03 -24175 2HESL1 0 5 2 3 7 5 6 1595.02 -17976 2HET1 0 0 0 0 0 0 10 <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 98E-01 -0.0007 6 6 5 3 5 45 33E.01 -2.0007 5 2 3 7 5 6 159E.02 -17976 2.4ESL1 0 5 0 0 0 0 0 0 1 32E.05 -4.4930 NORMALIZED.PSF 0.00 0 0 5 0 0 0 0 0 0 0 5 NORMALIZED.PSF 0.00 0 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF 10 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-02 -17976 2HESL1 0 5 0 0 0 0 0 0 0 5 0 NORMALIZED PSF 0.00 0.50 0.00 PSFRANKINGS FLI HER LOQ(HER) NORMALIZED PSF 0.00 0.50 0.00 10 10 100E+00 0.0000 4 5 3 3 5 4.5 3.20E-03 -2.6718 8 6 5 3 3 5 4.5 3.20E-05 -4.4949 4.4949<</td> <td>PSFRANKINGS FLI HCR LOQ(HER) OPERATORACTIONS PSF WEG 10</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF WEIGHTS 10 10 10 10 10 10 10 9985-01 -00007 6 6 5 3 3 5 45 338-03 -24175 2HESL1 0 5 0 0 5 2 3 3 7 5 6 1595-02 -17976 2HESL1 0 5 0</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2HESL1 0 5 0 0 5 6 5 3 3 5 45 338E.02 -11976 2HESL1 0 5 0 0 5 0 0 0 0 0 0 1327E.05 -44930 NORMALIZED PSF 0.00<td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2415 2451 0 0 5 0</td><td>PSFRAMKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS 10 10 10 10 10 10 10 10 9985-01 -0.0007 6 6 5 3 3 5 45 338-03 -2475 2HESL1 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0</td><td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS RANGEFACTOR 10 10 10 10 10 10 10 10 10 10 10 10 10 10 985-01 -0.0007 0 0 0 0 0 0 10 10 995-01 -0.0007 2475 2451 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 0 0 0 0 0 0 0</td></td>	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS 10 10 10 10 10 98E-01 -0.0007 6 6 5 3 5 45 33E.01 -2.0007 5 2 3 7 5 6 159E.02 -17976 2.4ESL1 0 5 0 0 0 0 0 0 1 32E.05 -4.4930 NORMALIZED.PSF 0.00 0 0 5 0 0 0 0 0 0 0 5 NORMALIZED.PSF 0.00 0 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 50 PSFRANKINGS FLI HER LOC(HER) NORMALIZED.PSF 0.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF 10 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-01 -0.0007 OPERATOR ACTIONS PSF 10 10 10 10 9985-02 -17976 2HESL1 0 5 0 0 0 0 0 0 0 5 0 NORMALIZED PSF 0.00 0.50 0.00 PSFRANKINGS FLI HER LOQ(HER) NORMALIZED PSF 0.00 0.50 0.00 10 10 100E+00 0.0000 4 5 3 3 5 4.5 3.20E-03 -2.6718 8 6 5 3 3 5 4.5 3.20E-05 -4.4949 4.4949<	PSFRANKINGS FLI HCR LOQ(HER) OPERATORACTIONS PSF WEG 10	PSFRANKINGS FLI HER LOQ(HER) OPERATOR ACTIONS PSF WEIGHTS 10 10 10 10 10 10 10 9985-01 -00007 6 6 5 3 3 5 45 338-03 -24175 2HESL1 0 5 0 0 5 2 3 3 7 5 6 1595-02 -17976 2HESL1 0 5 0	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2HESL1 0 5 0 0 5 6 5 3 3 5 45 338E.02 -11976 2HESL1 0 5 0 0 5 0 0 0 0 0 0 1327E.05 -44930 NORMALIZED PSF 0.00 <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2415 2451 0 0 5 0</td> <td>PSFRAMKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS 10 10 10 10 10 10 10 10 9985-01 -0.0007 6 6 5 3 3 5 45 338-03 -2475 2HESL1 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0</td> <td>PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS RANGEFACTOR 10 10 10 10 10 10 10 10 10 10 10 10 10 10 985-01 -0.0007 0 0 0 0 0 0 10 10 995-01 -0.0007 2475 2451 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 0 0 0 0 0 0 0</td>	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF WEIGHTS 10 10 10 10 10 998E-01 -0.0007 2415 2451 0 0 5 0	PSFRAMKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS 10 10 10 10 10 10 10 10 9985-01 -0.0007 6 6 5 3 3 5 45 338-03 -2475 2HESL1 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0	PSFRANKINGS FLI HER LOQ(HER) OPERATORACTIONS PSF VEIGHTS RANGEFACTOR 10 10 10 10 10 10 10 10 10 10 10 10 10 10 985-01 -0.0007 0 0 0 0 0 0 10 10 995-01 -0.0007 2475 2451 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 5 0 0 0 0 0 0 0 0 0

Figure 6: BVPS-1 Pre-EPU SLIM Worksheet Group 6

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	PERFOR	RMANCI	ESHAPI	GFACT	ORS								PERF		NCESH	APING	FACTO	RS				
			с	P											с	P						
	,	p	ŏ	R										ρ	ŏ	R						
	Ň	R	м	ö	т								Ň	R	м	ö	τ					
	т	E	P	č	R								Ť	E	P	č	R					
	Ē	č	Ĺ	Ē	Ä		S						Ē	č	È	E	Ā		8			
	R	Ē	Ē	D	ï		Ť						R	E	Ē	D	1		Ť			
	F	D	x	Ū	N	т	R						F	D	x	Ū	Ň	T	R			
	Å	ĩ	1	R	1	i.	E	5					Å	- i	1	R	1	i.	E	5		
	c	Ň	Ť	E	N	M	5	Ū					c	N	Ť	E	Ň	M	8	Ŭ		
	Ē	đ	Ŷ	8	G	E	8	Ň					Ē	G	Ŷ	5	G	E	8	M		
													-					-			INPUTTORISKMAI	NFOR
iorm. PSFWeights	0 10	0 25	0.10	0.10	0.10	0 10	0 25	100													HERDISTRIBUTIO	N
PERATOR ACTIONS			PSFRAI	VKINGS	********			 ғи	HER	LOG(HER)		OPERATORACTIONS		••••••	PSFV	EGHT:	 9	******			RANCEFACTOR	MEDIAN
AXHER	10	10	10	10	10	10	10	10	9 99E-01	-0 0005												
HECI1	2	5	3	3	5	2	3	35	2 23E-03	-2 65 12		ZHECII	0	5	0	0	0	0	5	10	75	1.05E-03
HECDS	1	6	8	5	7	2	8	58	194E-02	-17133		ZHECO5	5	10	5	5	5	5	10	45	5	1205-02
HEO82	2	9	3	2	4	1	8	5 4 5	1395-02	-18560		ZHE082	5	10	5	5	5	5	10	45	5	8 63E-03
INHER	0	0	0	0	0	0	0	0	8 35E-05	-4 0785												
							********					NORMALIZEDPSF	0.10	0 25	0.10	0.10	0 10	0 10	0 25	1		
ALIBRATION TASKS			PSFRAI	NKINGS.				ស	HER	LOG(HER)		WEIGHT\$										
AXHER	10	10	10	10	10	10	10	10	1.00E+00	0 0000												
TP HEOB 02	4	3	6	4	7	2	8	5 05	8 80E-03	-2 0555												
PRA-8(1)	2	9	3	2	4	1	8	5.45	100E-02	-2 0000												
C 2HEOB 1	5	7	7	6	6	4		6 55	5 49E-02	-12604												
IIN HER	0	0	0		•		0	•	9 00E-05	-4 0458												
юте									Regression	Output:												
								Constar		•	-4 07855											
1) RANKINGS ARE THO	SEFORS	MLAR						StdErr	of YEst		0.122121											
ACTION IN BV1 (ZHEOE								R Squar	ed		0 99483											
								No. of C	bservations		5											
								Degree	sof Freedom		3											
								XCoeff	icient(s)	0.4078012												
								Std Err		0 0 169732												

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Figure 7: BVPS-1 Pre-EPU SLIM Worksheet Group 7

L-05-140 Enclosure 1, Attachment 1 Page 9 of 16

	PERFO	RMANCE	ESHAPI	GFACT	ORS								PERF	ORMA	NCESH	APING	FACTO	RS				
			с	Ρ											c	Ρ						
	1	Ρ	0	R									1	Ρ	0	R						
	N	R	м	0	T								N	R	м	0	T					
	т	E	P	C	R								T	E	P	С	R					
	E	c	L	E			8						E	C	L	ε			5			
	R	E	E	D U	1	_	T						R	E	E	D		_	T			
	•	D ,	×	-	N	Ţ	R						F	D	×	U	N	T	R	-		
	A C	N) T	R E	J N	J M	E S	8 U							1	R			E	8		
	E	G	Ŷ	5 5	G	E	5	M		•			C E	N	T	E	N	M	5	U		
	-	G	T	a	G	E	3	м					E	G	¥	S	0	E	8	M	INPUTTORISKMA	
lorm. PSFWeights	0.13	0.13	0.10	0 10	0 11	0 31	0.11	100													HERDISTRIBUTIO	
PERATOR ACTIONS			PSFRA					FU	HER	LOG(HER)		OPERATOR ACTIONS			PSF	WEIGH	ITS				RANGEFACTOR	MEDIAN
MAXHER SHEFL4	10 3	10 3	10 3	10 5	10 7	10 4	10	10 3 971	9 965-01	-0.0018		1000 4		~	0		0		•			4 445 4-
CHEFL4	3	3	3	5	7	4	3	3 971	2 345-03 1716-03	-2 0305 -2 7675		2HEFL4 2HETT2	0	0	0	0	0	5 5	0	5 5	7.5	1 115-03 8 075-04
HEITZ	4	3	2	3	7	7	3	3 657 6 4 14	2 72E-02	-2 7675 -1 5653		ZHETT2 ZHEWA2	0	0	0	0	0	5 10	•	5 10	7.5 5	8 07E-04 169E-02
HEBV2	3	3	3		÷	2	2	3 129	1005-03	-15053		ZHEBV2	5	5	5	5	5	10	0 5	10 40	7.5	4 745-04
HEBVS	5	7	7			Â	6	7.371	7.116-02	-1 1479		ZHEBVS	5	5	5	0	5	10	5	35	5	4 4 15-02
HEBVI	5	ė			,	5	5	5 057	6 97E-03	-2.1571		ZHEBV4	5	5	5	5	5	10	5	40	7.5	3 295-03
HECDI	2	5			5	2	Å.	3 657	1716-03	-2 7675		ZHECD1	5	5	5	5	5	10	5	40	7.5	8 07E-04
HECTI	2			7	2	ē	5	5 014	6 676-03	-2.1758		ZHECTI	5	5	5	5	5	10	5	40	7.5	3 155-03
HEAS	6	6	6	4	4	10	5	6 7 14	3 685-02	+14345		ZHEA3	5	5	ŝ	5	5	10	5	40	5	2 286-02
DHERI1	1	Ó	1	0	0	5	7	26	591E-04	-3.2285		ZHERIT	5	5	5	5	5	10	5	40	10	2 225-04
HBC2	2	e	4	3	4	5	4	4 2 14	2 99E-03	-2 5248		2HDC2	5	5	0	5	5	10	5	35	7.5	1416-03
CHEC1	6	7	6	2	6	2	3	4 129	274E-03	-2.5620		ZHEIC1	5	5	Ó	0	0	10	0	20	7.5	1295-03
AINHER	0	0	0	0	0	0	0	0	4 34E-05	-4.3622												
												NORMALIZED PSF WEIGHTS	0.13	0.13	0 10	0 10	0,11	0.31	0 11	1		
CALIBRATIONTASKS			PSFRAI	NKINGS				FU	HER	LOG(HER)												
AXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
ERMIHERS1	2	7	2	3	2	4	6	3 829	175E-03	-2.7570												
TP HEOSO1	4	3		10	10	6	3	5 871	1805-02	-1.7447												
AIN HER	•		0 	0		0 	•	0	4 60E-05	-4 3372												
									Regression (Output:												
								Consta	nt		-4.36218											
								Steffr	of YEst		0 058578											
								R Squa	ber		0 999309											
									bservations		4											
								Degraa	sof Freedom		2											
								XCoeff	icient(s)	0 43604												
									of Coef.	0 0081103												

Figure 8: BVPS-1 Pre-EPU SLIM Worksheet Group 8

L-05-140 Enclosure 1, Attachment 1 Page 10 of 16

	1		SHAPIN										PERF	CULIN A	ACE OF	MLL 1440						
	t		-	_												_						
		P	с о	P R										P	C O	PR						
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	Ť	È	P	č	R								τ	E	P	č	R					
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	R	Ē	Ē	D	ï		T						R	ε	Ē	D	i i		Ť			
	F	D	x	U	N	T	R						F	D	x	U	N	т	R			
	A	1	i i	R	1	ł	E	5					A	t	1	R	ŧ.	1	E	8		
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	Е	G	Y	8	G	E	5	м					ε	G	۲	\$	G	ε	8	м		
																					INPUTTORISKMAN	
orm. PSFWeights	0 00	0.17	0.17	0 17	0.17	0,17	0.17	100													HERDISTRIBUTIO	N
PERATORACTIONS		 I	PSFRAN	KINGS				FU	HER	LOO(HER)		OPERATORACTIONS			PSF	WEICH	179				RANGEFACTOR	MEDIAI
AXHER	10	10	10	10	10	10	10	10	9 985-01	-0 0008												
HECDS	2	9	5	3	7	3	9	8	4 99E-02	-1.3022		ZHECDS	0	5			5	5	5	30	5	3 095-0
HECD7	2	9	8	5	8	5	9	7.333	1355-01	-0 6684		ZHECD7	0	5	5	5	5	5	5	30	3	108E-(
INHER	0	Ó	0	0	0	0	0	0	5 57E-04	-3 2542				• •	• -	• ~						
*********	*******		*******		*****							NORMALIZED PSF WEIGHTS	0.00	0.17	0.17	0.17	0.17	017	0 17	1		
ALIBRATION TASKS		I	PSFRAN	KINGS				FU	HER	LOG(HER)		9 11 1 11 11 11 11 11 11										
AXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000												
TP HEODO3	6	5	6	6		6	ŝ	6 667	4.36E-02	+1.3585												
PRISHI(1)	2	9	5	3	7	3	9	6	1005-01	-10000												
INHER	Ō	ō	ō	0	Ó	0	0	Ō	5.20E-04	-3 2840												
OTE									Regression													
								Constar	nt		-3 2542											
I) RANKINGS ARE THOS		MILAR						StdErr			0 268842											
ACTION IN BV1(ZHECDO	5)							R Squar			0 970575											
									bservations		4											
								Degree	sof Freedom		2											
								YCarl	iclent(s)	0.3253357												

Figure 9: BVPS-1 Pre-EPU SLIM Worksheet Group 9

					00					511001	10 110101	AN ACTIONS EV			0.1							
	PERFO	RMANCI	SHAPIN	GFACTO)R\$								PERF	ORMAI	VCESH	APING	ACTO	RS				
			c	P											c	Ρ						
	1	P	0	R									1	Ρ	0	R						
	N	R	м	0	Ť								N	R	м	0	Т					
	т	E	Р	c	R								т	E	P	C	R					
	E	C	L	E	A		S						E	c	L	E			8			
	R	3	E	D	1		T						R	E	E	D	1	-	T			
	F	D	x	U	N	т	R						F	D	X	U	N	T	R	_		
	•	1	1	R	1		E	S							1	R			E	5		
	c	N	T	E	N	M	S	U					c	N	Ţ	E	N	M	8	U		
	ε	G	Y	8	G	E	5	м					E	G	Y	5	Ġ	E	8	м	INPUTTORISKMA	NEAD
vorm PSFWeights	0.11	0 00	0 22	0 22	0 11	0 22	0.11	100													HERDISTRIBUTIC	
PERATOR ACTIONS			PSFRAM				********	FU	HER	LOO(HER)		OPERATOR ACTIONS			PSF	WEIGH	TS				RANGEFACTOR	MEDIAN
JAXHER	10	10	10	10	10	10	10	10	9 995-01									-	-		-	1725-02
ZHEOS3	7	1	1	5	3	6	6	5.778	2.77E-02	-15578		ZHEOS3	5	0	10 10	10	5	10 10	5 5	45	5	3 025-02
CHEOS4	7	1	7	5	3	8	8	6 4 4 4	4 88E-02	-13120		ZHEO\$4	5	0	10	10	5	10	•	45	3	3 025-02
AIN HER 	0	0	0	0		••••••	0	•••••	2 05E-04	-3 6688		NORMALIZEDPSF	0 11	0 00	0.22	0.22	0. 11	0 22	0 11	1		
CALIBRATION TASKS			PSFRAM	KINGS				FU	HER	LOG(HER)		WEIGHTS										
AXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
STP HEOR07	5	4	7	4		5		5 444	2 08E-02	-1 68 19												
MIN HER	Ó	0	0	0	0	0	0	0	2 05E-04	-3 6862												
									Regression	atout:												
								Constar	-		-3 68877											
								SteErre	ofYEst		0 001415											
								R Squar	ed		1											
								No of C	bservations		3											
								Degree	of Freedom		1											
								XCoeff	cient (s)	0 3668144												
								StdErr		0 000 1999												

Figure 10: BVPS-1 Pre-EPU SLIM Worksheet Group 10

	PERFO	RMANCE	SHAPIN	GFACT	ORS								PERF	ORMAI	NCESH	APING	FACTO	RS				
			с	P											с	P						
	1	Ρ	ō	R									1	P	ō	R						
	N	R	м	0	т								N	R	M	0	т					
	т	ε	Р	С	R								т	Ε	P	С	R					
	ε	С	٤	ε	A		5						ε	с	ι	Ε			5			
	R	E	E	D	1		т						R	Ε	E	Ð	1		т			
	F	D	x	U	N	۲	R						F	D	x	υ	N	T	R			
	Α	I.	1	R	1	1	E	3						1	1	R	1	1	E	5		
	С	N	T	E	N	м	8	U					C	N	7	ε	N	м	8	U		
	E	G	¥	8	G	E	8	м					E	G	Y	8	G	Е	S	м		
form. PSFWeights	0 13	0 13	0 26	0 11	0 13	0 13	0 13	100													INPUT TORISKMAI HER DISTRIBUTIO	
OPERATOR ACTIONS			PSFRAN	KINGS				ณ	, HER	LOG(HER)		OPERATORACTIONS			PSF	WEIGH	ITS				RANGEFACTOR	MEDIAN
AXHER	10	10	10	10	10	10	10	10	9 996-01	-0 0006												
SHEOF1	5	5	5	5	4	1	2	3 979	1.58E-04	-3 8005		ZHEOF1	5	5	10	5	5	5	5	40	10	5 94E-0
HEOF2	5	5	5	5	4	1	3	4 108	191E-04	-37199		ZHEOF2	5	5	10	5	5	5	5	40	10	7.15E-05
CHEOF3	5	6	5	5	6	1	5	4.745	4 82E-04	-3 3171		ZHEOF3	5	5	10	5	5	5	5	40	10	1815-04
CHEOF4	5	8	5	5	4	1	4	4 362	2 76E-04	-3 5588		ZHEOF4	5	5	10	5	5	5	5	40	10	104E-04
DHEOFS	5	e	5	5	8	1	5	4 745	4 825-04	-3 3171		ZHEOF5	5	5	10	5	5	5	5	40	10	1815-04
HEATI	8	9	10	1	- 4	5	8	7	1285-02	•18938		ZHEAT1	5	5	10	0	5	5	5	35	5	7 916-03
MIN HER	0	0	0	0	0	0	0	0	4 88E-07	-6.3114												
						<u> </u>					•	NORMALIZED PSF WEIGHTS	0 13	0 13	0 26	0.11	0.13	0.13	0 13	1		
CALIBRATION TASKS			PSFRAN	Kings				FLI	Her	LOO(HER)												
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0 0000												
SEABROOK ON	0	0	1	0	2	Ö	0	0 511	100E-08	-6.0000												
AIN HER	0	0	0	0	0	0	0	0	5.00E-07	-6.3010												
	-								Regression (Dutput:	•											
								Consten			-6 31136											
								StdErre			0 015023											
								RSquar			0 999991											
									of Freedom		3											
								Ump: 001			1											
								XCoeffi	rient/st	0 63 1081												
								StdErro	• •	0 0018882												

Figure 11: BVPS-1 Pre-EPU SLIM Worksheet Group 11

	PERFO	RMANCI	ESHAPIN	GFACT	ORS								PERF	ORMA!	VCESH	IAP ING	FACTO	RS				
			c	Ρ											с	P						
	I.	P	0	R									1	P	0	R						
	N	R	м	0	T								N	R	м	0	T					
	т	E	P	С	R								т	E	Ρ	С	R					
	E	С	L	E	•		5						E	С	L	E			8			
	R	E	E	D			T						R	E	E	D	1	_	Ţ			
	F	D	x	U	N	Т	R	_					F	D	x	U	N	T	R	•		
	•		1	R	1		ε	S					A		<u>!</u>	R	1		E	S U		
	С	N	T	E	N	M	5	U					c	N	T	E	N	м	8	M		
	ε	G	۲	5	G	E	8	м					E	G	Y	5	G	ε	8	M	INPUTTORISKMAI	
Norm. PSFWeights	0 22	0.11	0 22	0 11	0 11	0 11	0 11	100				<u></u>									HERDISTRIBUTIO	
OPERATORACTIONS			PSFRAM	IKINGS				FU	HER	LOG(HER)		OPERATOR ACTIONS			PSF	weige	175				RANGEFACTOR	MEDIAN
MAXHER	10	10	10	10	10	10	10	10	9 32E-01													
ZHECR3	9	8	8	5	2	5	6	6 667	3 37E-02	-14725		ZHECR3	10	5	10	5	5	5	5	45	5	2 095-02
ZHECR4	9	5	9	4	4	5	8	0 889	4.20E-02	+1.3764		ZHECR4	10	5	10	5		5	5	45	5	2 605-02
ZHECSF	9	5	9	4	4	5	8	6 889	4.20E-02	-13764		ZHECSF	10	5	10	5	5	5	5	45	5	2 605-02
MINHER	Ð	0	0	ø	0	0	0	0	4 40E-05	-4 3563								.	•			
											•	NORMALIZEDPSF	0 22	0 11	0 22	0 11	0 11	0 11	0.11	1		
CALIBRATIONTASKS			PSFRAM	ik ings				FU	HER	LOG(HER)		WEIGHTS										
MAXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
BIGROCK BRS	6	5	6	5		5		5 667	140E-02	-18539												
BIGROCK L2C	4	4	4	4	4	5	4	4.111	100E-03	-3 0000												
SEQUOYAHCT1	2	3	5	0	4	2	2	2.778	180E-03	-2 7447												
MINHER	0	0	0	0	0	0	0	0	3 75E-05	-4 4260												
									Regression	Output:	-											
								Consta			-4 35625											
								StdErr			0 343813											
								R Squar			0 966676											
								No of C	bservations		5											
								Degree	sof Freedom		3											
						•		XCoeff	icient(s)	0.432562												
									of Coef.	0.432562												

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Figure 12: BVPS-1 Pre-EPU SLIM Worksheet Group 12

	PERFO	RMANC	ESHAPI	NGFACT	ORS								PERF	ORMA	NCESH	APINO	FACTO	RS				
			с	P											с	P						
	J	P	0	R									1	P	0	R						
	N	R	м	0	T								N	R	м	0	T					
	т	E	P	c	R								T	ε	Ρ	¢	R					
	E	С	ι	E	A		8						E	С	L	E	•		8			
	R	ε	ε	D	1		T						R	Ε	E	D	1		т			
	F	D	X	U	N	Ŧ	R						F	D	x	U	N	Т	R			
	•	•	T	R	1		E	5					•	1	- I	R	1	1	E	5		
	c	N	T	ε	N	м	S	U					С	N	т	E	N	м	8	U		
	E	G	Y	8	G	E	S	м					E	G	۲	\$	a	ε	5	M		
	0.08						• • •														INPUTTORISKMAI	
Norm. PSFWeights	0.08	0.08	0.08	0 08	0 27	0 27	0 14	100			•										HERDISTRIBUTIO	N
OPERATOR ACTIONS			PSFRA	VK INGS				FLI	HER	LOG(HER)		OPERATOR ACTIONS			PSF	wea	HTS				RANGEFACTOR	MEDIAN
MAXHER	10	10	10	10	10	10	10	10	9 69E-01	-0 0135												
ZHEPAE	8	8	8	5	8	7	8	7.324	5.11E-02	-12912		ZHECR3	3	3	3	3	10	10	5	37	5	3.17E-02
MIN HER	0	0	0	0	0	0	0	0	163E-05	-4 7887												
											•	NORMALIZED PSF WEIGHTS	0.08	0 08	0 08	0 08	0 27	0 27	0,14	1		
CALIBRATION TASKS			PSFRA	VK INGS				ស	HER	LOQ(HER)												
MAXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
SEQUOYAH FLPH3CR	4	1	3	0	4	4	5	3 486	5 60E-04	-3 2366												
SEQUOYAH FLAB3C	6	8	0	8	4	4	6	4.757	4 40E-03	-2 3565												
SEQUOYAH FLAB IR	- 4	1	3	0	4	2	5	2 946	3 80E-04	-3 4202												
SEQUOYAHFLPHIR	- 4	1	3	0	4	4	5	3 486	5 80E-04	-3 2366												
MINHER	0	0	0	0	0	0	0	0	2.00E-05	-4 6990												
									Regression	Dutput:	•											
								Constar	. 1		-4 78865											
								StdErre			0.123435											
								R Squar			0 995087											
									barvations		6											
								Degree	of Freedom		4											
								XCoeffi	cient(s)	0 477518												
								StdErr		0 0167764												

Figure 13: BVPS-1 Pre-EPU SLIM Worksheet Group 13

	PERFO	RMANC	CESHAPI	NGFACT	ORS								PERF	FORMA	NCESH	APING	FACTO	RS				
				_											-	-						
			c o	P R										р	c o	P R						
	N	R	ŭ	ò	т								Ň	R	м	ö	т					
	τ	E	P	č	R								т	E	P	č	R					
	Ē	č	i	Ē	Ä		8						E	c	É.	Ē	Å		5			
	R	Ē	Ē	D	ĩ		Ť						R	E	Ē	D	ï		T			
	F	ō	x	Ū	Ň	т	R						F	Ð	x	Ū	Ň	т	R			
	Å	ī	ï	R	ï	i	E	8					Å	ī	i i	R	ï	1	E	8		
	c	Ň	Ť	E	N	M	8	Ū					c	N	T	E	N	м	5	U		
	E	G	Y	5	G	E	8	м					E	G	Y	8	G	ε	5	м		
																					INPUTTORISK	
Norm PSFWeights	0.13	0.13	0 13	0 13	0.26	0.08	0.13	100	. <u> </u>		•										HERDISTRIBUT	
OPERATOR ACTIONS			PSFRA					ស	HER	LOG(HER)		OPERATOR ACTIONS			PSF	WEIGH	ITS				RANGEFACTOR	MEDIAN
MAXHER	10	10		10	10	10	10	10	9 59E-01						_				-			
ZHENSF	8	6	8	5	4	4	5	5 579	6 585-03	-2, 18 19		ZHENSF	5	5	5	5	10	3	5	38	75	3 11E-0
Min HER 	0			•	0	0	0 	•	1225-05	-4 9123	•	NORMALIZED PSF WEIGHTS	0 13	0.13	0, 13	0.13	0 26	0 08	0 13	1		
CALIBRATIONTASKS			PSFRA	NK INGS				FU	HER	LOG(HER)												
MAXHER	10	10	10	10	10	10	10	10	100E+00	0 0000												
PLGCAL3.1	6	5	6	5	6	5	8	5 858	1405-02	-1 8539												
PLGCAL32	- 4	4	4	- 4	- 4	5	4	4 079	1005-03	-3 0000												
PLGCAL33	7	6	7	6	7	6	6	6.526	2.505-02	-1.6021												
PLOCAL34	9	8	9	9	9	9	9	8 868	150E-01	-0 8239												
MINHER	0	0	0	0	0	0	0	0	100E-05	-5 0000												
									Regression	Dutput:	•											
								Constar	•		-4 91226											
								StdErr	of YEst		0 209632											
								R Squar	ed		0 988696											
									bservations		6											
								Degree	s of Freedom		4											
								XCoeff	icient (s)	0.489409												
									of Coef.	0 026 1659												

Figure 14: BVPS-1 Pre-EPU SLIM Worksheet Group 14

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			ESHAP	OFACT									bcpt		meer	APING		0e				
	PERFU	RMANC	E SMAPI	VGFACI	UKS								PERF	URMAP	VCESP	WPING	FACIU	K3				
			с	Ρ											с	P						
	I	P	0	R									1	P	0	R						
	N	R	м	0	т								N	R	M	0	T					
	T	E	P	c	R								т	ε	P	С	R					
	E	c	L	E			S						E	c	ι	E			8			
	R	E	E	D	1	_	Ţ		i				R	E	E	D	1	_	T			
	F	D	×	U	N	Ţ	R						F	D	x	U	N	Ţ	R	•		
	<u>^</u>	1	-	R	1		E	8							1	R	1	1	E	8		
	c	N	T Y	ε	N	м	S	U					c	N	T	E	N	м	8	U		
	E	G	Ŷ	5	G	E	8	м					E	G	¥	S	G	E	8	м		
Norm PSFWeights	0 11	0 11	0 22	0.11	0 11	0 22	0.11	100			-										INPUT TORISKMA	
OPERATOR ACTIONS	-	-	PSFRA			~	~	FU	HER	LOO(HER)		OPERATOR ACTIONS			PSF	were	TS				RANGEFACTOR	MEDIAI
MAXHER ZHEXT2	10 8	10	10 10	10 1	10 4	10 9	10 9	10 7 667	9 95E-01 1285-01	-0 0022 -0 8911		ZHEXT2	5			5		10	5	45	3	1075
MINHER	ō		0				a a	1007	1205-01	-3 6117		SUCCESS	5	5	10	5	5	NU.	3	-0	3	103E-
									1340-04	-3 611/	-	NORMALIZEDPSF	0 11	0 11	0 22	0.11	0.11	0 22	0.11	1		
CALIBRATION TASKS			PSFRA	VKINGS				FU	HER	LOCI(HER)		WEIGHTS										
MAXHER	10	10	10	10	10	10	10	10	1 00E+00	0.0000												
DC 2HEOS 1	2	2	1	5	5	3	4	2 889	1505-03	-2 8239												
STP HEOR07	7	5	5	4	5	8	6	5,444	2 086-02	-1.68 19												
MINHER	0	0	0	0	0	0	0	0	1755-04	-3.7570												
									Regression	Dutput:	•											
								Constan			-3 81172											
								StdErre			0 096985											
								RSquar			0 997603											
									bervations		4											
								Degreet	sof Freedom		2											
								XCoeffi	cient(s)	0 380950												
								StdErre	• •	0 0132029												

Figure 15: BVPS-1 Pre-EPU SLIM Worksheet Group 15

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Attachment 2 to RAI 2.a.

BVPS-1 Post-EPU SLIM Worksheets

BEAVER VALLEY UNT 1 - GROUP 1 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

			с	Р						
	1	Р	ŏ	R						
	N	R	м	ö	т					
	т	E	P	č	R					
	Ē	č	Ĺ	Ē	Ā		S			
	R	Ē	Ē	D	î		т			
	F	D	x	Ū	N	т	R			
	Å	ī	ï	R	ï	i	Ε	s		
	c	Ň	Ť	E	Ň	M	s	Ŭ		
	Ē	G	Ŷ	s	G	E	S	м		
Nom, PSF Weights	0.13	013	013	031	013	006	0.13	100		
OPERATOR ACTIONS			PSF RA	NKINGS			-	FU	HER	LOC(HER)
MAXHER	10	10	10	10	10	10	10	10	9,985-01	-0.0008
ZHEOR1	5	5	5	3	5	1	5	4 125	1.88E-03	-2.7280
ZHECCC3	8	2	9	2	8	2	6	4875	4195-03	-23781
ZHEM1.5	8	4	6	5	6	1	5	525	62 E -03	-22042
MNHER	0	0	0	0	0	0	_ °	0	2295-05	-46394
CALIBRATION TASKS			PSF RA	NKINGS	5			FU	HER	LOG(187)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	۵۵۵۵
•	5	5	5	3	5	2	5	4,188	2005-03	-26990
DC ZHERF1 (1)						-		-1.100	2020	-2000

		С	Ρ				
1	Ρ	0	R				
N	R	М	0	т			
۲	Ε	Ρ	C	R			
E	С	L	E	Α		S	
R	Ε	Ε	D	I		т	
F	D	х	U	Ν	т	R	
Α	J	J	R	1	1	Е	
C	Ν	т	Ε	N	М	S	
E	G	Y	S	G	Ε	S	

PERFORMANCE SHAPING FACTORS

INPUT TO RISHMAN FOR HER DISTRIBUTION

					_					-
OPERATOR ACTIONS	5		PSF	WEG	HIS				RANCE FACTOR	MEDIAN
ZHEORI	0	o	o	5	0	o	0	5	7.5	8.89E-04
Z-ECC3	5	5	5	10	5	5	5	40	7.5	1.985-03
2+EM.5	5	5	5	10	5	0	5	35	7.5	2955-03
NORIMUZED PSF WEIGHTS	0.13	Q 13	0.13	Q31	013	0.05	0.13	1		

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NOTE	Regression Quiput:	
	Constant -4 63941	
(1) RANKINGS ARE THOSE FOR SIMILAR	Std Err of Y Est 0.002418	
ACTION IN BV1 (ZHEOR1)	R Squared 0999999	
	No. of Observations 3	
	Degrees of Freedom 1	

X Coefficient(s) 0.4536552 Std Err of Coef. 0.0003404

Figure 16: BVPS-1 Post-EPU SLIM Worksheet Group 1

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BEAVER VALLEY UNIT 1 - GROUP 2 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

(1) RANKINGS ARE THE ACTION IN BV1 (ZHE		r smil	AR					Constan Std Erro R Squar	of Y Est		-
NOTE									Regression (Dutat	
Min Her 	0	0	0	0	0	0	- 0	0	2.00E-05	-4 6990	
FLANT-X OFBPO1 (1)	7	1	7	5	3	3	3	5.333	640E-03	-2,1938	
MAXHER	10	10	10	10	10	10	10	10	1.00=+00	0.0000	
CALIBRATION TASKS			PSF RA	NKINGS	;			FU	HER	LOC(HER)	
MNHER	0	0	0	0	0	0	0	0	2.005-05	-4.6093	
ZHEOS2	7	t	7	5	3	3	5	5.5	7.68E-03	-2.1149	
2/6051	7	1	7	5	3	5	3	55	7.68E-03	-21149	
ZHEWMI	8	5	8	5	2	0	4	55	7.005-03	-21149	
ZHEOR2	7	7	6	3	5	1	5	45	2605-03	-2.5848	
21-13-10-10-1 21-13-10-10-1	8	5	8	5	2	3	4	575	1.01E-02	-20/5/ -1.9974	
MAXHER ZHEMUI	10 8	10 5	10 8	10 5	10 2	10 1	10	10 5.583	9.99E-01 8.40E-03	-0.0003 -2.0757	
OPERATOR ACTIONS	**			NKINGS		**	10	FU	HER	LOC(HER)	
Norm, PSF Weights	0.08	000	0.33	033	0.08	0.08	0.08	1.00			
	Е	G	Ŷ	s	G	E	S	м			
	ĉ	N.	Ť	E	Ň	, M	ŝ	Ŭ			
	Ā	ĭ	î	R	ï	÷	ε	s			
	F	D	x	D U	N	т	R				
	ER	C E	L E	E	A		\$ Т				
	Ţ	E	P	C	R		~				
	N	R	м	0	T						
	I	Ρ	0	R	_						
			С	Р							

		С	Ρ			
1	Ρ	0	R			
N	R	М	0	т		
т	E	Р	С	R		
Е	С	L	Ε	A		S
R	Ε	Ε	D	1		т
F	D	x	U	N	т	R
A	1	I.	R	1	1	E
С	N	т	E	N	м	S
Ε	G	Y	S	G	Ε	S

INPUT TO RISKMAN FOR HER DISTRIBUTION

OPERATOR ACTIONS	;		PSF	WEIG	HTS				RANGE FACTOR	MEDIAN
245401	0	0	5	5	0	0	0	10	7.5	3.976-03
216112	0	0	5	5	0	0	0	10	5	6.236-03
ZHEOR2	0	0	5	5	0	0	0	10	7.5	1235-03
Z-EWM1	0	0	5	5	0	0	0	10	7.5	3625-03
Z-EOS1	5	0	10	10	5	5	5	40	7.5	3625-03
246052	5	0	10	10	5	5	5	40	7.5	3625-03
NORMALIZED PSF WEIGHTS	0.08	۵۵	033	033	0.08	0 08	0.08	1		

s U м

NOTE	Regression C).utput:	
	Constant		4 60027
(1) RANKINGS ARE THOSE FOR SMILAR	Std Err of Y Est	(000789
ACTION IN BV1 (ZHEOS1)	R Squared		1
	No. of Observations		3
	Degrees of Freedom		1
	X Coefficient(s)	0.4696927	

Std Err of Coef. 0.0001115

Figure 17: BVPS-1 Post-EPU SLIM Worksheet Group 2

BEAVER VALLEY UNIT 1 - GROUP 3 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

	1 N T E R F A C E	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N I N G	T I M	S T R E S S	U M		
Norm, PSF Weights	0.12	0.12	0.10	0.10	0.07	024	0.24	1.00		
OPERATOR ACTIONS		PSF BANKINGS						FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	9.36E-01	-0.0285
ZHEC02	2	6	8	5	7	2	4	4 241	2,586-03	-2.5885
ZHEHM1	2	1	2	2	4	4	6	3.405	1.17E-03	-2.9336
ZHEREB	1	2	8	9	9	8	7	6.362	2.26E-02	-1 6458
ZHEFL1	7	7	9	9	6	6	8	7.345	6.18E-02	-1.2089
ZHEFL2	7	7	9	9	6	5	8	7,103	4835-02	-1.3162
216713	7	7	9	9	6	5	8	7.103	4 83E-02	-1.3162
ZHEIC3	6	9	8	2	9	6	8	6.845	370E-02	-1.4312
MINHER	0	0	0	0	0	0	- 0	0	3.365-05	-4 4743
CALIBRATION TASKS			PSF RA	NKINGS	;			FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000
STP HEOSO1	4	3	6	10	10	8	3	5.362	1.805-02	-1.7447
FERMI RE7	6	7	6	8	6	5	8	6.509	1.32E-02	-1 8794
MINHER	0	0	0	0	0	0	0	0	3.005-05	-4.5229

PERFORMANCE SHAPING FACTORS	
-----------------------------	--

		с	Р			
t	Ρ	ο	R			
N	R	м	0	т		
т	Ε	Р	С	R		
Е	С	L	Ε	A		S
R	E	Ε	D	1		т
F	D	х	U	N	Т	R
A	1	1	R	1	1	Ę
С	N	т	Е	N	м	S
Ε	G	Y	S	G	E	S

INPUT TO RISKMAN FOR HER DISTRIBUTION

				_	•						
OPERATOR ACTION	5		PSF V	Veght	s				RANGE FACTOR	MEDIAN	
ZHEC02	5	5	5	5	5	10	10	45	7.5	1.225-03	
ZHEHM1	5	5	5	5	5	10	10	45	7.5	5.50E-04	
ZHERE8	5	5	5	5	5	10	10	45	5	1.405-02	
ZHEFLI	5	5	5	5	0	10	10	40	5	3.83E-02	
ZHEFL2	5	5	5	5	0	10	10	40	5	2.99E-02	
ZHEFL3	5	5	5	5	0	10	10	40	5	2,996-02	
ZHEC3	5	5	0	0	5	10	10	35	5	2.30E-02	
NORMALIZED PSF WEIGHTS	0.12	0.12	0.10	0.10	007	0 24	0.24	1			

S U M

Regression	Output:	
Constant		-4 47428
Std Err of Y Est		0.338135
R Squared		0.978095
No. of Observations		4
Degrees of Freedon	n	2
X Coefficient(s)	0.444575	

X Coefficient(s) 0.444575 Std Err of Cool. 0.0470447

:

Figure 18: BVPS-1 Post-EPU SLIM Worksheet Group 3

BEAVER VALLEY UNIT 1 - GROUP 4 HUMAN ACTIONS EVALUATION

LOG(HER)

-3 0079

-2.9393

-5.0362

PERFORMANCE SHAPING FACTORS

		С	Р			
1	Р	0	R			
N	R	м	0	т		
T	ε	Р	C	R		
E	С	Ł	ε	A		S
R	Ε	E	D	1		T
F	D	X	U	N	т	R
Α	t	1	R	1	1	E
С	N	т	E	N	м	8
E	G	Y	S	G	Ε	S

E G Y S G E S M

2 8 3 5 6 1 6

4 - 6

0 0 0 0 0 0 0

STP HERC4

MINHER

FERM HECT3

OPERATORACIIONS			∽r KA	annes.				FU	HER	LUGHER
MAXHER	10	10	10	10	10	10	10	10	9.15E-01	-0.0387
ZHEHCI	2	1	2	2	4	0	5	2.83	2.58E-04	-3 5885
ZHEPR1	2	2	2	2	3	0	6	3.108	3.53E-04	-3.4518
ZHECD4	9	2	9	8	8	1	10	7.468	5.10E-02	·1.2922
ZHEMUS	8	6	8	5	8	5	6	6.553	1.80E-02	-1.7451
ZHEMUA	8	6	8	5	8	7	8	7.362	4.52E-02	-1.3449
ZHEOB1	2	6	3	2	4	1	7	4,191	1.225-03	-2.9144
ZHEOA1	2	0	2	0	3	2	7	3,191	3 90E-04	-3 4095
ZHEOT1	0	10	1	2	3	1	6	3.681	6.80E-04	-3.1672
MINHER 		0	0	0	0	0	0	0	1025-05	-4 9895
CALIBRATION TASKS		F	PSF RAI	KINGS				FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000

3 3 3

3 3

		с	Р			
1	Р	0	R			
N	R	м	0	т		
т	ε	Р	С	R		
ε	С	L	Ε	A		S
R	Е	Ε	D	1		т
F	Ð	х	U	N	Т	R
A	1	1	R	t	1	E
С	N	т	Е	N	м	S
Ę	G	Y	S	G	E	S

PERFORMANCE SHAPING FACTORS

INPUT TO RISKMAN FOR HER DISTRIBUTION

OPERATOR ACTIONS			PSF V	VEIGH	- rs				RANGE FACTOR	MEDIAN
ZHEHCI	0	0	0	0	0	0	5	5	10	9 685-05
ZHEPRI	0	0	0	0	0	0	5	5	10	1.33E-04
ZHECD4	5	5	5	5	5	5	10	40	5	3.16E-02
ZHEMU3	5	5	5	5	5	5	10	40	5	1.11E-02
ZHEMU4	5	5	5	5	5	5	10	40	5	2.80E-02
ZHEO81	5	5	5	5	5	5	10	40	7.5	5.75E-04
ZHEOA1	5	5	5	5	5	0	10	35	10	1.46E-04
ZHEOT1	5	0	5	0	5	5	10	30	10	2.55E-04
NORMALIZED PSF	0.13	0.11	0.13	0.11	0.13	0.11	0.30	1		

s U м

WEIGHTS

Regression Output;	
Constant	-4 98954
Std Err of Y Est	0.342488
R Squared	0.981802
No. of Observations	4
Degrees of Freedom	2

4 681 9 825-04

1.15E-03

9.20E-08

3.447

0

Figure 19: BVPS-1 Post-EPU SLIM Worksheet Group 4

BEAVER VALLEY UNIT 1 - GROUP 5 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

		с	Р				
t	Р	0	R				
N	R	м	0	т			
т	E	Ρ	С	R			
E	С	L	E	A		S	
R	E	Е	D	1		т	
F	D	х	U	N	7	R	
A	1	1	R	1	1	E	S
С	N	т	Ε	N	м	S	U
E	G	Y	S	G	E	S	м

- I	Р	0	R				
N	R	м	0	т			
T	E	₽	С	R			
E	С	L	Ε	A		S	
R	Е	E	D	1		T	
F	D	х	U	N	т	R	
A	1	1	R	1	- 1	E	S
С	N	т	E	N	м	S	U
E	G	Y	S	G	E	S	м

PERFORMANCE SHAPING FACTORS С Р

Norm, PSF Weights	0.15	0.15	0.15	0.15	0.15	0.11	0.14	1.00		
OPERATOR ACTIONS			PSFRA	NKINGS	:			FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	997E-01	-0.0012
ZHECC1	2	6	6	7	2	2	5	4.37	4215-03	-2.3761
ZHECC2	2	6	7	7	2	4	6	4.883	6.92E-03	-2.1597
ZHEC12	1	2	4	1	3	3	3	2.403	6.225-04	-3.2081
ZHEHHI	1	7	5	5	2	2	6	4 085	3.13E-03	-2.5049
24042	2	2	3	1	3	1	4	2.325	5.77E-04	-3.2390
ZHEWA1	2	5	4	2	6	2	2	3.344	1.55E-03	-2,8089
ZHEMA2	2	3	1	2	8	2	5	3.325	1.525-03	-2.8172
ZHEOD1	2	3	5	2	5	0	5	3.253	1.42E-03	-2.8473
ZHEP!1	0	0	1	5	3	3	5	239	6.145-04	-3.2116
ZHEPK1	0	1	1	5	3	3	5	2,539	7.10E-04	-3.1488
ZHERE5	1	2	8	9	9	- 4	5	5.487	1.245-02	-1.9050
ZHERR1	2	2	5	5	- 4	2	2	3,195	1345-03	-2.8719
ZHESE1	2	5	2	3	4	3	4	3.292	1.485-03	-2,8309
ZHESL2	3	2	8	5	4	1	8	4.539	4965-03	-2.3049
ZHESL3	7	10	9	9	10	1	10	8.25	184E-01	-0.7353
ZHEWA1	5	5	5	- 4	7	5	4	5.008	7.805-03	-2.1077
ZHEAF1	8	6	2	5	5	3	5	4.929	7.235-03	-2.1408
ZHEDF1	6	1	5	2	6	1	6	3.955	281E-03	-2.5515
ZHEIA1	6	6	6	- 4	4	1	5	4.708	5.84E-03	-2.2337
ZHEIA2	4	6	5	4	4	1	5	4.28	3.78E-03	-2.4227
ZHEIMA	7	7	5	3	4	1	3	4 422	4.425-03	-2.3542
ZHEOS8	2	4	2	5	3	3	2	3.008	1.125-03	-2.9514
ZHEPINA	8	9	8	9	8	7	9	8.331	1.97E-01	-0.7052
MINHER	0	0	0	0	0	0	0	0	603E-05	-4.2198

					-			·		
OPERATOR ACTIONS			PSF	Weig	HTS				RANGE FACTOR	MEDIAN
ZHE001	5	5	5	5	5	5	5	35	7.5	1.995-03
ZHE002	5	5	5	5	5	5	5	35	7.5	3.27E-03
ZHECIZ	5	5	5	5	5	5	5	35	10	2.345-04
ZHEFH	5	5	5	5	5	5	5	35	7.5	1.48E-03
2-12+2	5	5	5	5	5	5	5	35	10	2.17E-04
ZHEMA1	5	5	5	5	5	5	- 5	35	7.5	7.33E-04
ZHEMA2	5	5	5	5	5	5	5	35	7.5	7.19E-04
ZHEO01	5	5	5	5	5	5	5	35	7.5	6.71E-04
ZHEPI1	5	5	5	5	5	5	5	35	10	2.31E-04
ZHEPK1	5	5	5	5	5	5	5	35	10	2.67E-04
ZHERE5	5	5	5	5	5	5	5	35	5	7.71E-03
ZHERRI	5	5	5	5	5	5	5	35	7.5	6.34E-04
ZHESE1	5	5	5	5	5	5	5	35	7.5	6.97E-04
ZHESL2	5	5	5	5	5	5	5	35	7.5	2.345-03
ZHESL3	5	5	5	5	5	5	5	35	3	1.47E-01
ZHEWA1	5	5	5	5	5	5	5	35	7.5	3.69E-03
ZHEAF1	5	5	5	5	5	0	5	30	7.5	342E-03
ZHEDF1	5	5	5	5	5	0	5	30	7.5	1.33E-03
ZHEA1	5	5	5	5	5	0	5	30	7.5	2.76E-03
ZHEA2	5	5	5	5	5	0	5	30	7.5	1.78E-03
ZHEA4	5	5	5	5	5	0	5	30	7.5	2.095-03
ZHEOS8	5	5	5	5	5	0	0	25	7.5	5.28E-04
ZHEPNA	5	5	5	5	5	5	5	35	3	1.58E-01
NORMLAIZED PSF	0.15	0.15	Q.15	0.15	Q.15	0.11	0.14	1		

NORMLAIZED PSF 0.15 0.15 0.15 0.15 0.15 0.11 0.14 WEIGHTS

Figure 20: BVPS-1 Post-EPU SLIM Worksheet Group 5

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INFUT TO RISKMAN FOR HER DISTRIBUTION

RANGE FACTOR	MEDIAN
7.5	1.99E-03
7.5	3.27E-03
10	2.34E-04
7.5	1.48E-03
10	2.17E-04
7.5	7.33E-04
7.5	7.19E-04
7.5	6.71E-04
10	2.31E-04
10	2.67E-04
5	7.71E-03
7.5	6.34E-04
7.5	6.97E-04
7.5	2.345-03
3	1.47E-01
7.5	3.69E-03
7.5	3.42E-03
7.5	1.33E-03
75	2765.03

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CAUETATIONTASIS		F	SFRAN	KNCS				FU	HER	LCQ(HER)
MAXHER	10	10	10	10	10	10	10	10	1.0000-000	0000
STPHECO03	6	5	6	6	8	6	9	6578	4395-02	-1.3335
STPHEOEL1	3	4	5	3	3	4	6	3987	2135-03	-26716
STPHECODI	3	3	6	4	4	2	4	3779	231E-03	-26364
MNHER	0	0	0	0	0	0	0	0	690E05	-4,1612

Regression (). http://www.com/com/com/com/com/com/com/com/com/com/	
Constant		-4.21985
StdErrofYEst		0.098055
RSquared		0,997057
No. of Observations		5
Degrees of Freedom		3
X Coefficient(s) Std Err of Coef.	0.4218417 0.013232	

Figure 20: BVPS-1 Post-EPU SLIM Worksheet Group 5 (continued)

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BEAVER VALLEY UNT 1 - GROUP 6 HUMAN ACTIONS EVALUATION

PETFORMINGE SHIPPING FACTORS

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		I N T E R F A	P R E C E D I	C O M P L E X I	P R O C E D U R	T R I N 1	T	S T R E	S		
Norm PSF Weights 0.00 0.50 0.00 0.00 0.00 0.00 1.00 CPERATORACTIONS PSF RANKINCS FU HER LOC(HER) MAXHER 10 10 10 10 10 10 9985-01 -0.0007 ZHESL1 6 6 6 5 3 3 5 4.5 3385-03 -2.4715 ZHETTI 4 5 2 3 3 7 5 6 1.596-02 -1.7976 MINHER 0 0 0 0 0 0 0 3.21E-05 -4.4930 CAUBRATIONTASKS PSF RAMINCS FU HER LOC(HER) MAXHER 10 10 10 10 10 10.21E-05 -4.4930 MAXHER 10 10 10 10 10 10.21E-05 -0.0000 STP HEDSL1 3 4 5 3 3 4 6 4 213E-03		С	N	Т	Е	N	М	s	U		
OPERATORACTIONS PSF RANKINCS FLI HER LOQI-ER) MAX.HER 10 10 10 10 10 10 10 998E.01 -0.0007 Z-ESL1 6 6 6 5 3 3 5 45 338E.03 -2.4715 Z-ESL1 6 6 6 5 3 3 7 5 6 1.595.02 -1.7976 MINHER 0 0 0 0 0 0 0 321E.05 -4.4230 CAUBRATIONTASKS PSF RANKINCS FU HER LOQI-ER) MAX.HER 10 10 10 10 10 10 100 10 100		E	G	Y	S	G	Е	S	М		
MAX.HER 10 10 10 10 10 10 10 10 10 9986-01 -0.0007 ZHESL1 6 6 6 5 3 3 5 45 3386-03 -24715 ZHESL1 4 5 2 3 3 7 5 6 1.906-02 -1.7976 MNHER 0 0 0 0 0 0 0 321E-05 -4.4930 CAUBRATIONTASKS PSF RANKINGS FU HER LOQHER) MAX.HER 10 10 10 10 10 10 100 0.0000 STP HEOSL1 3 4 5 3 3 4 6 4 213E-03 -26716 DC2/HEOX1(1) 6 6 5 3 3 5 45 320E-03 -26716	Norm PSF Weights	0.00	0.50	0.00	۵۵۵	0.00	0.50	0.00	1.00		
MAX.HER 10 10 10 10 10 10 10 10 10 9986-01 -0.0007 ZHESL1 6 6 6 5 3 3 5 45 3386-03 -24715 ZHESL1 4 5 2 3 3 7 5 6 1.906-02 -1.7976 MNHER 0 0 0 0 0 0 0 321E-05 -4.4930 CAUBRATIONTASKS PSF RANKINGS FU HER LOQHER) MAX.HER 10 10 10 10 10 10 100 0.0000 STP HEOSL1 3 4 5 3 3 4 6 4 213E-03 -26716 DC2/HEOX1(1) 6 6 5 3 3 5 45 320E-03 -26716	OPERATOR ACTIONS		1	PSFRA	NKINGS	;			ស	HER	LOGHER
ZHESL1 6 6 6 5 3 3 5 45 338E-03 -24715 ZHETT1 4 5 2 3 3 7 5 6 1.59E-02 -1.7976 MNHER 0 0 0 0 0 0 0 0 321E-05 -4.4930 CAUBPATIONTASKS PSF RANKINOS FU HER LOC(HER) MAXHER 10 10 10 10 10 10 10 10 0.00000 STPHEOSL1 3 4 5 3 3 4 6 4 213E-03 -26716 DC2/HEDX1(1) 6 6 5 3 3 5 45 320E-03 -24949	MAXHER	10					10	10	10		
MINHER 0 0 0 0 0 0 0 0 321E05 -44300 CAUBRATIONTASKS PSF RANKINGS FU HER LOQHER) MAXHER 10 10 10 10 10 10 10 10 10 10 10 0.00000 STPHEOSL1 3 4 5 3 3 4 6 4 2.13E03 -2.6716 DC2/HEOX1(1) 6 6 5 3 3 5 4.5 3.20E03 -2.4949	ZHESL1	6	6	6	5	3	3	5	4.5	338E-03	
CAUBRATION TASKS PSF RANKINGS FU HER LOQHER) MAXHER 10 10 10 10 10 10 10 0.0000 STPHEOSL1 3 4 5 3 3 4 6 4 2.13E.03 -2.6716 DC2/HEOX1 (1) 6 6 5 3 3 5 4.5 3.20E.03 -2.4949	Z-ETTI	4	5	2	3	3	7	5	6	1.59E-02	-1.7976
MAX.HER 10 10 10 10 10 10 10 10 10 10 100 00000 STP.HEOSL1 3 4 5 3 3 4 6 4 2.13E.03 -2.6716 DC27HEOX1 (1) 6 6 5 3 3 5 4.5 3.20E.03 -2.4949	MNHER	0	0	0	0	0	0	0	0	3.21E-05	-4.4930
STP HEOSL1 3 4 5 3 3 4 6 4 213E03 -26716 DC2/HEOX1 (1) 6 6 6 5 3 3 5 4.5 320E03 -24949	CAUBRATIONTASKS			PSF RA	NVINCS	5			FU	HER	LOQHER)
STP HEOSL1 3 4 5 3 3 4 6 4 213E03 -26716 DC2/HEOX1 (1) 6 6 6 5 3 3 5 45 320E03 -24949	MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0000
	STP HEOSL1	3	4		3		4	6	4		
	DC ZHEOX1 (1)	6	6	6	5	3	3	5	4.5	3205-03	-2.4949
	••	0	O	0	0	0	0	0	0	3.205-05	-4.4949

		C	Р				
1	Ρ	0	R				
N	R	М	0	т			
т	E	Ρ	С	R			
E	С	L	E	Α		S	
R	E	Е	D	I		Т	
F	D	х	U	Ν	Т	R	
Α	1	1	R	1	1	Ε	S
С	N	т	Ε	N	М	S	U
Е	G	Y	S	G	Ε	S	м

PERFORMANCE SHAPING FACTORS

INPUT TO RISKMAN FOR HER DISTRUBITION

	_				•					-	
OPERATOR ACTIONS			PSF	WBG	HTS				RANGE FACTOR MEDIA		
2-ES.1	0	5	o	o	0	5	0	10	7.5	1.596-03	
Z-ETT1	0	5	0	0	0	5	0	10	5	987E-03	
NORMAUZED PSF WEIGHTS	0.00	0.50	0.00	0.00	0.00	0.50	0.00	1			

NOTE	Regression Quiput:	
	Constant	-4.49301
(1) RANKINGS ARE THOSE FOR SIMILAR	Sid Er of Y Est	0.023909
ACTION IN BMI (ZHESLI)	RSquered	0.900008
	No. of Observations	4
	Degrees of Freedom	2

X Coefficient(s) 0.4492291 Std Err of Coef. 0.0033667

Figure 21: BVPS-1 Post-EPU SLIM Worksheet Group 6

BEAVER VALLEY UNT 1 - GROUP 7 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

	I N T E R F A C E	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N I N G	T I M E	S T R E S S	S U M		
Norm PSF Weights	0.10	0.25	0.10	0.10	0.10	0.10	0.25 -	1.00		
OPERATOR ACTIONS			PSFRA	NKINGS	;			FJ	HER	LOQ(HER)
MAXHER	10	10	10	10	10	10	10	10	9.995-01	-0.0005
ZHEO 1	2	5	3	3	5	3	3	3.6	2455-03	-2.6105
ZHE005	1	6	8	5	7	5	8	6.1	2565-02	-1.5910
ZHE082	2	9	3	2	- 4	1	8	5.45	1.39E-02	-1.8560
MNHER	0	0	0	0	0	0	0	0	8.35E-05	-4.0785
CALIERATION TASKS			PSF RA	NKINGS	5			· FU	HER	L03(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000
STP HEOBOZ	4	3	6	4	7	2	8	5.05	8.805-03	-20555
	2	9	3	2	4	1	8	5.45	1.005-02	-2000
OFFRA8(1)	-						-			
OFFA8(1) DC2HE081	5	7	7	6	6	- 4	8	6.55	5405-02	-1.2604

		С	Ρ				
1	Ρ	0	R				
N	R	М	0	т			
т	Ε	Ρ	С	R			
E	С	L	Έ	Α		S	
R	ε	Е	D	1		T	
F	D	х	U	Ν	Т	R	
Α	1	1	R	t	1	ε	S
С	N	Т	Ε	Ν	М	S	Ų
E	G	Y	S	G	ε	S	M

PEFFORMANCE SHAPING FACTORS

INFUT TO RESEMAN FOR HERDISTRIBUTION

OPERATOR ACTIONS	PSFV	NBGH	rs	RANCEFACTOR	MEDIAN					
Z-E01	0	5	0	0	0	0	5	10	7.5	1.165-03
Z1 E005	5	10	5	5	5	5	10	45	5	1.50E-02
216082	5	10	5	5	5	5	10	45	5	8.63E-03
NOTWALLZED PSF WEIGHTS	0,10	025	0.10	0.10	0.10	0.10	025	1		

WEIGHTS

NOTE	Regression Output:				
	Constant	-4.07855			
(1) RANKINGS ARE THOSE FOR SIMLAR	Std Err of Y Est	0.122121			
ACTION IN BV1 (Z)-ECE2)	RSquared	0.99483			
	No. of Observations	5			
	Degrees of Freedom	3			

X Coefficient(s) 0.4078012 Std Err of Coof. 0.0100732

Figure 22: BVPS-1 Post-EPU SLIM Worksheet Group 7

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	PERF	ORMAN	æ shw	PING FA	CTORS					
			с	P						
	1	Р	0	R						
	Ν	R	м	0	T					
	т	E	Р	С	R					
	Ε	С	L	E	•		S			
	R	E	Ε	D	1		т			
	F	D	x	U	N	т	R			
	A	1	E E	R	1	1	E	S		
	С	N	т	ε	N	м	S	U		
	E	G	Y	S	G	E	S	м		
Norm, PSF Weights	0.13	0.13	0.10	0.10	0.11	0.31	0.11	1.00		
OPERATOR ACTIONS			PSF RA	NKINGS			-	ស	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	9 96E-01	-0.0018
ZHEFLA	3	3	3	5	7	- 4	3	3.971	2.34E-03	-2.6305
ZHETT2	4	3	2	3	3	5	3	3 657	1.71E-03	-2.7675
ZHEWA2	6	6	6	7	7	7	5	6.414	2.72E-02	+1.5653
ZHEBV2	3	3	3	- 4	7	2	2	3.129	1.005-03	-2.9980
ZHEBV3	5	7	7	9	9	8	6	7.371	7.11E-02	-1.1479
ZHEBV4	5	6	3	- 4	7	5	5	5 057	6 97E-03	-2.1571
ZHECD1	2	5	8	3	5	2	4	3 657	1.71E-03	-2.7675
ZHECT1	2	6	6	7	2	6	5	5.014	6.67E-03	-2.1758
ZHEIA3	6	6	6	4	4	10	5	6.714	3 685-02	-1.4345
ZHERII	1	0	1	0	0	5	7	26	5.91E-04	-3.2285
2HEIC2	2	6	4	3	- 4	5	4	4.214	2.99E-03	-2.5246
ZHEIC1	6	7	6	2	6	2	3	4.129	2.74E-03	-2.5620
MIN HER	0	0	0	0	0	0	0	0	4.34E-05	-4.3622
CALIBRATION TASKS			PSF RA	NKINGS	5			FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000
FERMI HERS1	2	7	2	3	2	4	6	3.829	1.75E-03	-2.7570
STP HEOSOI	- 4	3	6	10	10	6	3	5.871	1.80E-02	-1.7447
MINHER	ō	ō	ō		0	-	ō	0	4 60E-05	-4.3372

BEAVER VALLEY UNIT 1 - GROUP 8 HUMAN ACTIONS EVALUATION

	ŧ	P	с о	P R					
	Ň	R	м	ò	т				
	т	E	P	č	R				
	Ē	č	L	Ē	Ä		S		
	R	E	E	D	1		т		
	F	D	х	U	Ν	т	R		
	A	1	t	R	1	1	E	S	
	С	N	т	E	N	м	S	U	
	E	G	Y	S	G	E	S	м	
OPERATOR ACTIONS			PSF	WEIG	- HTS				
ZHEFL4	0	0	0	0	o	5	0	5	
	-		-	-			•		

PERFORMANCE SHAPING FACTORS

ZHEFL4	0	0	0	0	0	5	0	5	7.5	1.11E-03
ZHETT2	0	0	0	0	0	5	0	5	7.5	8 07E-04
ZHEWA2	0	0	0	0	0	10	0	10	5	1.69E-02
ZHEBV2	5	5	5	5	5	10	5	40	7.5	4.74E-04
ZHEBV3	5	5	5	0	5	10	5	35	5	4 41E-02
ZHEBV4	5	5	5	5	5	10	5	40	7.5	3 29E-03
ZHECD1	5	5	5	5	5	10	5	40	7.5	8.07E-04
ZHECTI	5	5	5	5	5	10	5	40	7.5	3.15E-03
ZHEIA3	5	5	5	5	5	10	5	40	5	2.28E-02
ZHER!	5	5	5	5	5	10	5	40	10	2.22E-04
ZHEIC2	5	5	Ō	5	5	10	5	35	75	1.41E-03
ZHEIC1	5	5	0	Ō	0	10	Ō	20	7.5	1.29E-03
NORMALIZED PSF	0.13	0.13	0.10	0.10	0.11	0.31	0.11	1		

INPUT TO RISKMAN FOR HER DISTRIBUTION

7.5 1.11E-03

WEIGHTS

.

Regressio	n Output:	
Constant		-4.36218
Std Err of Y Est		0.058576
R Squared		0 999309
No. of Observation	15	4
Degrees of Freedo	2	
X Coefficient(s)	0.43604	
Std Err of Coef.	0.0081103	

Figure 23: BVPS-1 Post-EPU SLIM Worksheet Group 8

BEAVER VALLEY UNT 1- GROUP 9 HUWAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

PETEOR	ANCE SHAFI	NGFACTORS
10101		

	INTERFACE	P R E C E D I N G	C O M P L E X I T Y	PROCEDURES	T R A I N I N G	T I M E	S T R E S S	S U M			
Norm PSF Weights	۵۵	0.17	0.17	0.17	Q17	0.17	017	1.00			
OPERATORACTIONS			PSFRA	NKINGS	, ·		-	FU	HER	LOCE(HER)	
MAXHER	10	10	10	10	10	10	10	10	9985-01	-0003	
Z-ECD5	2	9	5	3	7	2	9	5833	4405-02	-1.3564	
2-6007	2	9	8	5	8	4	9	7.167	120501	-09226	
MNHER	0	0	0	0	0	0	0	0	557E-04	-32542	
CALIBRATIONTASKS			PSF RA	NANCE	\$			FU	HER	LOG(HER)	
MAXHER	10	10	10	10	10	10	10	10	1.000+00	مممه	
STPHEEDUB	6	5	6	6	8	6	9	6.657	4385-02	-1.3585	
EFFR 5H1 (1)	2	9	5	3	7	3	9	6	1.00E01	-1.0000	
MNHER	0	0	0	0	0	0	0	0	520E-04	-3.2840	
NOTE									Regression (ጋቱቱ	
								Constar			-32502
(1) RANKINGSARE TH		RSML	AR					StdEr			0.299842
ACTIONINEVI (2+E	CD6)							RSqua			0.970575
									bervations		4
								Degrees	of Freedom	l	2

		С	Ρ				
1	Р	0	R				
Ν	R	М	0	т			
т	E	Ρ	С	R			
E	С	L	Ε	Α		S	
R	E	Ε	D	1		т	
F	D	х	U	Ν	т	R	
Α	1	I.	R	1	I.	Е	
С	Ν	т	E	N	М	S	
Е	G	Y	S	G	Е	S	

INPUTTORSKMANFOR							
HERDISTREUT	ON						
RANGEFACTOR	MEDIAN						

OPERATORACTIONS			PSF	WBG	RANGE FACTOR MEDIAN					
2-6006	0	5	5	5	5	5	5	30	5	273E-02
2-8007	0	5	5	5	5	5	5	30	3	955602
NORMALIZED PSF	۵۵	Q.17	Q 17	Q.17	0.17	Q.17	0.17	1		

S U м

WEIGHTS

NOTE	Regression Output:				
	Constant	-32542			
(1) RANKINGS ARE THOSE FOR SIMILAR	Std Error Y Est	0.288842			
ACTION IN BVI (Z-ECDS)	RSquared	0.970575			
	No. of Observations	4			
	Degrees of Freedom	2			
					

X Coefficient(s) 0.3253357 Std Err of Coef. 0.0100352

Figure 24: BVPS-1 Post-EPU SLIM Worksheet Group 9

MAXHER

246063

245054

MNHER

MAXHER

MNHER

STP HEORO7

CAUBRATION TASKS

BEAVER VALLEY UNIT 1 - GROUP 10 HUWAN ACTIONS EVALUATION

LOQ(HER) -0.0008

-1.7218

-1.3120

-30008

L00(HIF)

۵۵۵۵

-1.6819

-3.6992

10 9.995-01

6444 4885-02

FU HER

0 200E-04

10 1.00E+00

0 2055-04

5.444 2086-02

1.90E-02

5333

10

6

0

10

,

4

10

10

 $^{\pm 1}$

PERFORMANCE SHARING FACTORS

						_		
Q.11	۵œ	0.22	0.22	Q11	0.22	Q11	1.00	
E	G	Y	S	G	E	S	м	
С	N	Т	E	Ν	м	S	U	
Α	1	1	R	1	1 I	E	S	
F	D	х	υ	Ν	т	R		
R	E	Ε	D	1		т		
Е	С	L	E	Α		S		
Т	E	Ρ	С	R				
Ν	R	м	0	т				
I.	Р	0	R					
		С	Р					
	NTERFACE	N T E C E D I N G	I P O N R M T E P E C L R E E F D X A I I C N T E G Y	I P O R N R M O T E P C E C L E R E E D F D X U A I I R C N T E E G Y S	I P O R N R M O T T E P C R E C L E A R E E D I F D X U N A I I R I C N T E N E G Y S G	I P O R N R M O T T E P C R E C L E A R E E D I F D X U N T A I I R I I C N T E N M E G Y S G E	I P O R N R M O T T E P C R E C L E A S R E E D I T F D X U N T R A I I R I I E C N T E N M S E G Y S G E S	I P O R N R M O T T E P C R E C L E A S R E E D I T F D X U N T R A I I R I I E S C N T E N M S U E G Y S G E S M

10 10 10

10 10

1

1

10 10 10

7 5 3

7 5 3 8 8

PSF RANKINGS

10

7

7

0 0 0 0 0

10

5 4 7 4 6 5 6

0 0 0 0 0 0

		С	Р			
T.	P	0	R			
Ν	R	м	0	T		
Т	Ε	Р	С	R		
Ε	С	L	E	Α		S
R	E	E	D	1		Т
F	D	х	U	N	Т	R
Α	1	1	R	1	1	Ε
С	Ν	т	Е	Ν	М	S
Е	G	Y	S	G	E	S

PETFORMANCE SHAPING FACTORS

INFUT TO RISKWINFOR HERDISTREUTION

· · · · · ·										-
OPERATORACTIONS	;		PSF	WBG	hts				RANGEFACTOR	MEDIAN
ZHE053	5	0	10	10	5	10	5	45	5	1.185-02
2-6064	5	0	10	10	5	10	5	45	5	302E-02
Norwuzed PSF Weights	0.11	۵۵	022	0.22	Q11	022	Q11	1		

S U M

Regression Output:	
Constant	-3.68877
StdErdYEst	0.001415
RSquered	1
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s) 0.3338144 Std Err of Coef. 0.0001939

Figure 25: BVPS-1 Post-EPU SLIM Worksheet Group 10

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BEAVER VALLEY UNIT 1 - GROUP 11 HUWAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

			•	~						
		_	c	P						
	1	P	0	R	-					
	N T	R E	M P	o c	T R					
	•			-			_			
	E	C	L	E	A		S			
	R	E	E	D	1	-	T			
	F	D	x	U	N	T	R	-		
	A	1	1	R	1	1	E	S		
	С	Ν	т	E	N	м	S	U		
	Ę	G	Y	S	G	E	S	M		
								••		
Nom PSF Weights	0.13	0.13	025	011	Q13	0.13	0.13	100		
OPERATOR ACTIONS			PSF RA					FU	HER	LOC(HER)
MAXHER	10	10	10	10	10	10	10	10	990E-01	-00006
Z-EOF1	5	5	5	5	4	0	2	3851	1.325-04	-3.6810
ZHEOF2	5	5	5	5	4	2	3	4.234	2295-04	-36383
Z-EOF3	5	6	5	5	6	2	5	4.872	580E-04	-3255
ZHEOF4	5	6	5	5	4	2	4	4.489	332E-04	-3.4782
ZHEOF5	5	6	5	5	6	2	5	46/2	580E-04	-3265
ZHEXTI	8	9	10	1	4	5	8	7	1285-02	-1 8938
MNHER	0	0	0	0	0	0	0	0	4886-07	-6.3114
CALIBRATION TASKS			PSF RA	NKINGS	5			ស	HER	LOG(HER)
									4 0000 000	
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0000
SEABROOKON	0	0	1	0	2	0	0	0.511	1.005-05	-60000
MNHER	0	0	0	0	0	0	0	0	500E-07	-63010

		С	Ρ			
1	P	0	R			
N	R	М	0	т		
т	Е	Ρ	С	R		
Ε	С	L	E	Α		S
R	E	Ε	D	I		Т
F	D	х	U	Ν	т	R
Α	1	1	R	1	I	Ε
С	Ν	т	Е	N	М	S
Е	G	Y	S	G	E	S

PETFORMANCE SHAPING FACTORS

 INPUT TO RISKMA	
RANCE FACTOR	MEDIAN

OPERATOR ACTIONS	5		PSF	WEIG	HTS					RANCE FACTOR	MEDIAN
ZHEOF1	5	5	10	5	5	5	5		40	10	494E-05
Z1-ECF2	5	5	10	5	5	5	5		40	10	861E-05
2HEOF3	5	5	10	5	5	5	5		40	10	2186-04
Z-EOF4	5	5	10	5	5	5	5		40	10	1.2E04
ZHEOF5	5	5	10	5	5	5	5		40	10	2.18E-04
ZHEXTI	5	5	10	0	5	5	5	· · · · · ·	35	5	7.91E-03
NORMALIZED PSF WEIGHTS	Q 13	Q 13	028	Q11	Q 13	Q 13	Q 13		1		

S U M

Regression Output:	
Constant	-6.31136
Std Err of Y Est	0.015023
RSquared	0,9999991
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s) 0.631081 Std Err of Coef. 0.0018862

.

Figure 26: BVPS-1 Post-EPU SLIM Worksheet Group 11

BEAVER VALLEY UNIT 1 - GROUP 12 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

	I N T E R F A C	P R E C E D I N	C O M P L E X I T	P R O C E D U R E	T R A I N I N	T I M	STRES	SU		
	E	G	Ŷ	s	G	E	s	м		
	-	Ŭ	•	Ŭ	Ŭ	-	Ŭ			
Norm, PSF Weights	0.22	Q 11	022	0.11	0.11	Q.11	0.11	1.00		
OPERATOR ACTIONS MAX HER 2-ECP3 2-ECP4 2-ECP4 2-ECSF	10 9 9 9	10 8 5 5	PSF RA 10 8 9 9	NKINGS 10 5 4 4	10 2 4 4	10 5 5 5	10 6 8 8	FLI 10 6.887 6.899 6.899	HER 9.325-01 3.375-02 4.205-02 4.205-02	LOG(HER) -0.0308 -1.4725 -1.3764 -1.3764
MINHER	0	0	0	0	0	0	0	0	4.405-05	-4.3553
CALIBRATION TASKS			PSF RA	NKINGS	;			FU	HER	LOQHER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.0000
BIG ROCK BR5	6	5	6	5	6	5	6	5.667	1.40E-02	-1.8539
BIG ROOK L2C	4	4	4	4	4	5	4	4.111	100E-03	-3000
SEQUOYAH CT1	2	3	5	0	4	2	2	2,778	180E-03	-27447
MNHER	0	0	0	0	0	0	0	0	3755-05	-4 4200

PERFORMANCE SHAPING FACTORS

		С	Р				
1	Р	0	R				
N	R	м	0	т			
्र	E	Р	С	R			
E	С	L	Е	Α		S	
R	E	E	D	1		т	
F	D	x	U	N	т	R	
A	1	1	R	1	1	ε	
С	N	т	Е	N	м	S	
Ε	G	Y	s	G	E	S	

INPUT TO RISKMAN FOR HER DISTRIBUTION RANGE FACTOR MEDIAN

OPERATOR ACTIONS	6		PSF	Weg	HTS				RANGE FACTOR	MEDIAN
245073	10	5	10	5	5	5	5	45	5	200E-02
Z-ECR4	10	5	10	5	5	5	5	45	5	2.60E-02
ZHECSF	10	5	10	5	5	5	5	45	5	2605-02
NORWALIZED PSF WEIGHTS	0.22	Q 11	0.22	Q11	Q.11	0.11	Q 11	1		

S U M

Regression O	.tpit:	
Constant		-4.35825
Std Er of Y Est		0.343813
R Squared		0.900676
No. of Observations		5
Degrees of Freedom		3
•		
X Coefficient(s)	0.432552	

 X cosmoleni(s)
 0.43252

 Sid Err of Coaf.
 0.0463692

Figure 27: BVPS-1 Post-EPU SLIM Worksheet Group 12

-

BEAVER VALLEY UNIT 1 - GROUP 13 HUWAN ACTIONS EVALUATION

PERFORMINGE SHIPPING FACTORS

$\begin{array}{cccccccccccccccccccccccccccccccccccc$
N R M O T T E P C R E C L E A S R E E D I T F D X U N T R A I I R I I E S C N T E S U N T R A I I R I I E S U E G Y S G E S M Norm PSF Weights 0.06 0.03 0.09 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWKINCS FU HER LO201 MAXHER 10 10 10 10 10 10 9656501 0.02
T E P C R E C L E A S R E E D I T F D X U N T R A I I R I I E S C N T E N M S U E G Y S G E S M Norm PSF Weights 0.06 0.03 0.06 0.03 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWKINCS FU HER LO201 MAX HER 10 10 10 10 10 10 10 9656-01 0.02
E C L E A S R E E D I T F D X U N T R A I I R I E S C A I I R I E S U E G Y S G E S M Norm PSF Weights 0.06 0.06 0.06 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWKINCSS FU HER LOQ0 MAX HER 10 10 10 10 10 10 9656-01 0.00
R E E D I T F D X U N T R A I I R I I E S C N T E N M S U E G Y S G E S M Norm PSF Weights 0.08 0.08 0.08 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWKINCSS FU HER LOQ0 MAX.HER 10 10 10 10 10 10 10 9656-01 0.02
F D X U N T R A I I R I I E S C N T E N M S U E G Y S G E S M Norm PSF Weights 0.08 0.08 0.08 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWHXINCSS FLI HER LOCQI 0.00 MAX HER 10 10 10 10 10 10 10 10 10
A I I R I I E S C N T E N M S U E G Y S G E S M Norm PSF Weights 0.08 0.08 0.08 0.27 0.27 0.14 1.00 OPPERATORACTIONS PSF RWHXINCSS FU HER LOGGI MAX.HER 10 10 10 10 10 10 10
C N T E N M S U E G Y S G E S M Norm PSF Weights 0.08 0.08 0.08 0.27 0.27 0.14 1.00 OPERATORACTIONS PSF RWWINCSS FLI HER LOGI 0.00 LOGI MAX.HER 10 10 10 10 10 10 10 10 20
E G Y S G E S M Norm PSF Weights 0.08 0.08 0.08 0.03 0.27 0.27 0.14 1.00 OPERATORACTIONS PSF RWWINCSS FU HER LOG(1) MAX.HER 10 10 10 10 10 10 9656-01 -0.00
Norm PSF Weights 0.08 0.08 0.08 0.27 0.27 0.14 1.00 OPERATOR ACTIONS PSF RWWINGSS FU HER LOG(1) MAX HER 10 10 10 10 10 10 9665-01 0.00
OPERATOR ACTIONS PSF RWWINGS FLI HER LOQI MAX.HER 10 10 10 10 10 10 9656-01 0.0
OPERATOR ACTIONS PSF RWWINGS FLI HER LOQI MAX.HER 10 10 10 10 10 10 9656-01 0.0
MAXHER 10 10 10 10 10 10 10 10 9695-01 -0.0
MAXHER 10 10 10 10 10 10 10 10 9695-01 -0.0
ZHEPAE 8 6 8 5 8 7 8 7.324 511E02 -1.2
MNHER 0 0 0 0 0 0 0 0 1636-05 -47
CAUBRATION TASKS PSF RANKINGS FLI HER LOGI
MAXHER 10 10 10 10 10 10 10 10 10 10 10 10 10
MAXHER 10 10 10 10 10 10 10 10 10 10 10 10 SEQUOYAHFLPHOCR 4 1 3 0 4 4 5 3.466 5.80E-04 -3.2
SEQUOYAH FLPHOOR 4 1 3 0 4 4 5 3.456 580E.04 -32
SEQUOYAHFLPHOR 4 1 3 0 4 4 5 3466 580E04 32 SEQUOYAHFLABOC 6 8 0 8 4 4 6 4757 440E03 -23

PETFORMANCE SHAPING FACTORS

		С	Р				
1	P	0	R				
N	R	м	0	т			
т	E	Р	С	R			
E	С	L	E	Α		S	
R	E	Ε	D	1		т	
F	D	х	U	Ν	Т	R	
A	t I	1	R	I	1	Ε	
С	N	т	E	N	м	S	
Ε	G	Y	S	G	Е	S	

INPUT TO RISKWIN FOR HER DISTRIBUTION

OPERATOR ACTIONS	3		PSF	weig	HTS				RANCE FACTOR	MEDIAN
216073	3	3	3	3	10	10	5	37	5	3 176-02
NORWILLZED PSF WEIGHTS	0.08	0.08	0.08	0.08	027	0.27	Q 14	1		

S U M

Regression Output:	
Constant	-4.73865
Std Errof Y Est	0.123435
RSquered	0.995087
No. of Observations	6
Degrees of Freedom	4

X Coefficient(s) 0.477516 Std Err of Coef. 0.0167764

Figure 28: BVPS-1 Post-EPU SLIM Worksheet Group 13

BEAVER VALLEY UNIT 1 - GROUP 14 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

			•	-						
		_	C	P						
	1	P	0	R	_					
	N	R	M	0	T					
	т	E	Р	С	R					
	Ε	С	L	Ë	Α		S			
	R	Έ	Έ	D	1		Т			
	F	D	х	U	Ν	Т	R			
	A	1	1	R	1	1	Ε	S		
	С	N	т	Е	N	м	S	U		
	Е	G	Y	S	G	E	S	м		
Nom PSF Weights	Q 13	Q 13	Q.13	Q 13	0.26	0.08	0.13	1.00		
OPERATOR ACTIONS			PSF RA	NKINGS				FU	HER	LOC(HER)
MAXHER	10	10	10	10	10	10	10	10	9.595-01	-0.0182
ZHENSF	8	6	8	5	4	4	5	5.579	658E-03	-2.1819
MNHER	0	0	0	0	0	0	Ō	0	1.225-05	-4.9123
• <u> </u>										<u></u>
CALIBRATION TASKS			PSF RA	NKINGS	5			FU	HER	LOC(HER)
MAXHER	10	10	10	10	10	10	10	10	1.005+00	مممع
PLGCAL31	6	5	6	5	6	5	6	5658	1.405-02	-18539
PLGCAL32	4	4	4	4	4	5	4	4079	1.005-03	-30000
PLGCAL33	7	6	7	6	7	6	6	6526	2505-02	-1 6021
PLGCAL 34	9	8	9	9	9	9	9	8838	1.50E-01	-0.8239
MNHER	0	0	0	0	0	0	0	0	1.00E-05	-5.000

PERFORMANCE SHAPING FACTORS

		С	Ρ			
1	Ρ	0	R			
Ν	R	М	0	т		
т	Е	Ρ	С	R		
E	С	L	E	Α		S
R	Ε	E	D	I.		т
F	D	х	U	N	т	R
Α	t	1	R	t	1	E
С	Ν	т	E	N	М	S
Ε	G	Y	S	G	E	S

INPUT TO RISKMAN FOR HER DISTRIBUTION

OPERATOR ACTION	3		PSF	WEIG	HTS				RANCE FACTOR	MEDIAN
Z-IENSF	5	5	5	5	10	3	5	38	7.5	3115-03
NORWALIZED PSF WEIGHTS	0.13	Q 13	0.13	0.13	025	0.08	013	1		

S U M

Regression Quiput:	
Constant	-4.91226
Std Err of Y Est	0209032
RSquared	0,9886556
No. of Observations	6
Degrees of Freedom	4

X Coefficient(s) 0.489409 Std Err of Coef. 0.0261659

Figure 29: BVPS-1 Post-EPU SLIM Worksheet Group 14

BEAVER VALLEY UNT 1 - GROUP 15 HUMAN ACTIONS EVALUATION

FEFFORMANCE SHAFING FACTORS

PETFORMANCESHAPINGFAC	RRE
-----------------------	-----

	I NT ERFACE	P R E C E D I N G	C O M P L E X I T Y	PROCEDURE S	TRAINING	T I M E	S T R E S S	S U M		
Norm PSF Weights	0.11	Q11	022	Q11	Q11	022	Q11	1.00		
offeritoractions Maxher 2-Ext2 MNHER	10 8 0	10 9 0	PSF RA 10 10 0	NKINCE 10 1 0	10 4 0	10 9 0	10 9 0	FU 10 7.667 0	HER 9955-01 1,285-01 1,545-04	LOC(1+EF) -0.0022 -0.8911 -3.8117
CALIERATIONTASKS			PSFRA	NKINGE	5			RJ	HR	LCC(HER)
MAXHER DC2HEOSI STPHEORO7 MNHER	10 2 7 0	10 2 5 0	10 1 5 0	10 5 4 0	10 5 5 0	10 3 6 0	10 4 6 0	10 2889 5.444 0	1.00E+00 1.50E-03 208E-02 1.75E-04	00000 -28239 -1.6819 -3.7570

		С	Ρ				
1	Р	0	R				
Ν	R	М	0	т			
т	E	Ρ	С	R			
Е	С	L	Е	Α		S	
R	Έ	E	D	1		т	
F	D	х	U	Ν	Т	R	
Α	I	t	R	1	1	Ε	S
С	Ν	т	Е	Ν	м	S	U
E	G	Y	S	G	E	S	м

					INPUT TORSKAP HERDISTREUTIK				
		PSF	weg	HTS				RANGEFACTOR	MEDIAN
5	5	10	5	5	10	5	45	3	1.03501
111	0.11	022	011	Q11	022	0.11	1		

NORMALZED PSF 0.11 0.11 0.22 0.11 WEIGHTS

CHERATORACTIONS

ZHEXT2

RegressionOutput	
Oorstart	-3.81172
SdErdYEst	0.0999955
RSpared	0.997603
Na of Observations	4
Degrees of Freedom	2

X Coefficient(s) 0.380360 Std Err of Coef. 0.0132029

Figure 30: BVPS-1 Post-EPU SLIM Worksheet Group 15

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.

Attachment 3 to RAI 2.a.

BVPS-2 Pre-EPU SLIM Worksheets

	PERF	ORMAN	ICE SH	APING	FACTO	RS						PERF	ORMAN	CE SH	APING I	FACTO	ORS	
	I N T E R F A C E	P R E C E D I N G	COMPLEXITY	P R O C E D U R E S	T R A 1 N 1 N G	T I M E	S T R E S S	S U M				INTERFACE	P R E C E D I N G	COMPLEXITY	PROCEDURES	T R A I N I NG	T I E	S T R E S S
Norm PSF Weights	0.116	0 233	0.116	0.116	0.116	0.233	0.07	1										
OPERATOR ACTIONS MAX HER	PSF RANKINGS 8 8 8 8 8 8 8					8	FU 8	HER 4 80E-01	LOG(HER) -3.195-01	OPERATOR ACTIONS		F	SFWE	ights				
ZHEPR1 ZHESM1 ZHEWA1	2 5 7	8 8 8	4	2 5 5	3 5 5	9 7 6	6 5 5	565 6.05 640	3.44E-02 5.36E-02 7 93E-02	-1.46E+00 -1.27E+00 -1.10E+00	ZHEPR1 ZHESM1 ZHEWA1	5 5 5	10 10 10	5 5 5	5 5	5 5	10 10	5
ZHEWA3 ZHEWA5	777	8 8	777	5 7	5 10	6	5 6	6.40 7.28	7.93E-02 2.14E-01	-1.10E+00 -6.70E-01	ZHEWA3 ZHEWA5	5	10 10 10	5 5 5	5 5 5	5 5 5	10 10 10	0 0 5
MIN HER	2	2	2	2	2	2	2	2	5.72E-04	-3.24E+00	NORMALIZED PSF WEIGHTS	0.116	0.233 (0.116 (0.116 0	.116	0.233	0 07
CALIBRATION TASKS		1	PSF RA	NKNG	3			FU	HER	LOG(HER)	neg no							
MAX HER FERMI OE1 STP HEOR05 MIN HER	8 4 7 2	8 6 7 2	8 4 8 2	8 4 5 2	8 5 8 2	8 4 8 2	8 4 6 2	8 4 5814 7.1628 2	1.00E+00 4.31E-03 1.24E-01 1.00E-03	0.00E+00 -2.37E+00 -9.07E-01 -3.00E+00								
MUTHER	2			2			2	2	1.002-03	-3002-00								
								Constant Std Err o R Square No. of Cl	r Y Est	put: -4 2167171 0 411007816 0 939482569 4 2								
								X Coeffic Std Err o		0.487245984 0.087443826								

Beaver Valley Unit 2 – Group 1 Human Actions Evaluation

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Figure 31: BVPS-2 Pre-EPU SLIM Worksheet Group 1

	PERF	ORMAN	ICE SH	aping	FACTO	RS				PERFORMANCE SHAPING FACTORS									
	I N T E R F A C E	P R H C H D I N G	COMPLEXITY	PROCEDURES	T R A I N I N G	T I M	STRESS	S U M				I N T E R F A C E	P R E C E D I N G	COMPLEXITY	PROCEDURES	T R A I N I N G	T I M E	STRESS	S U M
Norm PSF Weights	0_111	0.111	0.222	0.111	0.111	0 222	0.111	1			•								
OPERATOR ACTIONS MAX HER	10	PSF F	RANKAN 10	iGS 10	10	10	10	FU 10	HER 1.545-01	LOG(HER) -8, 13E-01	OPERATOR ACTIONS		1	PSFW	BGHTS	i			
ZHEOS1 ZHEOS2 ZHEOS3	1	7 8 8	7 8 8	6 8 8	9 9 9	3 4 5	4 5 7	5.2222 6.1111 6.5556	1.045-02 1.715-02 2.205-02	-1.98E+00 -1.77E+00 -1.66E+00	2HEOS1 2HEOS2 2HEOS3	5 5 5	5 5 5	10 10 10	5 5 5	5 5 5	10 10 10	5 5 5	45 45 45
ZHEOS4 ZHESL4	1 2	8 8	8 8	8 9	9 9	8 7	8 8	7.3333 7.3333	341E-02 341E-02	-1 47E+00 -1.47E+00	ZHEOS4 ZHESL4	5 5	5 5	10 10	5 5	5 5	10 10	5 5	45 45
ZHEXT2 ZHEXT4 MINHER	8 8 0	9 9 0	10 10 0	1 5 0	4 4 0	9 9 0	9 9 0	7.6067 8.1111 0	4.12E-02 5.29E-02 5.44E-04	+1.39E+00 +1.28E+00 -3.26E+00	ZHEXT2 ZHEXT4	5 5	5 5	10 10	5 5	5 5	10 10	5 5	45 45
											NORMALIZED PSF WEIGHTS	0.111	0.111	0.222	0.111	0.111	0.222	2111	1
CALIBRATION TASKS	··	PSFI	RANKIN	GS				FU	HER	LOG(HER)									
MAX HER DC 22-EOS1 EPRI L1 (1) STP HEORO7 MIN HER	10 2 1 7 0	10 2 8 5 0	10 1 8 5 0	10 5 8 4 0	10 5 9 5 0	10 3 4 6 0	10 4 5 6 0	10 2.8889 6.1111 5.4444 0	5 00E-01 1.50E-03 2.00E-03 2.08E-02 1.50E-03	-3 01E-01 -2.82E+00 -2.70E+00 -1.68E+00 -2.82E+00									
NOTE: (1) RANKINGS ARE THOSE FOR SIMLAR						Constant Std Err o	l Y Est	-3 264095629 0 69738723											
ACTION IN BV2 (ZHEOS2)									ed oservations of Freedom	0.69679788 5 3									
								X Coeffic Std Err o		0 245075073 0.093336437									

Beaver Valley Unit 2 – Group 2 Human Actions Evaluation

Figure 32: BVPS-2 Pre-EPU SLIM Worksheet Group 2

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	PER	ORMA	NCE SH	aping	FACT	ORS						PERFO	ORMAI	NCE SH	APING	FACTO)RS		
	I N T ER F A C E	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A † N I N G	T I M E	STRESS	S U M				INTERFACE	P R E C E D † N G	C O M P L E X ! T Y	PROCEDURES	T R A I N I N G	T I M E	STRESS	S U M
Norm PSF Weights	0.111	0 056	0.111	0.111	0.167	0 222	0.222	1											<u> </u>
OPERATOR ACTIONS MAX HER 2HEFL2 2HERES MN HER	10 4 1 0	PSF 10 1 2 0	RANKI 10 8 8 0	VCS 10 5 9 0	10 10 9 0	10 8 7 0	10 8 7 0	FU 10 7.1667 6.7222 0	HER 2.16E-01 6.70E-02 5.58E-02 3.47E-03	LOG(HER) -8 66E-01 -1.17E+00 -1.25E+00 -2.46E+00	OPERATOR ACTIONS 2HEFL2 2HERE6	5 5	0 5	PSFWt 5 5	BGHTS 5 5	10 5	10 10	10 10	45 45
				Ŭ			•		3472-00		NORMALIZED PSF WEIGHTS	0.111	0.056	0.111	0.111	0.167	0 222	0.222	1
CALIBRATION TASKS	PS	FRAN	KINGS					ស	HER	LOG(HER)	WEIGHTS								
MAX HER STP HEOSO1 FERMI RE7 MIN HER	10 6 6 0	10 4 7 0	10 6 6 0	10 3 8 0	10 10 6 0	10 10 5 0	10 3 8 0	10 6 4444 6.50 0	1.00E+00 1.80E-02 1.32E-02 8.00E-03	0.00E+00 -1.74E+00 -1.88E+00 -2.10E+00									
								Constan Std Err o R Squan No, of O	of Y Est ed bservations of Freedom clent(s)	ut -2.45904629 0.74585100 0.60132401 4 2 0.179351546 0.10326328									

Beaver Valley Unit 2 – Group 3 Human Actions Evaluation

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Figure 33: BVPS-2 Pre-EPU SLIM Worksheet Group 3

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	PERF	ORMAN	ICE SH	aping	FACTO	RS						PERF	ORMAN	ICE SH	APINGI	FACTO	RS		
	I N T E R F A C E	P R E C E D I N G	C O M P L E X I T Y	PROCEDURES	T R A I N I N G	T I M	S T R E S S	S U M				I N T E R F A C E	P R E C E D I N G	COMPLEXITY	P R O C E D U R E S	T R A I N I N G	T 1 E	STRESS	S U M
Norm PSF Weights	0.125	0.125	0.125	1125	0.125	0.125	025	1		. <u> </u>									
OPERATOR ACTIONS MAX HER 2-EMU1 2-EMU2 2-EMU3 2-EMU3 2-EWU4 2-EWM1 MN HER CAUBRATION TASKS MAX HER STP HERC4 TM HLTB (1) FERM HECT3	10 2 2 2 2 2 2 2 0 0	10 4 4 5 0 F 10 2 4 6	SF RA 10 8 8 8 8 8 8 0 2SF RA 10 1 8 3	10 4 4 6 0 NKING 10 8 4 3	10 6 6 6 0 5 5 3	10 3 7 9 0 0 10 6 4 3	10 8 8 8 8 0 10 6 8 3	FU 10 5.38 5.88 6.13 5.38 0 FU FU 10 4.625 5.50 3.50	HER 1.76E-01 5 97E-03 5 97E-03 8 60E-03 1.03E-02 5 97E-03 1.17E-04 HER 1.00E-01 9 82E-04 6 24E-02 1.15E-03	LOC(HER) -7.55E-01 -2.22E+00 -2.22E+00 -2.92E+00 -3.93E+00 -2.22E+00 -3.93E+00 LOC(HER) -1.00E+00 -3.01E+00 -1.20E+00 -2.94E+00	OPERATOR ACTIONS Z-FEMU1 Z-FEMU3 Z-FEMU3 Z-FEMU4 Z-FEWM1 NORMALIZED PSF WEIGHTS	5 5 5 5 0.125	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5 5 5 5	5 5 5 5 5	5 5 5 5 0.125	10 10 10 10 10 0.25	40 40 40 40 40
MINHER	0	0	0	0	0	0	0	0	1.00E-04	-4 00E+00									
NOTE: (1) RANKINGS ARE THOSE FO ACTION IN BV2 (2HEML2)	R SIMLAR							Constant Std Err o R Squan No. of O	of Y Est ed bservations of Freedom cient(s)	tput -3 90053070 0.66739322 0.79766960 5 3 0.3174877722 0.092318066									

Beaver Valley Unit 2 – Group 4 Human Actions Evaluation

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Figure 34: BVPS-2 Pre-EPU SLIM Worksheet Group 4

ACTION IN BV2 (ZHECDI)										ient(s)	0 433127309									
ACTION IN BV2 (2HEOR2) RANKINGS ARE THOSE FI	OR SIMILAR	1								of Freedom	8 6	•								
RANKINGS ARE THOSE FI	OR SIMILAR	1							R Squara	d	0.747130953									
) RANKINGS ARE THOSE F(ACTION IN BV2 (2HEOR1)	OK SIMILAR								Constant Std Err o		-4 34244300 0.792487245									
INTES:										Regression Cu	PLE -4 34244300									
AN HER		_	• •			o 	•	•	0	100E-04	-4 00E+00									
STPHEOCO1	5		3 3			•	4	4	372	231E-03	-264E+00									
STP HEOSLI	5		3 4			-	3	6	3 87	213E-03	-267E+00									
MI HCDI (3)	2		4 3	3	. :	2	3	4	3 01	1.27E-04	-3 90E+00									
TP HEODOS	ē		6 6				8	9	6 57	4 38E-02	-1.36E+00									
M HSR2 (2)	2		i i				2	5	343	1.27E-04	-3 90E+00									
M HSR1 (1)	2		3 5			•	5	5	3 85	474E-02	-1 325+00									
AXHER	10	,	0 10	10	1	0 1	0	10	10	9 00E-01	-4 58E-02									
ALIBRATION TASKS	Pt	e Ra	NKINCE	1					FU	HER	LOG(HER)	WEIGHTS								
	•		• •	•		-	-	-				NORMLAIZED PSF	0 145	0 145	0 14	0 145	Q.14	0.14	0.145	
WNHER			o d				ò	ō.	.	455E-05	-4 34E+00		•		•				-	
ZHETBI (ZHEICI)	2		7 1	2			;	2	2 67	7925-04	-3 10E+00	2HET81 (2HEICI)	5	5	5	5	5	5	5	
DESL2 DESL3	3 7	1	28	5	1			в 10	4 57 8 02	4 33E-03 1.35E-01	-2.36E+00 -8.69E-01	27ESL2 27ESL3	5	5	- 7 5	5	5		5	
DESES	5		4 9	-	1		1 2	5	414	2 62E-03	-2 55E+00	2-6565	5	5	5	5	5	5	5	
DHESE2	3		7 1	-		-	1	2	2 67	7 92E-04	-3 10E+00	ZHESE2	5	5	5	5	5	5	5	
HERR2	2		2 5	-			2	2	314	104E-03	-2 98E+00	2467692	5	5	5	5	5	5	5	
HERRI	2		2 5				2	2	314	104E-03	-2 98E+00	2HERR1	5	5	5	5	5	5	5	
HERED	1		2 2		2	-	1	2	2 30	4 48E-04	-3 35E+00	24ERED	5	5	5	5	5	5	5	
HERES	1		26				2	5	5 13	7 54E-03	-2 12E+00	2HERE5	5	5	5	5	5	5	5	
34EP11	0		0 1	5	:		2	5	2 29	440E-04	-3 35E+00	2HEP11	5	5	5	5	5	5	5	
HEOSS	1		4 2				2	5	2 85	7 88E-04	-3 10E+00	246095	5	- 5	0	5	5	5	5	
HEOR2	2	1	3 5	3			5	5	3 85	210E-03	-2 68E+00	ZHEOR2	5	5	5	5	5	5	5	
HEORI	2	;	3 5	3	- 1	د ا	2	5	3.43	1 38E-03	-2 88E+00	2HEOR1	5	5	5	5	5	5	5	
HEOF2	2		1 1	2	:	2 '	1	5	2 01	3 37E-04	-3 47E+00	2HEOF2	5	5	5	5	5	5	5	
HEOFT	2		4 5	2			2	5	3 29	1205-03	-2 9CE+00	2HEOF1	5	5	5	5	5	5	5	
HEODI	ž	1		2		5	1	5	3 28	120E-03	-2 SCE+00	2-E001	5	5	5	5	5	5	5	
76081	5		3 5	3		3	7	6	4 57	4 31E-03	-2 37E+00	216081	5	5	5	5	5	5	5	
HEWA2	2		6 5	-	- 4		5	6	4 99	6 50E-03	-2 18E+00	ZHEMA2	5	5	5	5	5	5	5	
HEH2	2		2 3	1	:		-	4	2.57	\$ 57E-04	-3 23E+00	2-0+2	5	5	5	5	5	5	5	
HEHHI	1	1		5		2 4	-	6	4 30	379E-03	-2 48E+00	2-0+1	5	5	5	5	5	5	5	
54EFL1	2	1		- 4	7		•	3	4 28	325E-03	-2 49E+00	246711	5	5	5	5	0	0	5	
DECS1	3	1		7	7		-	6	6 14	206E-02	-1 69E+00	ZHECS1	5	5	5	5	5	5	5	
HECIZ	1	1		1	3		-	3	242	505E-04	-3 30E+00	24602	5	5	5	5	5	5	5	
HECC2	2	1		5			-	4	470	4 93E-03	-2 31E+00	Z-ECC2	5	5	5	5	5	5	5	
CHECO1	2		4 3	3	- 1			4	3 01	9 10E-04	-3 04E+00	ZHECD1	5	5	5	5	5	5	5	
CHECC2	5		67	7	- 2		-	6	4 67	5 82E-03	-2 24E+00	2-ECC2	5	5	5	5	5	5	5	
SHECC1	2			7	- 1	-	2	5	4 30	3 31E-03	+2.48E+00	ZHEOCT	5	- 5	- 5	- 5	5	5	5	
CHEAFJ (ZHEMA1)	2	1	3 3	2	- 2			2	201	3 36E-04	-3 47E+00	ZHEAFS (ZHEMAI)	5	5	5	5	- 5	5	5	
DHEAF2	2	:	3 3	2	- 1			2	201	3.36E-04	-3 47E+00	246452	5	5	- 5	5	5	- 5	5	
MAX HER	10	10) 10	10	10) 10	5 1	10	10	975E-01	-1 12E-02									
OPERATOR ACTIONS			PSFR	ANKINC	3				FU	HER	LOG(HER)	OPERATOR ACTIONS		1	PSFW	DGHTS				
Iom PSF Weights	0 145	0 14	5 0 14	0 145	0 14	1 014	014	<u> </u>	1											_
·	E			-		-	-	•					E	u	•	3	u	E	3	
	c	. N		E	N			5 5	U				C E	N	Ť	E	N G	M	5 8	
	A	1		R	1	1		E	5					1	1	R			- E	
	F	0) X	U	N) Т		R					F	D	x	U	N	T	R	
	R	E	-	0	1			τ					R	E	E	D			Ť	
	£	c	: L	E				5					ε	C	L	E	•		8	
	T	E	P	C	R								T	E	P	С	R			
	N	R	: м	0	т								N	R	M	0	T			
	1	P	0	R									1	P	0	R				
			c	Ρ											С	P				
	100	(1013														
	PEN	ORM	ANCE S	HAPINO	FAC	TORS							PERF	ORMAN	ICE SH	APING	FACTO	RS		

Beaver Valley Unit 2 – Action Group 5 Human Actions Evaluation

	PERF	ORMAI	NCE SH	aping	FACTO	RS						PERF	ORMAN	ICE SH	aping	FACTO	ORS		
	I N T E R F A C E	P R E C E D - N G	COMPLEXITY	P R O C E D U R E S	T R A I N I N G	T I M E	S T R E S S	S U M				I NTERFACE	P R E C E D I N G	COMPLEXITY	P R O C E D U R E S	T R A I N I N G	T I M E	STRESS	S U M
PSF Weights	0.143	0.143	0.143	0.143	0.143	0	0 286	1											
OPERATOR ACTIONS MAX HER	10	1 10	PSF RA 10	NKING 10	S 10	10	10	FU 10	HER 3.745-01	LOG(HER) -4.27E-01	OPERATOR ACTIONS		F	PSF WE	BGHTS				
ZHEOA1	2	0	2	0	3	2	7	300	3 84E-03	-2.42E+00	ZHEOA1	5	5	5	5	5	0	10	35
MNHER	0	0	0	0	0	0	0	0	5.395-04	-3.27E+00	NORMALIZED PSF WEIGHTS	0.143	0.143	0.143	0.143 (0.143	0.00	0 296	1
CALIBRATION TASKS	PS	RANK	INGS					FU	HER	LOG(HER)									
Max Her DC 2HEOE1 (1) FERMI HERBI2 MIN HER	10 2 3 0	10 0 4 0	10 2 3 0	10 0 3 0	10 3 5 0	10 2 5 0	10 7 8 0	10 3.00 4.86 0	5 00E-01 1.70E-03 1.18E-02 1.00E-03	-3 01E-01 -2.77E+00 -1.93E+00 -3.00E+00									
NOTE									Regression O	tot.									
(1) RANKINGS ARE THOSE FOR ACTION IN BV2 (2HEOA1)	R SIMILAR								of Y Est ed bservations of Freedom clent(s)	-3.2683E+00 3.2749E-01 9.5216E-01 4 2.000000 0.284162745 0.045039059									

Beaver Valley Unit 2 – Action Group 6 Human Actions Evaluation

Figure 36: BVPS-2 Pre-EPU SLIM Worksheet Group 6

	PERF	ORMAN	ice sh	WPING	FACTO	RS						PERF	ORMAN	ICE SH	APING	FACTO	RS		
	I N T E R F A C E	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N I NG	T I M	S T R E S S	S U M				1 N T E R F A C E	P R E C E D - N G	C O M P L E X I T Y	PROCEDURES	T R A N N G	T I M	STRESS	S U M
Nom: PSF Weights	0.12	0.24	0.14	0.12	0.12	Q 12	0.14	1											
OPERATOR ACTIONS		I	SFR∕	NKING	s			FU	HER	LOG(HER)	OPERATOR ACTIONS	5	1	PSF WE	BGHTS				
MAXHER	10	10	10	10	10	10	10	10	5.29E-01	-2.76E-01									
ZHECD5	1	5	8	5	6	2	8	5.08	1.84E-02	-1.74E+00	ZHECOS	5	10	5	5	5	5	10	45
ZHECI1	1	5	7	3	2	5	2	3.77	7.52E-03	-2.12E+00	ZHEC(1	5	10	10	5	5	5	5	45
ZHEA2	3	7	2	2	2	5	6	4.24	1.04E-02	•1.98E+00	ZHEIA2	5	10	5	5	5	5	5	40
ZHEIA3	3	8	7	9	9	9	6	7.35	8.67E-02	-1.05E+00	ZHEA3	5	10	5	5	5	5	5	40
2HEOB2	5	9	5	3	3	7	8	6.14	3.78E-02	-1.42E+00	ZHE082	5	10	5	5	5	5	5	40
Z-IESE3	2	9	1	2	5	1	6	4.35	1.12E-02	-1.95E+00	ZHESE3	5	10	5	5	5	5	5	40
ZHESE4	2	9	2	2	7	1	6	4.73	1.45E-02	-1.84E+00	ZHESE4	5	10	5	5	5	5	5	40
ZHETB2 (ZHEIC2)	2	9	1	2	5	1	6	4.35	1.12E-02	-1.95E+00	ZHETB2 (ZHE)C2)	5	10	5	5	5	5	5	40
ZHETB3	2	9	2	2	7	1	6	4.73	1.45E-02	-1.84E+00	ZHETB3	5	10	5	5	5	5	5	40
MINHER	0	0	0	0	0	0	0	0	5.73E-04	-3.24E+00	NORMALIZED PSF	0 122	0 243	0.135	0 122	122	0 122 1	0 135	1
					_						WEIGHTS								·
CALIBRATION TASKS		I	PSF R4	NKING	s			FU	HER	LOG(HER)									
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.00E+00									
STP HEOB02	6	- 4	2	3	4	7	8	4.76	8.80E-03	-2.06E+00									
OPRA-8 (1)	5	9	5	3	3	7	6	5.86	1.00E-02	-2.00E+00									
DC ZHEOB1	7	- 5	4	7	6	6	8	6.00	5.49E-02	-1.26E+00									
MIN HER	0	0	0	0	0	0	0	0	1.00E-03	-3.00E+00									
NOTE									Regression C	utrut									
(1) RANKINGS ARE THOSE FO ACTION IN BV2 (ZHEOB2)	OR SIMLAR							Constant Std Err o R Squan No. of O	t (YEst	-3.242184578 0.3969998645 0.90510960 5 3									
								X Coeffic Std Erro	• •	0.29657300 0 055441061									

Beaver Valley Unit 2 – Action Group 7 Human Actions Evaluation

Figure 37: BVPS-2 Pre-EPU SLIM Worksheet Group 7

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	PERF	ORMAN	ICE SH	APING I	ACTO	RS						PEF	FORMA	VCE SH	APING	FACTO	RS		
	INTERFACE	P R E C E D I N G	C O M P L E X 1 T Y	P R O C E D U R E S	T R A 1 N t N G	T I M E	STRESS	S U M				I N T E R F A C E	ECEDIN	C O M P L E X † T Y	P R O C E D U R E S	T R A I N I N G	T I M E	S T R E S S	S U M
Norm. PSF Weights	0.128	0.128	0.128	0.116_0	. 116	0.258_	0.128	1											
OPERATOR ACTIONS MAX HER	10	10	10	NKINGS 10	10	10	10	FU 10	HER 3.53E-01	LOG(HER) -4.53E-01	OPERATOR ACTIONS			PSF WE				_	
2+ECD3 2+ECD4 2+EIA1	2 2 1	3 5 3	3 8 2	2 5 5	2 6 2	1 4 7	5 7 3	2.38 5.12 3.76	1.46E-03 1.04E-02 3 91E-03	-2.64E+00 -1.96E+00 -2.41E+00	ZHÉCD3 ZHECD4 ZHEA1		555	5 5 5	5 5 5	5 5 5	10 10 10	5 5 5	40 40 40
2-EOT1 2-EREE 2-ER11 2-ESE1 (2-EOC1, 2-EOC2)	1 1 2	0 2 0 4	1 2 1 2	0 6 0	0 2 0	5 4 5 7	6 5 7 5	2.30 3.23 2.43 4.03	1.37E-03 2.68E-03 1.51E-03 4.79E-03	-2.86E+00 -2.57E+00 -2.82E+00 -2.32E+00	27E0T1 27EREE 27ER1 27ER1 27ESE1 (27E0C1, 27E0C	20 5 21 5	555	5 5 5 5	0 5 5 5	5 5 5 5	10 10 10 10	5 5 5	35 40 40 40
2+ESL1 2+ESL5 2+EWA2	2 2 2	1 4 3	5 5 7	2 2 4	3 4 2	, 7 8 5	6 8 5	4.16 5.17 4.15	5.25E-03 1.09E-02 5.20E-03	-2.28E+00 -1.96E+00 -2.28E+00	2+ESL1 2+ESL5 2+EWA2	~, (55 55	555	5 5 5 5	5 5 0	10 10 10	555	40 40 35
ZHEWA4 MIN HER	2	6 0	7 0	7	10 0	5 0	6 0	5.94 0	1.89E-02 2.61E-04	-1.72E+00 -3.58E+00	ZHEWA4			5	5	5	10	5	40 1
CALIBRATION TASKS		 	PSF RA	NKINGS	;			ณ	HER	LOG(HER)	WEIGHTS								
MAX HER STP HEOSL1 FERMI HERS1 STP HEOSO1 DC 2HEOX1 (1) MN HER	10 5 2 6 2 0	10 3 7 4 1 0	10 4 2 6 5 0	10 3 3 2 0	10 3 2 10 3 0	10 3 4 10 7 0	10 6 3 6 0	10 3.77 3.78 6.50 4.16 0	1.00E+00 2.13E-03 1.75E-03 1.80E-02 3.20E-03 1.00E-03	0.00E+00 -2.67E+00 -2.76E+00 -1.74E+00 -2.49E+00 -3.00E+00									
NOTE: (1) RANKINGS ARE THOSE FI ACTION IN BV2 (ZHESL1)	OR SIML	AR						Constan Std Err o R Squar No. of O	of Y Est ed bservations of Freedom cient(s)	Aput: -3 583059882 0.455189834 0.867599013 6 4 0.31302434 0.061141234									

Beaver Valley Unit 2 – Action Group 8 Human Actions Evaluation

Figure 38: BVPS-2 Pre-EPU SLIM Worksheet Group 8

	PERFO	DRMAN	CESH	APING	FACTO	RS						PERF	DRMAN	ICE SH	APING	FACTO	RS		
	INTERFACE	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N I N G	T I M	S T R E S S	S U M				INTERFACE	P R E C E D I N G	COMPLEXITY	PROCEDURES	T R A I N I N G	T I M	S T R E S S	S U M
Norm PSF Weights	0	0.176	0.176	0.176	0.176	0.118	0.176	1			e	<u></u>							
OPERATOR ACTIONS MAX HER 2HECOB 2HECO7 2HECVA6 MIN HER	10 2 2 2 0	F 10 9 4 0	SF RA 10 3 8 5 0	NKINGS 10 3 5 4 0	5 10 7 8 5 0	10 3 4 2 0	10 9 9 1 0	FLI 10 5.82 7.35 3.59 0.00	HER 6.285-01 7.655-02 1.655-01 2.485-02 4.055-03	LOG(HER) -2.02E-01 -1.12E+00 -7.82E-01 -1.61E+00 -2.39E+00	OPERATOR ACTIONS ZHECD3 ZHECD7 ZHEVA45 MORMALIZED PSF	0 0 0	5 5 5	SF WE 5 5	5 5 5 5 0.176	5 5 5	5 5 0	5 5 5	30 30 25
CALIBRATION TASKS	PSF	RANK	INGS					FU	HER	LOG(HER)	WEIGHTS	U	U 170	0.170	J. 170 (11/0		11/0	1
MAX HER STP HECO03 EPRI SHI (1) MIN HER NOTE: (1) RANKINGS ARE THOSE FOR: ACTION IN BV2 (ZHECO5)	10 6 2 0 Similar	10 1 6 9 0	0 6 3 0	10 5 3 0	10 6 7 0	10 8 3 0	10 9 9 0	Constant Std Err o R Square No. of O	YEst	0 00E+00 -1.36E+00 -1.00E+00 -2.30E+00 -2.392031371 0.333302955 0 9151131 4 2									
								X Coeffic Std Err o		0.219017541 0.047167948									

Beaver Valley Unit 2 – Action Group 9 Human Actions Evaluation

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Figure 39: BVPS-2 Pre-EPU SLIM Worksheet Group 9

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	PER	ORMA	NCE SI	APING	FACTO	ORS	•					PERF	ORMA	NCE SH	APING	FACTO	ORS	
	INTERFACE	P R U C U D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N G	T I M E	STRESS	S U M				I N T E R F A C E	P R E C E D I N G	COMPLEXITY	P R O C E D U R E S	T R A I N I N G	T I M E	STRESS
Norm PSF Weights	0.14	0.14	0.29	0.00	0.14	0.14	0.14	1	_	<u></u>	<u> </u>							
OPERATOR ACTIONS			PSF R/	NKINC	s			FU	HER	LOG(HER)	OPERATOR ACTIONS			PSF W	BGHT	5		
MAXHER	10	10	10	10	10	10	10	10	9.96E-01	-1.78E-03								
ZHEXTI	8	9	10	1	- 4	5	8	7.71	3.56E-02	•1.45E+00	ZHEXT1	5	5	10	0	5	5	5
MNHER	0	0	0	0	0	0	0	0.00	4.67E-07	-6.33E+00	NORMALIZED PSF WEIGHTS	0.14	0.14	0.29	0.00	0.14	0.14	0.14
CAUBRATION TASKS	PS	FRAN	KINGS					FU	HER	LOG(HER)	WEIGHTS							
MAXHER	10	10		10	10	10		10	1.00E+00	0.0000								
SEABROOK ON	0	0	1	0	2	0	0	0.5714	1.00E-06	-6.0000								
MINHER	0	0	0	0	0	0	o	0	5.00E-07	-6.3010								
									Regression O.	tput:								
<u> </u>									of Y Est ed bservations	-6.33E+00 4.29E-02 0.999927115 3								
								-	of Freedom	1								
								X Coeffic Std Err (0 632865998 0.005403158								

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Beaver Valley Unit 2 – Group 10 Human Actions Evaluation

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Figure 40: BVPS-2 Pre-EPU SLIM Worksheet Group 10

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Attachment 4 to RAI 2.a.

BVPS-2 Post-EPU SLIM Worksheets

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L-05-140 Enclosure 1, Attachment 4 Page 2 of 12

BEAVER VALLEY UNIT 2 - GROUP 1 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

	INTERFACE	P R E C E D I N G	C O M P L E X I T Y	P R O C E D U R E S	T R A I N I N G	T I M E	S T R E S S	S U M		
Norm PSF Weights	0.116	0.233	0.116	0.116 (0.116	0.233	0.07	1		
OPERATOR ACTIONS		F	SFRA	NKING	s			ស	HER	LOG(HER)
MAXHER	8	8	8	8	8	8	8	8	4.80E-01	-3.195-01
ZHEFRI	2	8	4	2	3	8	6	5.42	2.655-02	-1.58E+00
ZHESMI	5	8	4	5	5	7	5	6.05	5.36E-02	-1.27E+00
ZHEWA1	7	8	7	5	5	6	5	6.40	7.93E-02	-1.10E+00
ZHEWA3	7	8	7	5	5	6	5	6.40	7.90E-02	-1.10E+00
ZHEWA5	7	8	7	7	10	6	6	7.28	2.145-01	-6.70E-01
MNHER	2	2	2	2	2	2	2	2	5.725-04	-3.24E+00
CALIBRATION TASKS		F	×SF RA	NKING	5			FU	HER	LOG(HER)
MAXHER	8	8	8	8	8	8	8	8	1.00 E+ 00	0.00E+00
FERM OE1	4	6	4	4	5	4	4	4.5814	4.31E-03	-2.37E+00
STP HEOR05	7	7	8	5	8	8	6	7.1628	1.245-01	-9.07E-01
MNHER	2	2	2	2	2	2	2	2	1.005-03	-3.00E+00

		С	Ρ			
I -	Ρ	0	R			
N	R	м	0	т		
Т	Ε	Ρ	С	R		
E	С	L	Е	Α		S
R	Е	Е	D	1		Т
F	D	х	U	Ν	Т	R
Α	1	1	R	1	1	Е
С	N	т	Ε	N	М	S
E	G	Y	S	G	ε	S

PERFORMANCE SHAPING FACTORS

INPUT TO RISKMAN FOR HER DISTRIBUTION

OPERATOR ACTIONS		P	sfwei	GHTS					RANGE FACTOR	MEDIAN
ZHEPR1	5	10	5	5	5	10	5	45	5	1.64E-02
ZHESMI	5	10	5	5	5	10	5	45	5	3.32E-02
ZHEWA1	5	10	5	5	5	10	0	40	5	4.91E-02
ZHEWA3	5	10	5	5	5	10	0	40	5	4.91E-02
ZHEWAS	5	10	5	5	5	10	5	45	3	1.71E-01
NORWAUZED PSF WEIGHTS	0.116 (0.233 0	.116 0	116 0	116 0).233 (0.07	1		

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Regression O	utput:
Constant	-4.2167171
StdErrofYEst	0.411007816
R Squared	0.939482569
No. of Observations	4
Degrees of Freedom	2
X Coefficient(s)	0.487245984
Std Err of Cool.	0.087443826

Figure 41: BVPS-2 Post-EPU SLIM Worksheet Group 1

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BEAVER VALLEY UNIT 2 - GROUP 2 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

		с	Р				
I.	Ρ	0	R				
N	R	М	0	Т			
т	Ε	Р	С	R			
Е	С	L	E	Α		S	-
R	Е	Е	D	1		т	-
F	D	Х	υ	N	Т	R	
Α	1	1	R	1	1	Ε	
С	N	т	E	N	м	S	
E	G	Y	S	G	ε	S	

s U М

Norm PSF_Weights	0.111	0.111	0 222	0.111	0.111	0 222	0.111	1		
OPERATOR ACTIONS		PSF	RANKIN	IGS				FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.54E-01	-8.13E-01
ZHEO\$1	1	7	7	6	9	5	4	5.6667	1.33E-02	-1.88E+00
ZHEOS2	1	8	8	8	9	2	5	5.6667	1.33E-02	-1.88E+00
ZHEO\$3	1	8	8	8	9	3	7	6.1111	1.71E-02	-1.77E+00
ZHEOS4	1	8	8	8	9	8	8	7.3333	3.41E-02	-1.47E+00
ZHESL4	2	8	8	9	9	5	8	6.8889	2.66E-02	-1.58E+00
ZHEXT2	8	9	10	1	4	9	9	7.6667	4.12E-02	-1.39E+00
ZHEXT4	8	9	10	5	4	9	9	8.1111	5.29E-02	-1.28E+00
MINHER	0	0	0	0	0	0	0	0	5.44E-04	-3.26E+00
	Ŭ	Ŭ	Ŭ	Ū	Ŭ	Ŭ	Ŭ	v	0.412.04	-0.202.00

CALIBRATION TASKS		PSF R	ankin	GS				FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	5.00E-01	-3.01E-01
DC ZHEOS1	2	2	1	5	5	3	4	2.8889	1.50E-03	-2.82E+00
EPRI L1 (1)	1	8	8	8	9	4	5	6.1111	2.00E-03	-2.70E+00
STP HEOR07	7	5	5	4	5	6	6	5.4444	2.08E-02	-1.68E+00
MINHER	0	0	0	0	0	0	0	0	1.50E-03	-2.82E+00

	E R	Ċ	L E	E D	A		S T			
	F A C F		X 1 T Y	U R E S	N I N G	Т 1 М Е	R E S S	S U M		
					<u> </u>	_			INPUT TO RISKMAN HER DISTRIBUTIO	
OPERATOR ACTIONS		P		GHTS					RANGE FACTOR	1
ZHEOS1	5	5	10	5	- 5	10	5	45	5	. (
ZHEOS2	5	5	10	5	5	10	5	45	5	- 8
ZHEOS3	5	5	10	5	5	10	5	45	5	
745054			40	5	6	10	=	45	£	

ZHEOS4 ZHESL4	5 5	5 5	10 10	5 5	5 5	10 10	5 5	45 45	5 5	2.11E-02 1.65E-02
ZHEXT2	5	5	10	5	5	10	5	45	5	2.55E-02
ZHEXT4	5	5	10	5	5	10	5	45	5	3.28E-02
NORMALIZED PSF WEIGHTS	0.111 0	.111 (0.222 0	.111 0	.111 (0.222 (.111	1		

NOTE:	Regression Output:					
	Constant	-3.264095629				
(1) RANKINGS ARE THOSE FOR SIMILAR	Std Err of Y Est	0.69738723				
ACTION IN EV2 (ZHEOS2)	R Squared	0 69679788				
	No. of Observations	5				
	Degrees of Freedom	3				
	X Coefficient(s)	0.245075073				

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X Coefficient(s)	0.245075073
Std Err of Coef.	0.093336437
Sid en or Coer.	0.050500437

Figure 42: BVPS-2 Post-EPU SLIM Worksheet Group 2

PERFORMANCE SHAPING FACTORS С

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RISKMAN FOR

MEDIAN

8 26E-03

8 26E-03

1.06E-02

BEAVER VALLEY UNIT 2- GROUP 3 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

		С	Р				
1	Р	ŏ	R				
Ň	R	м	ö	т			
T	E	P	č	Ř			
Ε	С	L	Ε	A		S	
R	Ε	Ε	D	T		т	
F	D	х	U	Ν	Т	R	
Α	1	1	R	1	1	E	S
С	Ν	Т	E	Ν	М	S	U
Ε	G	Y	S	G	E	S	М

Norm PSF Weights	0.111	0.056	0111	0.111	0.167	0222	0222	1		
OPERATORACTIONS		PSFF	SANKI N	ß				ณ	HER	LCC(HER)
MAXHER	10	10	10	10	10	10	10	10	2165-01	-6.665-01
ZHEFL2	4	1	8	5	10	8	8	7.1667	670E-02	-1.17E+00
2-6763	1	2	8	9	9	8	7	6.9444	6.125-02	-1.21E+00
MNHER	0	0	0	0	0	0	0	0	347E-03	-246E+00
								_		
CAUBRATIONTASKS	PS	FRANK	INGS					ស	HER	LCC(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0.00 E+ 00
STP HEOSON	6	4	6	3	10	10	3	6.4444	1.805-02	-1.74E+00
FEFM RE7	6	7	6	8	6	5	8	6.50	1.32E-02	-1.89E+00
MNHER	0	0	0	0	0	0	0	0	800E-03	-2.10E+00

	I N T E R F A C E	PRECEDING	C O M P L E X I T Y	PROCEDURES	T R A I N I N G	T I M E	S T R E S S	S U M	INFULTORSYMAN HERDISTRBUIC	
OPERATORACTIONS		F	SFWE	BGHIS	;				RANCEFACTOR	MEDIAN
2-157-22 2-157-55	5 5	0 5	5 5	5 5	10 5	10 10	10 10	45 45	5 5	4.155-02 3.795-02
NORMALIZED PSF	0.111 0	1058 (2111 (0111 (0.167 (0222 (0222	1		

PERFORMANCE SHAFING FACTORS

WEIGHTS

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Regression Outpu	t
Constant	-245904629
StdErdfYEst	0,74585100
RSquared	0.60132401
No. of Observations	4
Degrees of Freedom	2

X Coefficient(s)	0,179351546
Sid Errof Opef.	0.10326328

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Figure 43: BVPS-2 Post-EPU SLIM Worksheet Group 3

BEAVER VALLEY UNIT 2 - ACTION GROUP 4 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

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Norm PSF Weights	0.125 (2.125 (125 (0.125 (125 (1125	0.25	1		
OPERATOR ACTIONS		F	SFRA	NKING	3			ស	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.76E-01	-7.56E-01
ZHEMUT	2	4	8	4	6	2	8	5.25	5.45E-03	-2.20E+00
ZHEMLE	2	4	8	4	6	2	8	5.25	5.45E-03	-226E+00
Z-EMJ3	2	4	8	4	6	5	8	5.63	7.17E-03	-2.14E+00
2HEMU4	2	4	8	4	6	7	8	5.88	8.60E-03	-2.07E+00
ZHEWM1	2	5	8	6	6	0	8	5.38	5.97E-03	-2.225+00
MNHER	0	0	0	0	0	0	0	0	1.175-04	-3.93E+00
CALIERATION TASKS	<u> </u>	 F	SFRA	NANCE	3			ัณ	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E-01	-1.00E+00
STPHERC4	3	2	1	8	5	6	6	4.625	9.82E-04	-3.01E+00
TM HLTIB(1)	2	4	8	4	6	4	8	5.50	6.245-02	-1.20E+00
FERM HECT3	4	6	3	3	3	3	3	3.50	1.15E-03	-294E+00
MNHER	0	0	0	0	0	0	0	0	1.005-04	-4.00E+00

PERFORMANCE SHAPING FACTORS

		С	Ρ				
1	Ρ	0	R				
Ν	R	М	0	Т			
Т	Ε	Ρ	С	R			
E	С	L	E	Α		S	
R	E	E	D	1		т	
F	D	х	U	N	т	R	
Α	1	1	R	1	1	Ε	
С	N	т	Ε	N	М	S	
E	G	Y	S	G	Ε	S	

INPUT TO RISKMAN FOR HERDISTRIBUTION

OPERATOR ACTIONS		P	SFWE	GHTS				RANGE FACTOR	MEDIAN	
21-EMU1	5	5	5	5	5	5	10	40	7.5	2575-03
2HEM 2	5	5	5	5	5	5	10	40	7.5	2575-03
ZHEMUS	5	5	5	5	5	5	10	40	7.5	3.38E-03
2HBM.14	5	5	5	5	5	5	10	40	7.5	4.065-03
Z-EVMI	5	5	5	5	5	5	10	40	7.5	2.825-03
NORWAUZED PSF WEIGHTS	0.125 0	0.125 0	.125 (1125 0	125 0	125	0.25	1		

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NOTE	Regression O.	tput;
	Constant	-3.93053070
(1) RANKINGS ARE THOSE FOR SIMILAR	Std Err of Y Est	0.66739322
ACTION IN BV2 (ZHEMU2)	R Squared	0.79766860
	No. of Observations	5
	Degrees of Freedom	3
	X Coefficient(s)	0.317487722
	Std Err of Coef.	0.092318066

Coefficient(s)	0.317487722
Err of Coef.	0.092318066

Figure 44: BVPS-2 Post-EPU SLIM Worksheet Group 4

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	PERFORMANCE SHAPING FACTORS		PERFORMANCE SHAPING FACTORS
	CP POR TEPCR ECLEAS TECLEAS TECLEAS T TEDINTR FOXUNTR FOXUNTEN GYSGES	. S . U . M	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
Norm. PSF Weights	0.145 0.145 0.14 0.145 0.14 0.14 0.145	1	HER DISTRIBUTION
OPERATOR ACTIONS	PSF RANKINGS	FLI HER LOG(HER)	OPERATOR ACTIONS PSF WEIGHTS RANGE FACTOR MEDIAN
MAXHER	10 10 10 10 10 10 10	10 9.75E-01 -1.12E-02	
ZHEAF2	2 3 3 2 2 0 2	2.01 3.36E-04 -3.47E+00	ZHEAF2 5 5 5 5 5 5 5 35 10 1.26E-0
ZHEAF3 (ZHEMA1)	2 3 3 2 2 0 2	2.01 3.36E-04 -3.47E+00	ZHEAF3 (ZHEMA1) 5 5 5 5 5 5 5 5 5 35 10 1.26E-0
ZHEOC1	2 6 6 7 2 2 5	4.30 3.31E-03 -2.48E+00	ZHECC1 5 5 5 5 5 5 5 35 7.5 1.56E-C
ZHECC2	2 6 7 7 2 4 6	4 87 5.82E-03 -2.24E+00	ZHECC2 5 5 5 5 5 5 5 35 7.5 2.75E-0
ZHECD1	2 4 3 3 2 1 4	2.73 6.88E-04 -3.16E+00	ZHECD1 5 5 5 5 5 5 5 5 35 10 2.58E-0
ZHECD2	2 5 8 5 6 1 4	4.42 3.73E-03 -2.43E+00	ZHECD2 5 5 5 5 5 5 5 35 7.5 1.76E-0
ZHECI2	1 2 4 1 3 3 3	2.42 5.05E-04 -3.30E+00	ZHECI2 5 5 5 5 5 5 5 35 10 1.90E-0
ZHECS1	3777776	6.28 2.37E-02 +1.62E+00	ZHECS1 5 5 5 5 5 5 5 35 5 1.47E-0
ZHEFL1	2764713	4.28 3.25E-03 -2.49E+00	ZHEFL1 5 5 5 5 0 0 5 25 7.5 1.53E-0
ZHEHHI	1 7 5 5 2 2 6	4.02 2.49E-03 -2.60E+00	ZHEHH1 5 5 5 5 5 5 5 35 7.5 1.18E-0
ZHEH+12	2 2 3 1 3 1 4	2.29 4.44E-04 -3.35E+00	ZHENH2 5 5 5 5 5 5 5 35 10 1.67E-0
ZHEMA2	2 6 5 3 8 5 6	4.99 6.56E-03 -2.18E+00	ZHEMA2 5 5 5 5 5 5 5 35 7.5 3.10E-0
ZHEOB1	5 3 5 3 3 7 6	4.57 4.31E-03 -2.37E+00	ZHEOB1 5 5 5 5 5 5 5 35 7.5 2.04E-0
ZHEOD1	2 3 5 2 5 0 5	3.14 1.04E-03 -2.98E+00	ZHEOD1 5 5 5 5 5 5 5 35 7.5 492E-0
ZHEOF1	2 4 5 2 3 4 5	3.57 1.59E-03 -2.80E+00	ZHEOF1 5 5 5 5 5 5 5 5 35 7.5 7.51E-C
ZHEOF2	2 1 1 2 2 3 5	2.29 446E-04 -3.35E+00	ZHEOF2 5 5 5 5 5 5 5 5 35 10 1.67E-0
ZHEOR1	2 3 5 3 4 0 5	3.15 1.05E-03 -2.98E+00	ZHEOR1 5 5 5 5 5 5 5 5 35 7.5 4.94E-0
ZHEOR2	2 3 5 3 4 5 5	3 85 2.10E-03 -2.68E+00	ZHEOR2 5 5 5 5 5 5 5 35 7.5 993E-0 ZHEOS5 5 5 5 5 5 5 30 10 296E-0
ZHEOS5	1 4 2 2 4 2 5 0 0 1 5 3 2 5	2.86 7.885-04 -3.105+00	
ZHEP11 ZHERE5	1 2 8 9 9 3 5	2.29 4.46E-04 -3.35E+00 5.27 8.67E-03 -2.06E+00	ZHEP1 5 5 5 5 5 5 35 10 1.675-0 ZHERE5 5 5 5 5 5 5 35 7.5 4.095-0
ZHERED	1 2 2 6 2 3 2	2.58 5.93E-04 -3.23E+00	ZHERED 5 5 5 5 5 5 5 5 3 3 7.5 400-4
ZHERR1	2 2 5 5 4 2 2	3.14 1.045-03 -2.985+00	ZHEREI 5 5 5 5 5 5 5 5 3 3 10 22254
ZHERR2	2 2 5 5 4 2 2	3.14 1.04E-03 -2.98E+00	ZHERR2 5 5 5 5 5 5 5 5 35 7.5 489E4
ZHESE2	2 7 1 2 5 1 2	2.87 7.92E-04 -3.10E+00	ZHESE2 5 5 5 5 5 5 5 35 10 2.97E-0
ZHESE5	5 4 5 2 7 1 5	4.14 2.82E-03 -2.55E+00	ZHESE5 5 5 5 5 5 5 5 5 3 3 7.5 1.33E4
ZHESL2	3 2 8 5 4 0 8	4.29 3.28E-03 -2.48E+00	ZHESL2 5 5 5 5 5 5 5 35 7.5 1.55E4
ZHESL3	7 10 9 9 10 0 10	7.88 1,18E-01 -9.29E-01	ZHESL3 5 5 5 5 5 5 5 35 3 9.41EC
ZHET81 (ZHEIC1)	2 7 1 2 5 1 2	2.87 7.92E-04 -3.10E+00	ZHETB1 (ZHEIC1) 5 5 5 5 5 5 5 5 35 7.5 3.74E-C
MINHER	0 0 0 0 0 0	0 4.55E-05 -4.34E+00	NORMLAIZED PSF 0.145 0.145 0.14 0.145 0.14 0.145 1 WEIGHTS

BEAVER VALLEY UNIT 2 - ACTION GROUP 5 HUMAN ACTIONS EVALUATION

Figure 45: BVPS-2 Post-EPU SLIM Worksheet Group 5

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OUBRATIONTASIS	PSF	RANK	NGS					FU	HR	LCQHER)
MAXHER	10	10	10	10	10	10,	10	10	900E01	-4595602
TMHERI(1)	2	3	5	3	4	5	5	385	474E02	-1.32 E+ 00
TMH5P2(2)	2	3	5	3	4	2	5	343	1.27E04	-390E+00
SIPHECOUS	6	6	6	5	6	8	9	657	433E02	-1.3 3E+ 00
TMHODI(3)	2	4	3	3	2	3	4	301	1.27E04	-390 E+ 00
STPHEORI	5	3	4	3	3	3	6	387	213E03	-267E+00
STPHECODI	6	3	2	3	4	4	4	372	231E03	-264 E+00
MNHER	0	0	0	0	0	0	0	0	1.005-04	-4.005+00
NOTES				RigessionQutat						
(1) RANKINGSARETHOER	RSMLAR							Constant		-4.34244300

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(1) PANKINGSAFETH DEEFORSMLAR ACTIONINB/2 (2) FEORI) (2) PANKINGSAFETH DEEFORSMLAR ACTIONINB/2 (2) FEOR2) (3) PANKINGSAFETH DEEFORSMLAR ACTIONINB/2 (2) FEOD)
 Regression Output:

 Constant
 -4.34244300

 Sch Ein of YEst
 0.752487245

 RSqueed
 0.74713263

 Na of Observations
 8

 Degrees of Freedom
 6

 XCoefficient(s)
 0.433127339

 Sch Ein of Observations
 0.403127339

 Sch Ein of Observations
 0.10287016

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Figure 45: BVPS-2 Post-EPU SLIM Worksheet Group 5 (continued)

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NOTE

(1) RANKINGS AFETH DEFORSIMLAR

ACTIONINE (ZHEDAT)

BEAVER VALLEY UNT 2- ACTION GROUP 6 HUWAN ACTIONS EVALUATION

FEFFORMINGESHARINGFACTORS

		С	Ρ			
1	Ρ	0	R			
Ν	R	М	0	Т		
Т	E	Ρ	С	R		
Е	С	L	Е	Α		S
R	Ε	Ε	D	1		т
F	D	Х	U	N	т	R
Α	I.	T	R	1	I.	Ε
С	Ν	т	E	N	М	S
E	G	Y	S	G	Е	S

S Ū М

PSFW8gtts	0.143 (143_0	143 (143_0	143	0 0	1286	1		
OPERATORACTIONS		F	SF RAI	VANCE	5			ស	HER	LOQ(HER)
MAXHER	10	10	10	10	10	10	10	10	374E-01	-427E01
ZHEOA1	2	0	2	0	3	2	7	⁷ 300	384E-03	-242E+00
MNHER	0	0	0	0	0	0	0	0	539E-04	-327E+00
CAUERATIONTASKS	PSF	RANK	NGS					FU	HER	LCC(HER)
MAXHER	10	10	10	10	10	10	10	10	5005-01	-301E-01
DCZHBOE1 (1)	2	0	2	0	3	2	7	300	1.70E03	-277E+00
FEFM HEFEI2	3	4	3	3	5	5	8	486	1.185-02	-1.93E+00
MNHER	0	0	0	0	0	0	0	0	1.005-03	-300E+00

		С	Р				
1	Ρ	0	R				
Ν	R	Μ	0	т			
Т	Е	Ρ	С	R			
E	С	L	Е	Α		S	
R	Ε	Ε	D	1		Т	
F	D	Х	U	Ν	т	R	
Α	1	I.	R	1	L	E	S
С	Ν	Т	Ε	Ν	М	S	U
Ε	G	Υ	S	G	Ε	S	М

PERFORMINGESHARING FACTORS

OPERATORACTIONS			P	£₩₽	GHIS					RANGEFACTOR	MECIAN
Z-EDA1	:	5	5	5	5	5	0	10	35	7.5	1.81E03
NORMALIZED PSF WEIGHTS	014	3 0 14	3 0	143 0	143 0	143	۵۵	0266	1		

INFULTORSAMANFOR

HERDISTRUETION

Figure 46:	BVPS-2 Post-EPU SLIM Worksheet Group 6	;

-32880E+00

327495-01

952165-01

200000

0284162745

0045039059 -

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RegessionQutat

Constant

RStared

9dErdYEst

X Coefficient(s)

Std Errof Coef.

No of Observations

Degrees of Freedom

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CALIBRATION TASKS	10	10	PSF RA 10	NIKING 10	is 10	10 7	10	FU 10	HER 1.00E+00 8.80E-03	LOG(HER)
MIN HER	0	0	0	0	0	0	0	0	5.73E-04	-3 24E+00
ZHETB3	2	9	2	2	7	1	6	4.73	1.458-02	-1.84E+00
ZHETB2 (ZHEIC2)	2	9	1	2	5	i	6	4.75	1.43E-02	-1.95E+00
ZHESE3 ZHESE4	2 2	9 9	1 2	2 2	5 7	1	6 6	4.35 4.73	1.12E-02 1.45E-02	-1.95E+00 -1.84E+00
ZHEO82	5	9	5	3	3	7	8	6.14	3.78E-02	-1.42E+00
ZHEIA3	3	8	7	9	9	9	6	7.35	8.67E-02	-1.06E+00
ZHEIA2	3		2	2	2	5	6	4.24	1.04E-02	-1.98E+00
ZHECII	1	57	7	3	2	5	2	3.77	7.52E-03	-2.12E+00
ZHECD5	1	5	8	5	6	5	8	5.45	2.368-02	-1.63E+00
MAXHER	10	10	10	10	10	10	10	10	5.29E-01	-2.76E-01
OPERATOR ACTIONS			PSF RA			45		FU	HER	LOG(HER)
Norm, PSF Weights	0.12	0.24	0.14	0.12	0.12	0.12	0.14	1		
	E	G	Ŷ	s	G	E	Š	м		
	ĉ	Ň	÷	Ē	Ň	м	s	Ŭ		
	Å	1	î	R	i i	i	Ē	Ś		
	F	D	X	Ŭ	Ň	т	R			
	R	Ĕ	Ē	ت D	î		T			
	E	Ē	Ľ	E	Ā		s	•		
	•		-		-					
	I N T	P R E	О М Р	R O C	T R					

PERFORMANCE SHAPING FACTORS

BEAVER VALLEY UNIT 2 - ACTION GROUP 7 HUMAN ACTIONS EVALUATION

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PERFORMANCE SHAPING FACTORS

INPUT TO RISKMAN FOR HER DISTRIBUTION

OPERATOR ACTIONS	5	F	PSF W	EIGHTS	5				RANGE FACTOR	MEDIAN
ZHECD5	5	10	5	5	5	5	10	45	5	1.46E-02
ZHECII	5	10	10	5	5	5	5	45	7.5	3.55E-03
ZHEIA2	5	10	5	5	5	5	- 5	40	5	6.43E-03
ZHEIA3	5	10	5	5	5	5	5	40	5	5.37E-02
ZHEOB2	5	10	5	5	5	5	5	40	5	2.34E-02
ZHESE3	5	10	5	5	5	5	5	40	5	6 92E-03
ZHESE4	5	10	5	5	5	5	5	40	5	8.97E-03
ZHETB2 (ZHEIC2)	5	10	5	5	5	5	5	40	5	6.92E-03
ZHETB3	5	10	5	5	5	5	5	40	5	8.97E-03
NORMALIZED PSF WEIGHTS	0.122	0.243	0.135	0.122	0.122	0.122	0.135	1		

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NOTE (1) RANKINGS ARE THOSE FOR SIMILAR ACTION IN BV2 (ZHEOB2)

Regression Ou	ripuit:
Constant	-3.242184576
Std Err of Y Est	0.396998645
R Squared	0.90510960
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	0.29657300

Std Err of Coef. 0.055441061

Figure 47: BVPS-2 Post-EPU SLIM Worksheet Group 7

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		P	c	P R						
	N	R	м	0	т					
	Ť	Ē	P	č	Ŕ					
	Ė	č	Ĺ	Ĕ	Ä		S			
	Ř	Ĕ	Ē	Ď	î		Ť			
	F	ō	x	ū	Ň	т	Ř			
	Å	ī	1	Ř	1	i	E	s		
	ċ	Ň	Ť	E	Ň	й	ŝ	Ū		
	E	G	Y	S	G	E	S	м		
Norm PSF Weights	0.128	0.128	0.128	0.116	0.116	0.258	0.128	1		
OPERATOR ACTIONS			PSF R	ANIMAN	s			ស	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	3.53E-01	-4.53E-01
ZHECD3	2	3	3	2	2	0	5	2.13	1,21E-03	-2.92E+00
ZHECD4	2	5	8	5	6	ō		4 09	4 99E-03	-2.30E+00
ZHEIA1	1	3	2	5	2	7	3	3.76	3.91E-03	-2.41E+00
ZHEOT1	1	0	1	0	0	5	6	2.30	1.37E-03	-2.86E+00
ZHEREE	1	2	2	6	2	5		3.49	3 23E-03	-2.49E+00
ZHERI1	1	0	1	0	0	5	7	2.43	1.51E-03	-2.82E+00
ZHESE1 (ZHEOC1, ZHEOC2)	2	- 4	2	1	- 4	7	5	4 03	4.79E-03	-2.32E+00
ZHESL1	2	1	- 5	2	3	- 5	6	3.65	3.63E-03	-2.44E+00
ZHESL5	2	- 4	5	2	- 4	6	8	4.66	7.53E-03	-2.12E+00
ZHEWA2	2	3	7	- 4	2	5	5	4,15	5.20E-03	-2.28E+00
ZHEWA4	2	6	7	7	10	5	6	5.94	1.89E-02	+1.72E+00
MIN HER	0	0	0	0	0	0	0	0	2.61E-04	+3.58E+00
CALIBRATION TASKS			PSF R	ANKING	s			FU	HER	LOG(HER)
MAXHER	10	10	10	10	10	10	10	10	1.00E+00	0 00E+00
STP HEOSL1	5	3	- 4	3	3	3	6	3.77	2.13E-03	-2 67E+00
FERMI KERS1	2	7	2	3	2	- 4	6	3.78	1.75E-03	+2.76E+00
STP HEOS01	6	- 4	6	3	10	10	3	6 50	1.80E-02	-1.74E+00
DC ZHEOX1 (1)	2	1	5	2	3	7	6	4.16	3 20E-03	-2 49E+00
MINHER	0	0	0	0	Ó	0	0	0	1.00E-03	-3.00E+00

PERFORMANCE SHAPING FACTORS

BEAVER VALLEY UNIT 2 - ACTION GROUP 8 HUMAN ACTIONS EVALUATION

		С	P				
1	Ρ	0	R				
N	R	м	0	т			
т	E	Ρ	С	R			
E	С	L	Ε	A		S	
R	E	Ε	D	1		т	
F	D	х	υ	N	т	R	
	1	1	R	1	1	E	
С	N	т	E	N	м	S	
Е	G	Y	S	G	E	S	

PERFORMANCE SHAPING FACTORS

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INPUT TO RISKMAN FOR HER DISTRIBUTION

									and the second se	
OPERATOR ACTIONS			PSF W	/EIGHT	s				RANGE FACTOR	MEDIAN
ZHECD3	5	5	5	5	5	10	5	40	7.5	5.72E-04
ZHECD4	5	5	5	5	5	10	5	40	7.5	2.36E-03
ZHEIA1	5	5	5	5	5	10	5	40	7.5	1.85E-03
ZHEOT1	5	5	5	0	5	10	5	35	7.5	6.48E-04
ZHEREE	5	5	5	5	5	10	5	40	7.5	1.52E-03
ZHER11	5	5	5	5	5	10	5	40	7.5	7.11E-04
ZHESE1 (ZHEOC1, ZHEOC2)	5	5	5	5	5	10	5	40	7.5	2.26E-03
ZHESL1	5	5	5	5	5	10	5	40	7.5	1.71E-03
ZHESLS	5	5	5	5	5	10	5	40	7.5	3.55E-03
ZHEWA2	5	5	5	5	Ō	10	5	35	7.5	2.46E-03
ZHEWA4	5	5	5	5	5	10	5	40	5	1.17E-02
NORMALIZED PSF WEIGHTS	0.128	0.128	0.128	0.116	0.115	0.255	0.128	1		

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NOTE	Regression O	utput:
	Constant	-3.583059682
(1) RANKINGS ARE THOSE FOR SIMILAR	Std Err of Y Est	0.455189634
ACTION IN BV2 (ZHESL1)	R Squared	0 867599013
	No. of Observations	6
	Degrees of Freedom	4
	X Coefficient(s)	0.31302434

Std Err of Coef. 0.051141234

Figure 48: BVPS-2 Post-EPU SLIM Worksheet Group 8

Nom PSF Weichts

BEAVER VALLEY UNIT 2- ACTION GROUP 9 HUMAN ACTIONS EVALUATION

PERFORMANCE SHAPING FACTORS

		С	Ρ				
1	Ρ	0	R				
Ν	R	М	0	т			
т	Ε	Ρ	С	R			
E	С	L	Ε	Α		S	
R	E	E	D	- 1		Т	
F	D	Х	υ	Ν	т	R	
Α	1	1	R	1	1	Ε	S
С	N	Т	Ε	N	М	S	U
Ε	G	Y	S	G	Ε	S	М

			~	~	_					
OPERATORACTIONS		F	SFRA	NKING	5			FU	HER	LCCG(HER)
MAXHER	10	10	10	10	10	10	10	10	6.28E-01	-2025-01
ZHECO8	2	9	3	3	7	3	9	5.82	7.63E-02	-1.12E+00
ZHEOD7	2	9	8	5	8	4	9	7.35	1.65E-01	-7.825-01
ZHEWA6	2	4	5	4	5	2	1	3.59	2486-02	-1.61E+00
MNHER	0	0	0	0	0	0	0	٥٠٥	4.055-03	-239E+00
CALIERATION TASKS	psc	RANK	NCS					, FU	HER	
	10	11111						,	161	Local D y
MAXHER	10	10 1	0	10	10	10	10	10	1.00E+00	0.00E+00
STP HECC03	6	6	6	5	6	8	9	6.5882	4.38E-02	-1.36E+00
EFRI SHI (1)	2	9	3	3	7	3	9	5.8235	1.00E-01	-1.00E+00
MNHER	0	0	0	0	0	0	0	0	500E-03	-230E+00

0 0.176 0.176 0.176 0.176 0.118 0.176

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PERFORMANCE SHAPING FACTORS

		C.	P				
1	Ρ	0	R				
N	R	М	0	Т			
Т	Ε	Ρ	С	R			
E	С	L	Ε	Α		S	
R	Ε	Ε	D	I.		Т	
F	D	Х	U	Ν	Т	R	
Α	1	1	R	1	1	E	
С	Ν	т	Е	N	М	S	
Е	G	Y	S	G	E	S	

INFUTTORISKVANFOR HERDISTRIBUTION

OPERATORACTIONS		P	9∓W⊟	GHTS					RANCE FACTOR	MEDIAN
Z-E006	0	5	5	5	5	5	5	30	5	4.745-02
ZHE007	0	5	5	5	5	5	5	30	3	1.325-01
ZHEMP6	0	5	5	5	5	0	5	25	5 ,	1.536-02
Morivauzed PSF Weights	0 0	176 0	1176 0	176 0	176 0	118 0	176	1		

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NOTE	Regression Output:			
	Constant	-2392031371		
(1) RANKINGS ARE THOSE FOR SIMLAR	Std Errof Y Est	0339302965		
ACTION IN B-/2 (Z-ECD5)	RSquared	0.9151131		
	No. of Observations	4		
	Degrees of Freedom	2		
	X Coefficient(s)	0.219017541		
	Std Err of Coef.	0.047167948		

Figure 49: BVPS-2 Post-EPU SLIM Worksheet Group 9

BEAVER VALLEY UNIT 2- GROUP 10 HUMAN ACTIONS EVALUATION

PEFFORMANCE SHAPING FACTORS

MNHER	0	0	0	0	0	0	0	0.	500E-07	-6.3010
SEABROOKON	0	0	1	õ	2	0	õ	0.5714	1.00506	-6000
CAUERATIONTASIS	PS 10	FRANI 10	9NGS 10	10	10	10	10	FU 10	HER 1.00⊑+00	1003(HEF) 00000
<u>.</u>										
MNHER	0	0	0	0	0	0	0	۵۵	4.67E07	-633 E +00
ZHEXTI	8	9	10	1	4	5	8	7.71	35E-02	-1.45E+00
MAXHER	10	10	10	10	10	10	10	10	993E-01	-1.785-03
OFFRATORACTIONS		1	PSF R4	NANG	8			FU	HER	LCC(HEF)
Norm PSF Weights	014	Q 14	029	۵۵	Q 14	014	Q14	11		
	E	G	Υ	S	G	Ε	S	м		
	С	Ν	т	Ε	N	М	S	U		
	Α	1	1	R	1	t	Е	S		
	F	D	х	U	Ν	т	R			·
	R	E	E	D	1		т			
	Ē	ō	Ĺ	Ē	A		s			
	т	E	P	č	R					
	N	R	м	ō	т					
	1	Р	C O	P R						

		С	Ρ				
1	Ρ	0	R				
Ν	R	Μ	0	Т			
Т	Ε	Ρ	С	R			
E	С	L	Ε	Α		S	
R	Ε	Ε	D	1		Т	
F	D	х	U	Ν	Т	R	
Α	1	1	R	1	1	E	S
С	Ν	т	Ε	Ν	М	S	U
E	G	Y	S	G	Ε	S	м

INFULTIORSYMPHICR		
RANGEFACTOR	MEDIAN	

2215-02

OPERATORACTIONS		I	PSF W	BGHIS	3				RANCEFACTOR
ZHEXTI	5	5	10	0	5	5	5	35	5
Normauzed PSF Weights	014	Q14	029	۵۵	014	014	Q14	1	

RegressionQu	pt
Constant StdErrofYEst RS1.ared	-833 E+00 422 E-02 09999927115
 Na d'Ozervetore Degress d'Freedom	3 1
X Coefficient(s) Sci Errof Coef.	0.632805998 0.005403158

Figure 50: BVPS-2 Post-EPU SLIM Worksheet Group 10

L-05-140 Enclosure 2

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Proprietary Response to RAI Question Number 4

L-05-140 Enclosure 3

Non-Proprietary Response to RAI Question Number 4

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"Probability Risk Assessment (PRA) RAI Response #4 for the RSG/EPU Program"

BVPS EPU Submittal

August 29, 2005

Westinghouse Electric Company LLC P.O. Box 355 Pittsburgh, PA 15230-0355

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Question

4. Section 10.16.1.5 states that the RSGs will result in a lower frequency for steam generator tube rupture (SGTR) because of the use of Alloy 690. Please provide the basis for the new SGTR frequency including the supporting reference(s) (or excerpts).

Response:

Beaver Valley Power Station Unit No. 1 will be installing Westinghouse Model 54F steam generators, designed and constructed with Alloy 690 tubes. It was recognized that current, industry generic steam generator tube rupture (SGTR) initiating event frequencies are based on years of operating experience of Alloy 600 steam generator tubes and that operating experience may not be applicable to new steam generator tube designs, such as designs utilizing Alloy 690. A methodology was prepared, by Westinghouse, for calculation of a generic SGTR initiating event frequency for steam generators constructed with Alloy 690 tube material. This methodology does not ignore the many years of data currently available for Alloy 600 steam generator design, but incorporates that information with current understanding of the SGTR failure modes and improvements to steam generator tube designs and improvements to plant operating practices.

STEAM GENERATOR TUBE RUPTURES EVENTS

Most of the PWR steam generator tubes which have failed over the years have been millannealed Alloy 600 tubes. However, some failures of thermally treated Alloy 600 tubing have been reported, primarily due to fretting (degradation mechanisms due to the design of the support plates and anti-vibration bars (AVBs), and the presence of loose parts, rather than the tubing material). But there have also been a few failures of thermally treated Alloy 600 tubing due to primary and secondary-side stress corrosion cracking (SCC).

Degradation mechanisms include primary water stress corrosion cracking (PWSCC), outside diameter stress corrosion cracking (ODSCC), transgranular stress corrosion cracking, intergranular stress corrosion cracking (IGSCC) (fretting, wear and thinning), pitting, denting, high-cycle fatigue, and wastage (erosion-corrosion and corrosion-fatigue).

Table 4-1: SGTR Industry Events					
Plant	Year	Failure Mechanism			
Point Beach 1	1975	Wastage/SCC			
Surry 2	1976	PWSCC			
Doel 2	1979	PWSCC			
Prairie Island 1	1979	Loose Parts Wear			
Ginna 1	1982	Loose Parts Wear			
North Anna 1	1987	High-Cycle Fatigue			
McGuire 1	1989	IGSCC			

A search of the INPO database for SGTR License Event Reports was performed. The search confirmed the following SGTR events, which are provided in Table 4-1.

Table 4-1: SGTR Industry Events				
Plant	Year	Failure Mechanism		
Mihama 2	1991	High-Cycle Fatigue		
Indian Point 2	2000	PWSCC		

STEAM GENERATOR TUBE RUPTURE FREQUENCY METHODOLOGY

A methodology was created by Westinghouse for a generic SGTR initiating event frequency for use with Westinghouse Alloy 690 steam generator designs. The methodology considers the history of steam generator operating experience (total tube years and plant availability) and calculates a steam generator tube non-plugging factor to determine a "tube years adjusted" value. The Alloy 690 SGTR initiating event frequency is the postulated number of SGTR events (based on expert elicitation) divided by the "tube years adjusted" value.

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Expert Elicitation

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A Westinghouse expert opinion discussion was held to discuss the likelihood of SGTR due to various failure mechanisms.

The expert opinion discussion focused on the known, potential failure mechanisms for current steam generator tubes. Based on current knowledge of Alloy 690 steam generator tubes, the likelihood of a SGTR event due to a given failure mechanism was debated and the results were documented.

The results of the expert opinion discussion can be used to calculate a postulated number of steam generator tube rupture events.

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Steam Generator Tube Rupture Frequency Calculations

For mill annealed steam generators, a frequency per tube-year has been calculated to be 1.25 E-06 (see Table 4-3); and, for thermally treated or Alloy 690 steam generators, the frequency per tube-year has been calculated to be 1.94 E-07 (see Table 4-4).

An extensive search of data was performed for all domestic, foreign and foreign licensee Westinghouse type steam generators.

The data points for the overall database consist of the following:

- Plant name
- Steam generator model
- Number of plant loops
- Number of tubes per steam generator
- Total number of tubes in all steam generators at that plant
- Date plant was commissioned or date the plant replaced the original steam generator
- Effective date of analysis or the date the plant ceased operation
- Total number of years between commission or replacement date and the date of analysis or ceased operation
- Tube-years (a multiplication between total number of years and the total number of tubes)
- 3 year availability
- 3 year capability
- Shutdown date if the plant ceased operation
- Steam generator replacement date if the steam generator was replaced
- Replacement model

- Date the plant is considering future steam generator replacement
 Total number of tubes plugged at each plant

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BVPS-1 Steam Generator Tube Rupture Frequency Calculation

BVPS-1 has three SGTR initiating events (one for each steam generator); thus, the calculation here will be on a per steam generator basis. Based on the frequency (tube-year) value of 1.94E-07 for Model 54F (Alloy 690) steam generators, the calculation for BVPS-1 results in the following:

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Frequency = 6.96E-04 SGTR per year per steam generator

L-05-140 Enclosure 4

Affidavit



Westinghouse Electric Company Nuclear Services P.O. Box 355 Pittsburgh, Pennsylvania 15230-0355 USA

U.S. Nuclear Regulatory Commission Document Control Desk Washington, DC 20555-0001

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Our ref: CAW-05-2046

August 26, 2005

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: "Probability Risk Assessment (PRA) RAI Response #4 for the RSG/EPU Program" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-05-2046 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by FirstEnergy Nuclear Operating Company.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-05-2046, and should be addressed to B. F. Maurer, Acting Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

B. F. Maurer, Acting Manager Regulatory Compliance and Plant Licensing

Enclosures

cc: B. Benney L. Feizollahi bcc: B. F. Maurer (ECE 4-7A) 1L
R. Bastien, 1L (Nivelles, Belgium)
C. Brinkman, 1L (Westinghouse Electric Co., 12300 Twinbrook Parkway, Suite 330, Rockville, MD 20852)
RCPL Administrative Aide (ECE 4-7A) 1L, 1A (letter and affidavit only)

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<u>AFFIDAVIT</u>

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared J. A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

り. A. Gresham, Manager Regulatory Compliance and Plant Licensing

Sworn to and subscribed before me this 26^{+h} day of <u>August</u>, 2005

Notary Public

Notarial Seal Sharon L. Fiori, Notary Public Monroeville Boro, Allegheny County My Commission Expires January 29, 2007

Member, Pennsylvania Association Of Notaries

- (1) I am Manager, Regulatory Compliance and Plant Licensing, in Nuclear Services, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
- (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

- Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market-advantage to the competition of those countries.
- (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Probability Risk Assessment (PRA) RAI Response #4 for the RSG/EPU Program," (Proprietary) dated August 26, 2005, for support of the RSG/EPU project, being transmitted by the FirstEnergy Nuclear Operating Company letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for Beaver Valley Units 1 & 2 is expected to be applicable for other licensee submittals in response to certain NRC requirements for justification of Alloy 600 SG Tube Rupture Frequency methodology.

This information is part of that which will enable Westinghouse to have a:

- (a) competitive position for RSG.
- (b) competitive position for PRA Data Analysis.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of future PRA and RSG analysis contracts.

- (b) Westinghouse can sell support and defense of SGTR Initiating Event Frequency Methodology.
- (c) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar calculations for SGTR Initiating Event Frequency and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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