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

Peach Bottom Atomic Power Station, Units 2 & 3
Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Supplement to the Request for License Amendments Related to Application of Alternative Source Term, dated July 14, 2003

References:

(1) Letter from M. P. Gallagher (Exelon Generation Company, LLC) to US NRC, dated July 14, 2003

(2) Letter from G. F. Wunder (U. S. Nuclear Regulatory Commission) to J. L. Skolds (Exelon Generation Company, LLC), dated January 16, 2004

(3) Letter from M. P. Gallagher (Exelon Generation Company, LLC) to US NRC, dated April 23, 2004

(4) Teleconference between G. F. Wunder (U. S. Nuclear Regulatory Commission) and Exelon Generation Company, June 15, 2004

(5) Letter from G. F. Wunder (U. S. Nuclear Regulatory Commission) to J. L. Skolds (Exelon Generation Company, LLC), dated June 29, 2004

(6) Letter from K. R. Jury (Exelon Generation Company, LLC) to US NRC, dated May 20, 2004

This is a supplement to the Reference (1) License Amendment Request (LAR). The Reference (1) LAR proposed certain Technical Specification and Technical Specification Bases changes to implement an alternative source term (AST) methodology at Peach Bottom Atomic Power Station (PBAPS), Units 2 & 3.

As part of the LAR submittal, Exelon proposed a change to the Shutdown Electrical Power Systems TS in accordance with Technical Specification Task Force (TSTF) Traveler–51. The extent of the proposed revision qualified the Applicability of the Shutdown Electrical Power Systems Technical Specifications 3.8.2, 3.8.5, and 3.8.8 to apply only to the movement of "recently" irradiated fuel.

The U.S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI), Reference (2), Question 2, specifically discussed the proposed revision of the PBAPS Shutdown Electrical Power Systems TS 3.8.2, 3.8.5, and 3.8.8. Question 2 requested Exelon to justify movement of irradiated fuel assemblies that have decayed at least 24 hours without the availability of safety systems such as those needed to maintain plant shutdown, for monitoring and maintaining the unit status, or to mitigate events postulated during shutdown.

Upon further review and consideration regarding this subject, Exelon requests that the AST LAR, Reference (1), be revised to delete the proposed changes to PBAPS Electrical Technical Specifications 3.8.1, 3.8.2, 3.8.4, 3.8.5, and 3.8.8. The Specifications for Electrical Power System requirements during

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movement of irradiated fuel will not be revised per the AST LAR. Submitted revisions for the following Technical Specification pages are no longer requested and should be removed from the LAR for both Unit 2 and Unit 3:

3.8-19	3.8-34
3.8-20	3.8-35
3.8-21	3.8-36
3.8-22	3.8-44
3.8-23	3.8-45
3.8-33	

During a teleconference to discuss the PBAPS AST submittal (Reference 4), the NRC staff requested clarification regarding the submitted Minimum Containment Pressure Available (MCPA) Curve. The curve, originally submitted as part of Reference (1) LAR, was updated as part of the Reference (3) April 23, 2004 RAI response. The Reference (6) May 20, 2004 RAI response unintentionally contained a copy of the original MCPA Curve as part of a re-submittal of the LAR. For clarification, the revised MCPA curve submitted as part of the Reference (3) RAI response, dated April 23, 2004, should be used in the NRC's analysis.

In the Reference (5) letter, the NRC submitted an additional RAI. Attachment 1 to this supplemental letter provides a complete response to all questions with the exception of questions 2, 4.d, and 5, which have partial responses provided. These questions will be completely answered with a future letter. Attachment 2 to this supplemental letter provides the referenced drawing not located in the UFSAR. Attachments 3 and 4 to this supplemental letter provide the referenced spreadsheets in electronic form (Compact Disc).

There is no impact to the No Significant Hazards Consideration submitted in the Reference (1) letter. There are no additional commitments contained within this letter.

If you have any questions or require additional information, please contact Doug Walker at (610) 765-5726.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

Executed on 12/8/04

Robert C. Braun
Site Vice President
Peach Bottom Atomic Power Station
Exelon Generation Company, LLC

Attachments:
1. Responses to Requests for Additional Information
2. PBAPS Arrangement Drawing A-9, Revision 11
3. Compact Disc containing "Determination of Inboard MSIV Leak Rates using NEDC-31858P and NEDC-32091 Methodology" Spreadsheet
4. Compact Disc Containing "Determination of MSL Decontamination Factors" Spreadsheet

cc: S. J. Collins, Regional Administrator, Region I, USNRC
USNRC Senior Resident Inspector, PBAPS
G. F. Wunder, Project Manager [PBAPS] USNRC
R. R. Janati - Commonwealth of Pennsylvania

bcc: R. Bell, PSEG
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Vice President, Licensing & Regulatory Affairs
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Manager, Licensing
Manager, PBAPS Nuclear Oversight - PB, SMB4-5
Commitment Coordinator - KSA 3-E
Correspondence Control Desk - KSA 1-N-1
Records Management - KSA 1-N-1
Bushek, P – PBAPS
Kauffman, S – PBAPS
Msisz, T – KSA
Golub, P – KSA

ATTACHMENT 1

PEACH BOTTOM ATOMIC POWER STATION
UNITS 2 AND 3

Docket Nos. 50-277
50-278

License Nos. DPR-44
DPR-56

Supplement to License Amendment Request for
"PBAPS Alternative Source Term Implementation"

Exelon Responses to the NRC's Requests for Additional Information

1. In Reference 1, Appendix 1, Page 1 the basis for the core isotopic inventory is presented. Representative values for the Cycle 14 design (cycle length, average number of fuel assemblies per batch, and average burnup) were used to determine the core inventory. Section 3.1 (page 1.183-12) of Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms For Evaluating Design Basis Accidents At Nuclear Power Reactors," states that the inventory of fission products in the reactor core and available to the containment should be based on the maximum full power operation of the core with, as a minimum, current licensed values for fuel enrichment, fuel burnup and, assumed core power equal to the current licensed rated thermal power times the ECCS evaluation uncertainty. In their April 23, 2004 submittal, the licensee provides a "Compliance Matrix" that gives a comparison of their submittal to that which is required by RG 1.183. The licensee states that the Peach Bottom Atomic Power Station (PBAPS) "conforms" with RG 1.183, Section 3.1. The method proposed appears to conflict with the regulatory guidance. Based upon the information provided, the PBAPS method does not appear to consider the spectrum of enrichments and burnups allowed by the PBAPS license and, thus does not conform to Section 3.1. Please provide justification for why the source term generated for a representative core bounds the core design values permitted by the current license (maximum enrichment, burnup etc...) or change the submittal to provide a conservative source term that bounds the allowable operational values that impact the source term.

Response to 1

The source term generated for a representative core at PBAPS is designed to provide bounding doses consistent with Regulatory Guide 1.183, Section 3.1 for the applicable range (including regulatory limits) of fuel enrichments and burnups, and for an assumed core power equal to the current licensed rated thermal power times the ECCS evaluation uncertainty. The sensitivity analyses provided in the table below confirm that all Control Room (CR) and offsite doses are bounded by the source term approach utilized in the submittal.

For core power, the 3528 MWt value equal to the current licensed maximum rated thermal power of 3514 MWt times the Emergency Core Cooling System (ECCS) evaluation uncertainty factor of 1.0037 is utilized. Full power operation was conservatively assumed for the entirety of the 711 EFPD cycle utilized as the value typical of current PBAPS cycle design, as opposed to the normal practice where a power coastdown would begin at ~690 EFPD. Any cycle extension past 711 EFPD would further increase the magnitude of the power coastdown, resulting in lower isotopic activities for short-lived isotopes compared to the source term utilized.

As noted, the Reference 1, Appendix 1, Page 1 basis for the core isotopic inventory uses representative values for Cycle 14 with utilization of the maximum calculated Curies for each isotope of the 100 Effective Full Power Day (EFPD) or End of Cycle (EOC) values. This practice maximizes inventory for all isotopes; i.e., cycle 14 values, as conservatively modeled, provide a bounding 2-year fuel cycle source term.

The representative fuel cycle reflects the way the core is actually operated, within its licensed safety limits and economic parameters. However, the question requests additional justification that this representative core source term bounds the core design values permitted by the current license for such items as maximum enrichment and burnup. This justification is provided by sensitivity analyses of a range of core source terms using

ORIGEN2.1, for enrichments up to 5.0% and burnups corresponding to full-power operation for a cycle length up to 740 EFPD. 740 EFPD is used as a practical economic value. The ORIGEN2.1 outputs were utilized as the bases for file inputs to RADTRAD LOCA runs for the following Cases:

- Base = Core source term of the Submitted Case (4.107% Enrichment, 711 EFPD Cycle length, with utilization of the maximum calculated Curies for each isotope of the 100 Effective Full Power Day (EFPD) or End of Cycle (EOC) values)
- Case A = Base Case except for 5.0% Enrichment with utilization of the maximum calculated Curies for each isotope of either the 100 EFPD or EOC values
- Case B = Base Case except for with 5.0% Enrichment and artificially bounding full-power cycle length of 740 EFPD with utilization of the maximum calculated Curies for each isotope of either the 100 EFPD or EOC values
- Case C = Base Case except for with 4.107% Enrichment and artificially bounding full-power cycle length of 740 EFPD, but with utilization of only the EOC values of Curies for each isotope
- Case D = Base Case except for with a one-year "short cycle" of 3.56% Enrichment and full-power cycle length of 351 EFPD with utilization of the maximum calculated Curies for each isotope of either the 100 EFPD or EOC values. This is a test to show the effects of lower enrichments and shorter operating cycles within practical economic values.
- Case E = Base Case except for with 5.0% Enrichment and full-power cycle length of 711 EFPD, but with utilization of only the EOC values of Curies for each isotope
- Case F = Base Case except for with 4.107% Enrichment and full-power cycle length of 711 EFPD, but with utilization of only the 100 EFPD values of Curies for each isotope
- Case G = Base Case except for with 4.107% Enrichment and full-power cycle length of 711 EFPD, but with utilization of only the EOC values of Curies for each isotope

The relative dose results, confirming that Control Room (CR), Low Population Zone (LPZ), and Exclusion Area Boundary (EAB) doses are bounded by the submitted Base Case approach utilized, are shown below.

Relative Total LOCA Activity Release Doses

Case	% Enrichment	Core Average Burnup (EFPD)	CR Dose	LPZ Dose	EAB Dose
Base	4.107	100 and 711	100.0%	100.0%	100.0%
A	5	100 and 711	98.8%	98.4%	98.2%
B	5	100 and 740	99.3%	99.6%	99.8%
C	4.107	EOC 740	99.0%	99.2%	99.5%
D	3.56	100 and 351	99.3%	97.9%	97.1%
E	5	EOC 711	98.0%	97.3%	96.9%
F	4.107	100 EFPD	95.3%	88.9%	85.2%
G	4.107	EOC 711	98.6%	98.0%	97.9%

The following items provide additional information relevant to our sensitivity analyses:

- For fission products that reach "equilibrium" because of relatively short half-lives, the core inventory is primarily a function of the fraction of power produced in fissioning of uranium and plutonium isotopes, and the yield from these isotopes. Therefore, equilibrium values vary over the operating cycle as uranium fission rates reduce and plutonium fission rates increase.
- Minimum enrichment assumptions, consistent with selection of actual cycle parameters, maximize important core iodines because the relative fission product yields of core plutonium isotopes are higher, and more plutonium fissions are occurring at the end of cycle.
- Minimized enrichment also typically increases the calculated values of higher actinides and long-lived isotopes.
- Some noble gas isotopes have higher inventories at the beginning of a cycle due to higher U-235 fission product yields. However, as shown in the test cases above, the overall dose is higher at end of cycle conditions {Case F vs. Case G above}.
- The test cases above also show that an increase in initial enrichment produces a reduction in doses.

The methodology for the base case of utilizing the higher of the Beginning-of-Cycle and End-of-Cycle isotopes thus assures bounding results.

2. In Reference 1, page 4 of 18, the licensee does not provide an acceptable response to question 6. The licensee has not verified that no other potential unfiltered inleakage pathways could result in X/Q values higher than the control room intake values. In light of the control room habitability issues noted in Generic Letter (GL) 2003-01, the staff does not believe that the licensee has provided adequate assurance that the current habitability requirements will continue to be met. Please provide the information requested.

Response to 2:

Tracer Gas testing for Peach Bottom was completed in October 2004. Preliminary results are within the AST analyzed values for assumed unfiltered inleakage. A complete response to this question will be provided in a future supplement once the vendor report is finalized.

3. In Reference 1, Attachment 1, page 12, a value for the ECCS flash fraction is given as 1.41% as opposed to 10% in the RG. The licensee states that a smaller amount (than the RG) can be justified based on the actual sump pH history and area ventilation rates, but the pH history and area ventilation rates were not provided. The licensee also provided a short analysis that interpolated calculated iodine partition factors taken from report ORNL-TM-2412, Part IV. The staff has reviewed the information provided and has determined that it does not provide reasonable assurance that the current habitability requirements will be maintained. The reasons for the staff's decision are as follows:

The ORNL study cited, is based upon theoretical calculations for the design of reactor containment spray systems. The staff questions the applicability of this methodology. Many of the release mechanisms and other plant-specific issues have not been addressed. These issues create notable uncertainties in how much iodine is available for release. Major uncertainties exist to what extent the chemicals within the leakage will interact with the release environment and lead to a great reduction in its vapor pressures. The production of elemental iodine is related to the pH of the water pools. A major uncertainty in fixing the production of volatile iodine chemical forms is due to uncertainty in the extent of evaporation to dryness. Experts believe that up to 20% of the iodine in water pools that have evaporated would be converted to a volatile form (most likely as elemental iodine). Uncertainties also depend upon the environment where the fluid is leaked and the way the fluid is leaked (misting etc.). Fluid pH shifts may occur due to interactions with components, cable jackets, concrete and radiation.

Since none of these issues have been addressed by PBAPS, feedback is needed from PBAPS. Please advise the staff whether PBAPS will continue to pursue the value of 1.41% in light of the staff's need for additional justification for this deviation from the recommended value in the RG. This feedback is needed in a timely manner given that the staff expects that they will need outside assistance to review this request. If PBAPS decides to address the plant-specific issues identified by the staff, the staff will pursue the outside assistance and additional RAIs will be developed in coordination with outside assistance.

Response to 3:

PBAPS has decided to utilize the 10% value for the ECCS flash fraction given in RG 1.183, in combination with the more conservative minimum Technical Specification Control Room ventilation flow rate of 2700 cfm per Question 6, and the spreadsheets provided per Question 9. The revised results are as follows:

Revised LOCA Radiological Consequence Analysis			
Location	**Duration**	**TEDE (rem)**	**Regulatory Limit TEDE (rem)**
Control Room	30 days	4.80	5
EAB	Maximum, 2 hours	10.8	25
LPZ	30 days	7.23	25

4. In Reference 1, Attachment 1, page 16, the response to question 32 does not provide a complete analysis upon which to judge the adequacy of the response. The staff requests further clarification and justification of the analysis performed.

Regarding reference 1, Appendix 5, page 24:

a. What is the overall decontamination factor (DF) weighted by in rack vs. drop assemblies and how is it derived? Why is there a weighting of the rack and dropped assemblies?

Response to 4.a:

Fuel pin damage from a dropped fuel assembly is assumed to occur for both the dropped assembly and the struck assembly or assemblies. The dropped assembly is assumed to lie across the bail handles of assemblies stored in the rack. Water coverage over this dropped assembly is conservatively based on the top of that assembly (21.181 feet of coverage). All pins in this assembly are assumed damaged. Releases from struck assemblies in the racks are assumed to occur from the top of the fuel plena. Water coverage over the "in-rack" assembly plena is 22.352 feet. All water coverage values used are with reference to the minimum Technical Specification 3.7.7 fuel pool water level. The calculated DFs for the "dropped assembly" and the "in-rack" fuel are 143.4 and 178.5, respectively. The overall DF (160.7) is derived to account for this on a pin basis as follows:

Overall DF of 160.7 = ((87.33 pins * 143.4 + (172 pins - 87.33 pins) * 178.5) / 172 pins.

The weighting is to reflect the differences in water coverage and resulting DF for a dropped assembly lying on the bails of the fuel in the rack versus over the fuel pin plena for the struck fuel located in the rack.

b. Provide more information regarding the Fermi 2 analysis and justify why this is applicable to the PBAPS analysis.

Response to 4.b:

The reference to the Fermi 2 analysis was to provide an explanation for the statement that the extent of fuel damage for a drop over the reactor well is bounding compared to that for a drop over the racks in the spent fuel pool. Since the analysis is based on generic fuel damage assessment methodology and a bounding parameter of a 6-foot fuel drop height, the results are applicable to all plants using current General Electric BWR fuel. The 6-foot drop height assumed over the fuel in the Fermi-2 analysis is conservative since the actual PBAPS potential drop height in the spent fuel pool is less than 3 feet.

c. The argument that provides a comparison between the fuel handling accident (FHA) in the reactor well and the fuel-handling building does not appear to be complete. Other factors influence the dose such as release timing, atmospheric dispersion factors, and control room heating, ventilation and air conditioning (HVAC) response. Please provide a more comprehensive analysis of the FHA in the reactor well and the fuel-handling building. The analysis must include all the factors which influence the dose from these accidents.

Response to 4.c:

The reactor well and spent fuel pool at the Peach Bottom Atomic Power Station are both located on the 234' elevation within the Reactor Building. This can be seen in drawing M-6 (PBAPS UFSAR Figure 12.1.6). Only safety railing and a distance of less than approximately 20 horizontal feet separate these two areas. Additionally, both areas are served by the same HVAC system. Release mechanisms to the environment are therefore identical. Therefore, there are no additional factors that could influence the dose from accidents in these two locations.

d. The proposed change to Technical Specification 3.6.4.1 (Secondary Containment) will no longer require that the secondary containment be operable during the movement of fuel assemblies that have a decay period of at least 24 hours. The FHA analysis assumes the release to the control room intake and the environment is through the turbine building/reactor building (TB/RB) ventilation stack. Please justify that an FHA release through the TB/RB ventilation stack is an appropriately conservative assumption given that the secondary containment may be inoperable. Include general arrangement drawings in your response showing the potential release points.

Response to 4.d:

Secondary containment operability assures that any post-FHA releases from the fuel pool are captured by the reactor building ventilation system and directed via the Standby Gas Treatment System (SGTS) to the main stack. With secondary containment operability no longer required, the SGTS filtration will no longer be credited and the release would generally be through the TB/RB ventilation stack (treated as a ground level release). In addition, the ability to maintain a secondary containment negative pressure may be compromised. Therefore, alternative flow paths for the releases to the environment must be considered.

As shown in general arrangement drawing M-7 (PBAPS UFSAR Figure 12.1.7), metal siding and a metal roof deck surround the elevations of the secondary containment above the refueling floor. However, as per PBAPS Specification 6280-A-9 for furnishing and installation of this metal siding, it can withstand without loss of air tightness a positive external wind pressure of 28 psf {5.4 in. WG}, a negative external wind pressure of 17 psf {3.3 in. WG}, or an internal pressurization to 37 psf {7.1 in WG}. The specification further requires testing of the reactor building in operation to verify maintenance of a minimum ¼ inch of water pressure. Therefore, FHA releases to the environment through the metal siding are not considered credible.

This is also true for the solid concrete walls forming the balance of the secondary containment. Any leakage from the secondary containment to the Turbine or Radwaste Buildings through openings between the buildings would be released through the TB/RB ventilation stack (UFSAR Figures 12.1.2, 12.1.3, 12.1.4, and 12.1.5).

Potential building door openings such as the Railroad Bay doors and reactor building personnel access doors at grade elevation (UFSAR Figure 12.1.3) were evaluated as potential alternative flow paths, with the entire release assumed to be through these openings. Neither of these doors could result in a more conservative release to the control room intake and the environment over a 2-hour period than through the turbine

building/reactor building ventilation stack assumed. Releases, such as through the Railroad Bay doors at grade level with wind gusts causing the interior to be at positive pressure, would have slower rates of release from the elevated refueling floors, and the corresponding X/Q values to the Control Room intake are smaller.

PBAPS is currently preparing justification to verify that FHA releases from other potential openings (i.e., RHR hatch, Torus hatch, and Roof Scuttles) will not result in exceeding the AST dose acceptance criteria. This justification will be provided in a future supplement.

5. In Reference 2 below, Attachment 1, page 10, the PBAPS response to question 17 does not provide a confirmation of the assumed inleakage value in the proposed amendment request. Many licensees have found that walkdowns, while useful, do not alone provide a reliable method of determining the susceptibility of a control room to inleakage. PBAPS has also not confirmed that their facility's control room meets the applicable habitability regulatory requirements and that the control room habitability systems are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing bases. Therefore, the staff believes that PBAPS has not shown that GDC 19 will be met with the proposed amendment. Please provide this confirmation as requested by question 1 of GL 2003-01 so that confirmation of your habitability requirements can be made. One method acceptable to the staff that may be used to provide this confirmation is Regulatory Guide 1.196, "Control Room Habitability at Light-Water Nuclear Power Reactors."

Response to 5:

Tracer Gas testing for Peach Bottom was completed in October 2004. Preliminary results are well within the AST analyzed values for assumed unfiltered inleakage. A complete response to this question will be provided in a future supplement once the vendor report is finalized.

6. In Reference 2, Attachment 1, page 16, the PBAPS response to question 31 does not provide the confirmation that control room HVAC flow rates used in the accident analysis are conservative. RG 1.183, Section 5.3.1 (page 1.183-21), states: *If a range of values or a tolerance band is specified, the value that would result in a conservative postulated dose should be used.* Reference 2, Table A states that PBAPS "conforms" with Section 5.3.1 of Regulatory Guide 1.183. Use of a nominal value does not provide a conservative postulated dose and therefore, the method proposed by PBAPS does not conform to Regulatory Guide 1.183. Based upon these responses the following additional information is requested:

    1. Provide all nominal values used in the radiological dose analysis. Justify why the use of each of these values provides the most conservative postulated dose. Provide the analysis used to justify this conclusion or provide an analysis that uses allowable values that determine the most conservative postulated dose.

    2. Provide the confirmation originally requested in question 31.

Response to 6:

MCREV
As noted in the original RAI Question 31, the control room emergency ventilation flow rate may be within the range 2700 to 3300 CFM. The dose effect for the control room following a LOCA was determined by RADTRAD analysis to be slightly higher for the lower limit of 2700 CFM. The new analysis results for 2700 CFM (in combination with the additional conservatism of the 10% ECCS flash fraction per Question 3 and the spreadsheet leak rate/decontamination factor data provided per Question 9) are included in the response to Question 3.

For the control room modeling for the FHA, a 20,600 cfm unfiltered intake flow rate is utilized in combination with an assumed allowance for up to 1600 cfm of unfiltered inleakage for the entire accident duration. As per our previous response to the original RAI Question 31, appropriate operator decisions regarding ventilation paths to be used to minimize control room doses can be expected based on available instrumentation and health physics coverage.

The PBAPS control room does not have emergency filtered recirculation. There are no other control room ventilation flow rates where a range of values instead of nominal values would apply.

SGTS
Regarding SGTS, the flow rates assumed in the accident analysis models are always set artificially high and always bound the actual Technical Specification based ranges. For example, for the LOCA analysis, a value of 100,000 air changes per minute flow rate is modeled to assure that no holdup in the secondary containment is credited. For the FHA, a 6 air changes per minute flow rate is modeled to assure that essentially all of the activity release from the pool is released within 2 hours after the accident.

The ventilation flow rate values that would result in the most limiting control room dose have been utilized in the revised analyses.

7. In Reference 2, Attachment 1, page 11, the PBAPS response to question 20 states that only the steam line piping that has been seismically qualified is credited in this analysis. Please confirm that all equipment credited have a seismic qualification for a Safe Shutdown Earthquake as defined in 10 CFR Part 100 or seismically qualified using the methodology in NEDC-31858P.

Response to 7:

All equipment credited in the LOCA analysis is seismically qualified for a Safe Shutdown Earthquake as defined in 10 CFR Part 100. Steam line piping, out to, but not including, the turbine stop valve is seismically qualified. The turbine stop valves are not credited in the analysis.

8. In Reference 2, Attachment 1, page 12, the PBAPS response to question 21 states that the AEB-98-03 methodology is used to assess the aerosol and elemental deposition and that no credit is taken for the organic deposition. Reference 2, Table 1, page 1, provides the organic deposition constant. Please confirm that the organic deposition is not used. Please describe the treatment you have used for deposition in the main steam line in full. Justify why this method is valid for use with elemental iodine.

Response to 8:

As noted, Reference 2, Table 1, page 1 shows the organic deposition constant. This was provided for information only. No organic iodine deposition is credited for the RADTRAD runs. The treatment used for deposition of aerosol and elemental iodine components in the main steam lines is as shown in electronic form in Attachment 4 for complete understanding of the details of the modeling and application.

The methodology for conversion of the spreadsheet aerosol and elemental iodine deposition results into RADTRAD is that of AEB-98-03, as suggested by the NRC staff in previous AST RAIs for PBAPS, except that elemental iodine deposition is actually calculated. As per AEB-98-03, the spreadsheet values as derived herein are applied in the RADTRAD analysis as an equivalent filter efficiency. The elemental iodine deposition derivation in the spreadsheet, as shown, uses the deposition velocity formula in the J. E. Cline reference "MSIV Leakage Iodine Transport Analysis", 3/26/1991. With the AEB-98-03 formulations, settling velocities (for aerosols) and deposition velocities (for elemental) are analogous.

As noted in AEB-98-03, the conservatisms introduced by use of the well-mixed model compared to the plug flow model, considering that flow in some parts of the steam lines are in plug flow, justifies the overall conservatism of application of this method for aerosol and elemental iodine deposition.

9. In Reference 2, Attachment 1, page 13, PBAPS states that an alternate method of evaluating leak rates is now being applied. The staff requests additional information regarding the methodology used to determine the predicted leak rate of 0.437 cfm in the maximum line at containment conditions. Please provide the calculations and assumptions used to determine this leak rate. For the leakage rates in each main steam isolation valve piping segment describe the method used to determine the flow rates.

Response to 9:

The method used for evaluating MSIV leak rates; inside and outside containment flow rates; and Aerosol and Elemental Iodine Deposition in Main Steam piping are discussed below. Additionally, the spreadsheets [Attachments 3 and 4] performing these analyses are provided in electronic form to aid in a complete understanding of the details of the modeling and application.

<u>Containment Leak Rates</u>

In the originally submitted analysis of MSIV leakage, the containment leak rate due to MSIV leakage was determined in a manner consistent with industry practice and 10 CFR 50,

Appendix J requirements, where test acceptance criteria are established based on containment test pressures and design basis leak rates in percent per day. Specifically,

Leak Rate Acceptance Criterion (scfh) =

Containment Volume (ft^3) * Containment Leak Rate (fraction/day) / 24 hours / day * [(14.7 psia + P_a psig) / 14.7 psia]

In Peach Bottom's case, the containment total free air volume is 293,900 ft^3; the design basis leak rate is proposed to be 0.007/day; and P_a remains at 49.1 psig. Therefore, the Leak Rate Acceptance Criterion will be 372 scfh.

The proposed MSIV leak rate limit is 75 scfh per line and 150 scfh total, when measured at $\geq$ 25 psig. Reversing the above process:

Containment Leak Rate (fraction/day) =
150 scfh * 24 hr/day * 14.7 psia / (14.7 psia + 25 psig test pressure) / 293,900

The resulting MSIV Containment Leakage Rate is 0.004536/day total or 0.002268/day maximum for any one line. These are equivalent to 0.9257 cfm and 0.4628 cfm, respectively, at containment conditions.

However, the NRC staff has indicated, in previous RAIs and discussions, an interest in consideration of accident rather than test conditions in characterizing effective MSIV containment leak rates. For MSIV leakage, the NRC has previously approved the approach documented in NEDC-31858P "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems", September 1993, and NEDC-32091 "MSIV Leakage Radiological Dose Assessment Code (Ver. 1.1) Users' Manual", August 1992. The Attachment 4 Spreadsheet, [Sheet: BWROG Leak Rate Correction] documents the application of this methodology with Peach Bottom conditions. The resulting containment leak rates are 0.004287/day total and 0.0021435/day maximum for any one line. These are equivalent to 0.875 cfm and 0.4375 cfm, respectively at containment conditions. These results are slightly lower that the standard approach initially used, and support the acceptability of the industry standard approach. Since the NEDC-31858P/NEDC-32091 approach is an approved methodology and provides some additional margin, this approach was adopted.

Credit for Leak Rate Reduction with Reduction in Containment Pressure

RG 1.183 (Sections 3.7, and Appendix A Section 6.2) indicates that assumed containment leakage may be reduced after the first 24 hours, if supported by plant configuration and analyses, to a value not less than 50% of the technical specification leak rate. Attachment 3: [F1-Drywell Pressure Chart] shows the drywell pressure as a function of time and for comparison, the P_a and MSIV test pressures. Attachment 3: Leak Reduction Formulations shows that there are a variety of formulations that have been identified as potential predictors of leak rate ΔP dependence. For primary containment leakage other than MSIV, the worst case predictor was used to establish that leakage would be reduced to 56% of L_a at 24 hours and to 50% of L_a at 38 hours. MSIV leakage is calculated to be reduced to 77.2% of the technical specification value at 24 hours, 65.4% at 48 hours, 59.0% at 72 hours, 56.2% at 96 hours, and 50% at 275 hours, based on the worst case predictors, as

indicated in the Attachment 3: Drywell Pressure Data, and Attachment 4: Leak Reduction Assessment. Attachment 3: F2-Leak Rate Reduction illustrates how leak rates are conservatively modeled in comparison to as-conservatively-calculated values.

Flow Rates in Inboard MS Piping

Flow rates in inboard piping are generally the same as the containment leak rate in cfm. Flow rates in inboard steam piping are not impacted by any heat transfer from the MS pipe walls since these pipes are open to the containment atmosphere through the vessel.

During the early in-vessel release period, all activity is assumed to be released to the drywell atmosphere and no credit is taken for mixing of the drywell airspace with the suppression pool air space. After this two-hour period, the two zones are assumed to be well mixed because of steam flow. To model the early period, the leak rate is artificially increased to 0.7736 cfm, which is 0.4375 cfm times the total containment volume of 293,900 ft^3 divided by a drywell volume of 166,200 ft^3. The latter value is the minimum drywell volume of 159,000 ft^3 plus 7200 ft^3 vessel free space. These volumes are the basis for the LLRT system design.

Flow Rates in Outboard MS Piping

Flow Rates in Outboard MS Piping are determined with the following conservatisms to maximize flow rates and thus to assure conservatism in deposition credit.

All outboard piping is assumed to be at atmospheric pressure, i.e. the entire pressure drop occurs across the first operational MSIV. Maximum line flow rates are 75 scfh / 60 min/hr = 1.25 scfm, without temperature correction. However, substantial heating from pipe wall surfaces can be expected, and with no pressure increase, would result in increased velocities proportional to the ratio of pipe wall absolute temperature to the temperature at standard conditions. For the first 24 hours, the steam piping wall temperature is assumed to be at a constant temperature of 558 °F (no cooling credited), yielding a flow rate of 2.41 cfm. As discussed in Attachment 4 the steam line temperature decreases to 410 °F by 24 hours. This temperature is used as a constant through 48 hours, yielding a flow rate of 1.59 cfm, including the reduction in MSIV leak rate after 24 hours. The pipe wall temperature decreases to 300 °F by 48 hours, yielding a flow rate of 1.18 cfm that is used to 72 hours. Similar reductions in temperature and flow rates represented as a conservative step function are used for the duration of the accident, as shown in the Attachment 4: Unit 3 DF Determination BOUNDS.

Piping Segmentation Credit

For conservatism, the design basis LOCA pipe break is assumed to be in a main steam line inside containment. The piping upstream of the inboard MSIV on this line is assumed to be unavailable for deposition. For this line, modeling of deposition and plateout considers piping from the inboard MSIV to the end of seismically qualified outboard piping. Two segments are assumed, the first being penetration piping, and the second being from the outboard MSIV to the end of seismically qualified outboard piping. The outboard MSIV is assumed to have failed open since this maximized the flow rate and thus minimizes deposition in the penetration piping.

For the intact line, all seismically qualified main steam piping is credited for deposition. Three nodes are considered: inboard, penetration, and outboard. Penetration piping is again assumed depressurized for conservatism.

Where deposition is credited, only the bottom half of pipe having a horizontal orientation is considered for the deposition of aerosol forms of iodine and particulate.

Aerosol and Elemental Iodine Deposition in MS Piping

Attachment 4: Unit 3 DF Determination BOUNDS shows the derivation of Aerosol and Elemental Iodine Filter Efficiencies. The organic iodine efficiencies are small and are not credited.

10. In Reference 2, Attachment 1, page 14, PBAPS states that the TSC doses have been reanalyzed. Since the TSC is within the control room, please describe how the TSC impacts the control room doses. Provide a general arrangement drawing of the control room and TSC and describe the inputs and assumptions used to recalculate the TSC doses and justify the values used. Also, provide the results of the analysis.

Response to 10:

The TSC is in the Unit 1 control room, not the Units 2 & 3 common Control Room. Unit 1 (shut down) is approximately ¼ mile away from the Units 2 & 3 control room. Therefore, the TSC has no effect on the Units 2 & 3 Control Room doses. A separate TSC dose analysis was performed in accordance with the guidance in Regulatory Guide 1.183, showing that the Regulatory Guide 1.183 limits are met. Refer to drawings C-1 and C-2 (PBAPS UFSAR Figures 2.2.9 and 2.2.10 respectively).

References

1. M. P. Gallagher, Exelon Nuclear, letter to U. S. Nuclear Regulatory Commission (USNRC), March 15, 2004.

2. M. P. Gallagher, Exelon Nuclear, letter to USNRC, April 23, 2004.

ATTACHMENT 2

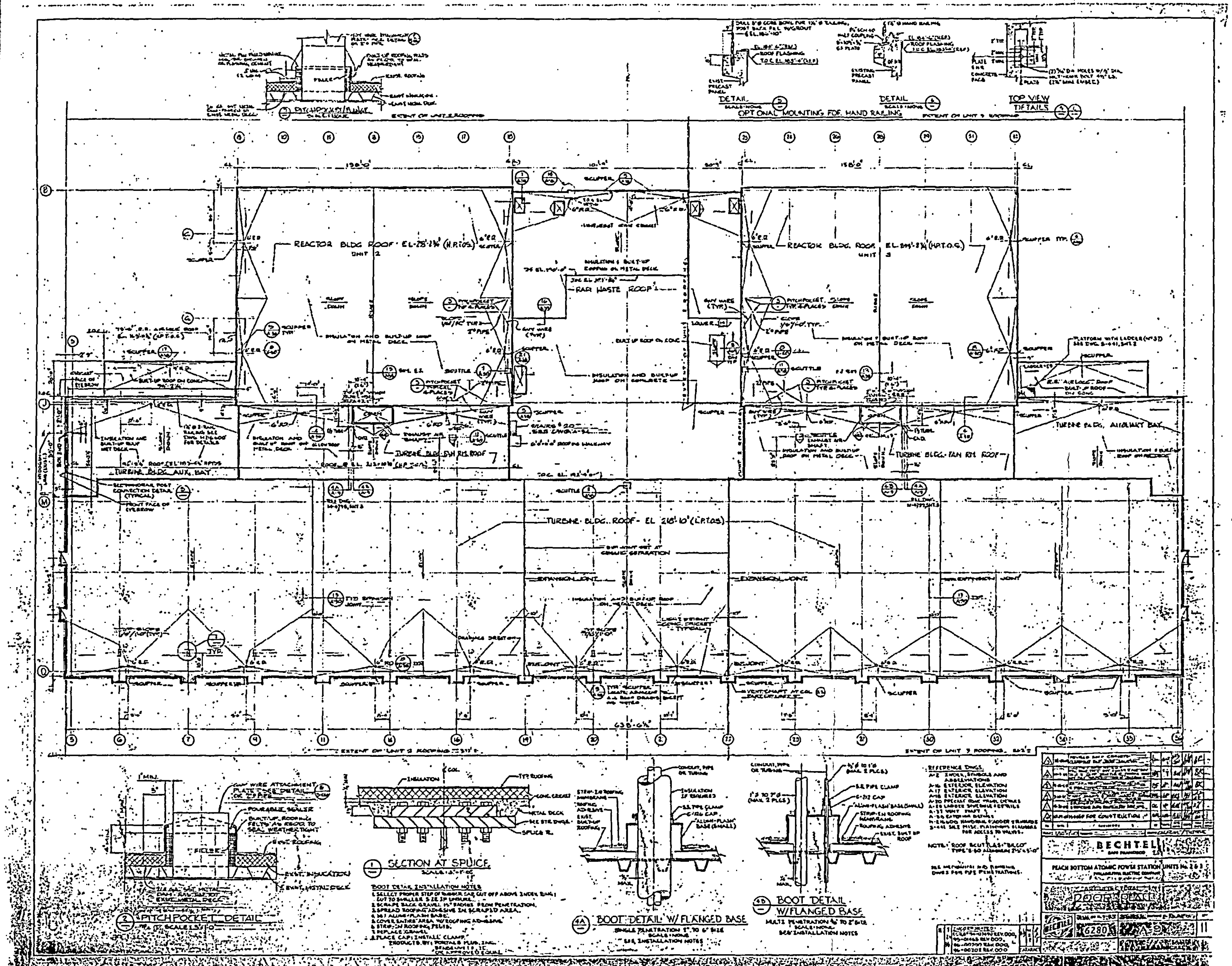
PEACH BOTTOM ATOMIC POWER STATION
UNITS 2 AND 3

Docket Nos. 50-277
50-278

License Nos. DPR-44
DPR-56

Supplement to License Amendment Request for
"PBAPS Alternative Source Term Implementation"

PBAPS Arrangement Drawing A-9, Revision 11


REACTOR BLDG ROOF - EL 2__'-2¾" (H.P.T.O.S) UNIT 2
REACTOR BLDG. ROOF EL 2__'-2¾" (H.P.T.O.S) UNIT 3
RAD WASTE ROOF
TURBINE BLDG. AUX. BAY
TURBINE BLDG. AUXILIARY BAY
TURBINE BLDG. FAN RM ROOF
TURBINE BLDG. ROOF - EL 215'-10" (L.P.T.O.S)
EXPANSION JOINT
INSULATION AND BUILT-UP ROOF ON METAL DECK
SCUPPER
SCUTTLE
OPTIONAL MOUNTING FOR HAND RAILING
TOP VIEW
DETAILS
PITCHPOCKET DETAIL
SECTION AT SPLICE
BOOT DETAIL W/ FLANGED BASE
BOOT DETAIL W/FLANGED BASE
BOOT DETAIL INSTALLATION NOTES
ISSUED FOR CONSTRUCTION
BECHTEL
SAN FRANCISCO
PEACH BOTTOM ATOMIC POWER STATION UNITS No. 2 & 3
PHILADELPHIA ELECTRIC COMPANY
ARCHITECTURAL
ROOF PLAN
6280
11

ATTACHMENT 3

PEACH BOTTOM ATOMIC POWER STATION
UNITS 2 AND 3

Docket Nos. 50-277
50-278

License Nos. DPR-44
DPR-56

Supplement to License Amendment Request for
"PBAPS Alternative Source Term Implementation"

Compact Disc Containing "Attachment 3 – MSIV vs PC Leakage Test for Leak Rate Reduction with Time.xls" Spreadsheet

Assessment of Leak Rate Reduction with Time and Reduced Containment Pressure

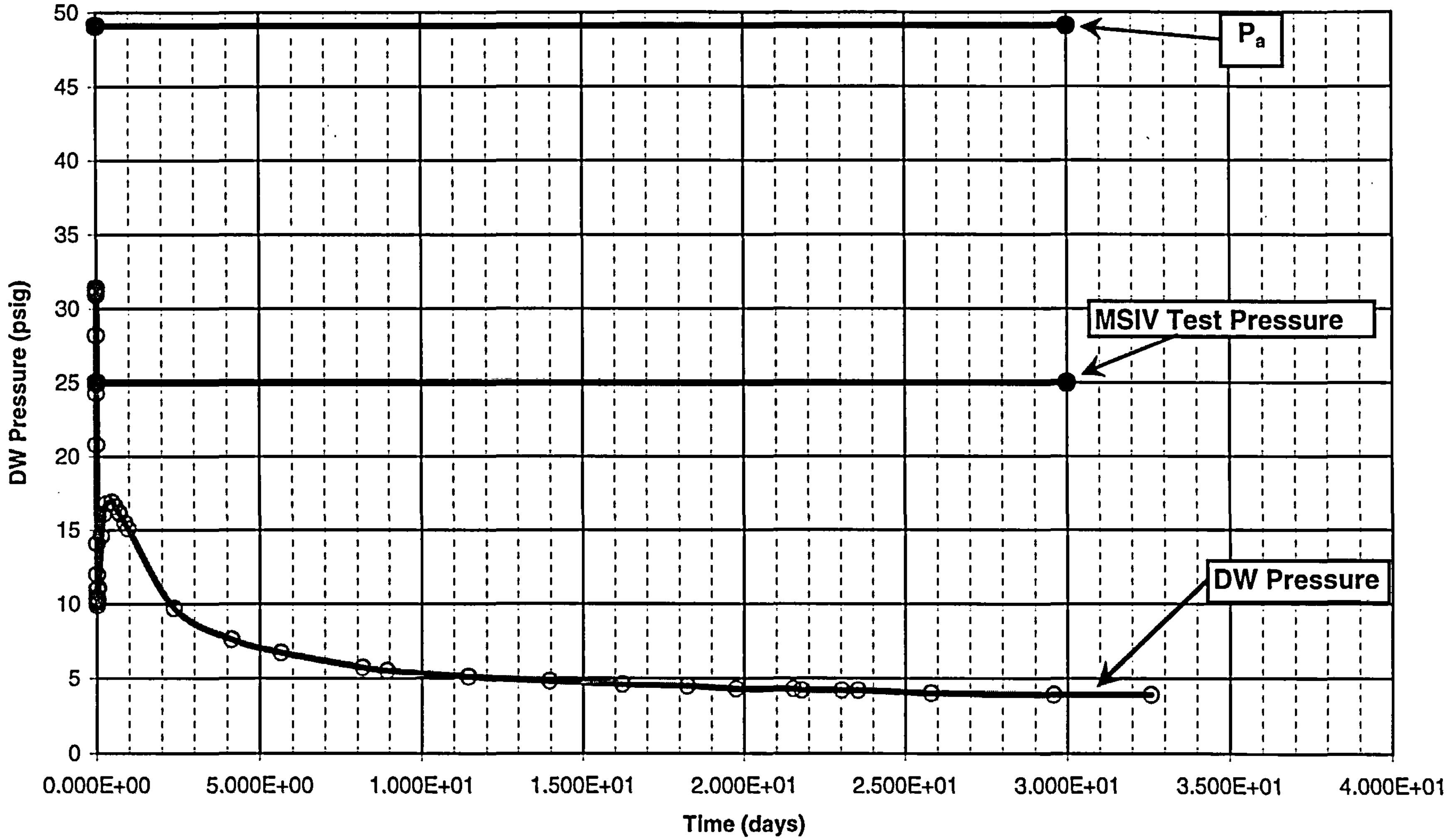
Per RG 1.183, Appendix A, postulated leakage may be reduced after the first 24 hours, if supported by site-specific analyses, to a value not less than 50% of the maximum leak rate. This Attachment provides the Peach Bottom site-specific analysis.

Sheet "F1-Drywell Pressure Chart" shows a comparison of post design basis LOCA analyzed drywell pressures, vs. leak rate test pressures for MSIV and other containment isolation valves. The pressure values are from Calc PM-1061, Rev 0, and are duplicated on Sheet "Drywell Pressure

Sheet "Leak Rate Formulations" documents the range of PM-1061 formulations that could potentially be applicable for predicting leakage at lower than test pressures. PM-1061 only addressed leakage reductions for testing at P_a. This Attachment extends that methodology to MSIVs, which are tested at $\geq$ 25 psig.

Sheet "Leak Reduction Assessment" evaluates the formulations for both PC leakage and MSIV leakage. The selection of a step-wise reduction is shown in Sheet "Drywell Pressure Data" and illustrated on Sheet "F2-Leak Rate Reduction".

Figure 1: PBAPS Post-LOCA Containment Pressure



Based on SIL-636 Containment Pressure Reevaluation

		X		Y	49.1	25	Test Pressures (psig)	
Time	Time	Time	DW Pressure	DW Pressure	PC Leak	MSIV Leak Fractions		
(sec)	(hrs)	(days)	(psia)	(psig)	Fraction	F 1a	F 7	Worst
0.001	2.778E-07	1.157E-08	1.72E+01	2.50E+00				
18.45996	5.128E-03	2.137E-04	4.93E+01	3.46E+01	0.839	1.176		1.176
45.61621	1.267E-02	5.280E-04	4.57E+01	3.10E+01	0.795	1.114		1.114
52.13184	1.448E-02	6.034E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
65.53809	1.821E-02	7.585E-04	4.61E+01	3.14E+01	0.800	1.121		1.121
69.85059	1.940E-02	8.085E-04	4.61E+01	3.14E+01	0.800	1.121		1.121
73.85059	2.051E-02	8.548E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
77.94434	2.165E-02	9.021E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
82.00684	2.278E-02	9.492E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
86.19434	2.394E-02	9.976E-04	4.59E+01	3.12E+01	0.797	1.117		1.117
91.75684	2.549E-02	1.062E-03	4.58E+01	3.11E+01	0.796	1.115		1.115
97.50684	2.709E-02	1.129E-03	4.58E+01	3.11E+01	0.796	1.115		1.115
109.2256	3.034E-02	1.264E-03	4.56E+01	3.09E+01	0.793	1.112		1.112
212.0022	5.889E-02	2.454E-03	4.29E+01	2.82E+01	0.758	1.062		1.062
308.5225	8.570E-02	3.571E-03	3.90E+01	2.43E+01	0.703	0.986		0.986
410.1475	1.139E-01	4.747E-03	3.55E+01	2.08E+01	0.651	0.912		0.912
516.585	1.435E-01	5.979E-03	2.88E+01	1.41E+01	0.536	0.751		0.751
622.6865	1.730E-01	7.207E-03	2.67E+01	1.20E+01	0.494	0.693		0.693
772.9365	2.147E-01	8.946E-03	2.57E+01	1.10E+01	0.473	0.663		0.663
884.124	2.456E-01	1.023E-02	2.52E+01	1.05E+01	0.462	0.648		0.648
911.9365	2.533E-01	1.055E-02	2.51E+01	1.04E+01	0.460	0.645		0.645
1053.062	2.925E-01	1.219E-02	2.48E+01	1.01E+01	0.454	0.636		0.636
1197.499	3.326E-01	1.386E-02	2.46E+01	9.90E+00	0.449	0.629		0.629
2659.374	7.387E-01	3.078E-02	2.49E+01	1.02E+01	0.456	0.639		0.639
3823.312	1.062E+00	4.425E-02	2.58E+01	1.11E+01	0.475	0.666		0.666
10990.19	3.053E+00	1.272E-01	2.93E+01	1.46E+01	0.545	0.764		0.764
17851.88	4.959E+00	2.066E-01	3.08E+01	1.61E+01	0.573	0.802		0.802
26057.94	7.238E+00	3.016E-01	3.15E+01	1.68E+01	0.585	0.820		0.820
40572.88	1.127E+01	4.696E-01	3.16E+01	1.69E+01	0.587	0.822		0.822
49656.44		5.747E-01	3.13E+01	1.66E+01	0.581	0.815		0.815
58284	1.619E+01	6.746E-01	3.09E+01	1.62E+01	0.574	0.805		0.805
60084	1.669E+01	6.954E-01	3.09E+01	1.62E+01	0.574	0.805		0.805
60984	1.694E+01	7.058E-01	3.08E+01	1.61E+01	0.573	0.802		0.802
73705.72	2.047E+01	8.531E-01	3.02E+01	1.55E+01	0.562	0.787	0.761	0.787
82705.72	2.297E+01	9.572E-01	2.98E+01	1.51E+01	0.555	0.777	0.751	0.777
205409	5.706E+01	2.377E+00	2.44E+01	9.70E+00	0.444	0.623	0.615	0.623
357894	9.942E+01	4.142E+00	2.23E+01	7.60E+00	0.393	0.551	0.562	0.562
488476.8	1.357E+02	5.654E+00	2.14E+01	6.70E+00	0.369	0.518	0.539	0.539
706177.5	1.962E+02	8.173E+00	2.04E+01	5.70E+00	0.341	0.477	0.514	0.514
771500.3	2.143E+02	8.929E+00	2.02E+01	5.50E+00	0.335	0.469	0.509	0.509
989248.3	2.748E+02	1.145E+01	1.98E+01	5.10E+00	0.322	0.452	0.499	0.499
1206853	3.352E+02	1.397E+01	1.95E+01	4.80E+00	0.313	0.438	0.491	0.491
1402727	3.896E+02	1.624E+01	1.93E+01	4.60E+00	0.306	0.429	0.486	0.486
1576860	4.380E+02	1.825E+01	1.92E+01	4.50E+00	0.303	0.424	0.484	0.484
1707418	4.743E+02	1.976E+01	1.90E+01	4.30E+00	0.296	0.415	0.479	0.479
1859488	5.165E+02	2.152E+01	1.90E+01	4.30E+00	0.296	0.415	0.479	0.479
1881188	5.226E+02	2.177E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
1989922	5.528E+02	2.303E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
2033437	5.648E+02	2.354E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
2228928	6.191E+02	2.580E+01	1.87E+01	4.00E+00	0.285	0.400	0.471	0.471
2555275	7.098E+02	2.957E+01	1.86E+01	3.90E+00	0.282	0.395	0.469	0.469
2815761	7.822E+02	3.259E+01	1.86E+01	3.90E+00	0.282	0.395	0.469	0.469

Test Pressures

	Pa (psig)	MSIV (psig)
0.01	49.1	25
30	49.1	25

Stepwise Reduction Credit Plot

time (hrs)	time (days)	PC Leak fraction
0	0	1
24	1	1
24.01	1.0004167	0.56
38	1.5833333	0.56
38.01	1.58375	0.5
720	30	0.5

Stepwise Reduction Credit Plot

time (hrs)	time (days)	MSIV Leak fraction
0	0	1
24	1	1
24.01	1.0004167	0.772
48	2	0.772
48.01	2.0004167	0.654
72	3	0.654
72.01	3.0004167	0.59
96	4	0.59
96.01	4.0004167	0.562
275	11.458333	0.562
275.01	11.45875	0.5
720	30	0.5

Methodology for Determination of Leak Rate Reductions as a Function of Time for PC Leakage

The Leakage Characterization Methodologies considered and evaluated herein are:

Case	Leakage Treatment	Reference, Eq. No.	Leakage Ratio Formulation
1a	Turbulent flow - Darcy's Formula	Ref. 1, Eq. 3-5	$L_x/L_a=[(P_x-P_{norm})/(P_a-P_{norm})]^{0.5}$
1b	Turbulent flow - Darcy's Formula (Ideal Gas)	Ref. 1, Eq. 3-5	$L_x/L_a=[(P_x-P_{norm})*P_x/(T_x+459.7)/((P_a-P_{norm})*P_a/(T_a+459.7))]^{0.5}$
2	Laminar flow	Ref. 1, Eq. 3-6	$L_x/L_a=(P_x-P_{norm})/(P_a-P_{norm})$
3	Molecular Flow - Dong, Bromley & Dushman	Ref. 2, Eq. 2	$L_x/L_a=(P_x-P_{norm})/(P_a-P_{norm})$
4	Laminar Viscous Flow - Grinnell	Ref. 2, Eq. 8	$L_x/L_a=(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)$
5	Turbulant Viscous Flow - Darcy-Weisbach	Ref. 2, Eq. 13	$L_x/L_a=[(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)]^{0.5}$
6	Turbulent Viscous Flow - Knapp & Metzgar	Ref. 2, Eq. 17/18	$L_x/L_a=[(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)]^{4/7}$
7	Compressible Flow - Convergent Passage	Ref. 2, Eq. 21	$L_x/L_a=P_x/P_a$

References:

1 Technical Paper 410, "Flow of Fluids through Valves, Fittings, and Pipe," 1988 Crane

2 TID-20583, "Leakage Characteristics of Steel Containment Vessels and the Analysis of Leakage Rate Determinations," May 1964, AEC

Application of Methodology from PM-1061, Rev. 0, "Determination of Reduced Primary Containment Leakage Rate for AST Implementation" to the MSIV Leakage Pathway

14.7 P_{norm} = atmospheric air pressure (14.7 psia)

280 T_a = maximum containment accident temperature (^oF)

63.8 P_a = maximum primary containment accident pressure and LLRT test pressure (psia)

39.7 P_{msiv} = MSIV minimum test pressure (psia)

time	time	time	time	P_x	T_x	PC Leakage other than MSIVs								MSIV Leakage							
(seconds)	(minutes)	(hours)	(days)	(psia)	(^oF)	1a	1b	2	3	4	5	6	7	1a	1b	2	3	4	5	6	7
123.78809	2.06	0.034	0.001	45.3	275	0.79	0.67	0.62	0.62	0.48	0.69	0.65	0.71	1.11	1.19	1.22	1.22	1.35	1.16	1.19	1.14
364.77246	6.08	0.101	0.004	39.6	267	0.71	0.57	0.51	0.51	0.35	0.59	0.55	0.62	1.00	1.01	1.00	1.00	0.99	1.00	1.00	1.00
607.49902	10.12	0.169	0.007	26.9	221	0.50	0.34	0.25	0.25	0.13	0.36	0.31	0.42	0.70	0.60	0.49	0.49	0.37	0.61	0.57	0.68
911.93652	15.20	0.253	0.011	25.1	207	0.46	0.30	0.21	0.21	0.11	0.33	0.28	0.39	0.64	0.54	0.42	0.42	0.30	0.55	0.51	0.63
1775.5615	29.59	0.493	0.021	24.4	194	0.44	0.29	0.20	0.20	0.10	0.31	0.27	0.38	0.62	0.52	0.39	0.39	0.28	0.53	0.48	0.61
3485.8115	58.10	0.968	0.040	25.6	192	0.47	0.32	0.22	0.22	0.11	0.34	0.29	0.40	0.66	0.56	0.44	0.44	0.32	0.57	0.52	0.64
5623.3115	93.72	1.562	0.065	25.6	192	0.47	0.32	0.22	0.22	0.11	0.34	0.29	0.40	0.66	0.56	0.44	0.44	0.32	0.57	0.52	0.64
6958.499	115.97	1.933	0.081	27.8	197	0.52	0.36	0.27	0.27	0.14	0.38	0.33	0.44	0.72	0.64	0.52	0.52	0.41	0.64	0.60	0.70
33311.188	555.19	9.253	0.386	31.7	206	0.59	0.44	0.35	0.35	0.20	0.45	0.40	0.50	0.82	0.78	0.68	0.68	0.58	0.76	0.73	0.80
57384	956.40	15.940	0.664	31	203	0.58	0.42	0.33	0.33	0.19	0.44	0.39	0.49	0.81	0.75	0.65	0.65	0.55	0.74	0.71	0.78
86305.719	1438.43	23.974	0.999	29.4	198	0.55	0.39	0.30	0.30	0.17	0.41	0.36	0.46	0.77	0.70	0.59	0.59	0.48	0.69	0.65	0.74
161816.72	2696.95	44.949	1.873	25.8	181	0.48	0.32	0.23	0.23	0.12	0.34	0.29	0.40	0.67	0.58	0.44	0.44	0.33	0.57	0.53	0.65
248986.28	4149.77	69.163	2.882	23.6	169	0.43	0.28	0.18	0.18	0.09	0.30	0.25	0.37	0.60	0.50	0.36	0.36	0.25	0.50	0.45	0.59
336116.28	5601.94	93.366	3.890	22.5	162	0.40	0.26	0.16	0.16	0.08	0.27	0.23	0.35	0.56	0.46	0.31	0.31	0.21	0.46	0.41	0.57
858595.63	14309.93	238.499	9.937	20	141	0.33	0.20	0.11	0.11	0.05	0.22	0.18	0.31	0.46	0.36	0.21	0.21	0.14	0.37	0.32	0.50
2598751.8	43312.53	721.876	30.078	18.6	127	0.28	0.17	0.08	0.08	0.03	0.18	0.14	0.29	0.39	0.30	0.16	0.16	0.10	0.31	0.26	0.47

Conclusions:

1. PC Leakage other than MSIV is assumed to be reduced to 56% La after 1 day and 50% La after 38 hours based on PM-1061 results.
2. MSIV Leakage reductions are based on the 1a and 7 formulations, whichever is limiting. Sheet "Drywell Pressure Data" and "F2-Leak Rate Reduction" show the step-wise, conservatively bounding assumptions.

Figure 2: Leak Rate Vs. Time, Calculated and Assumed

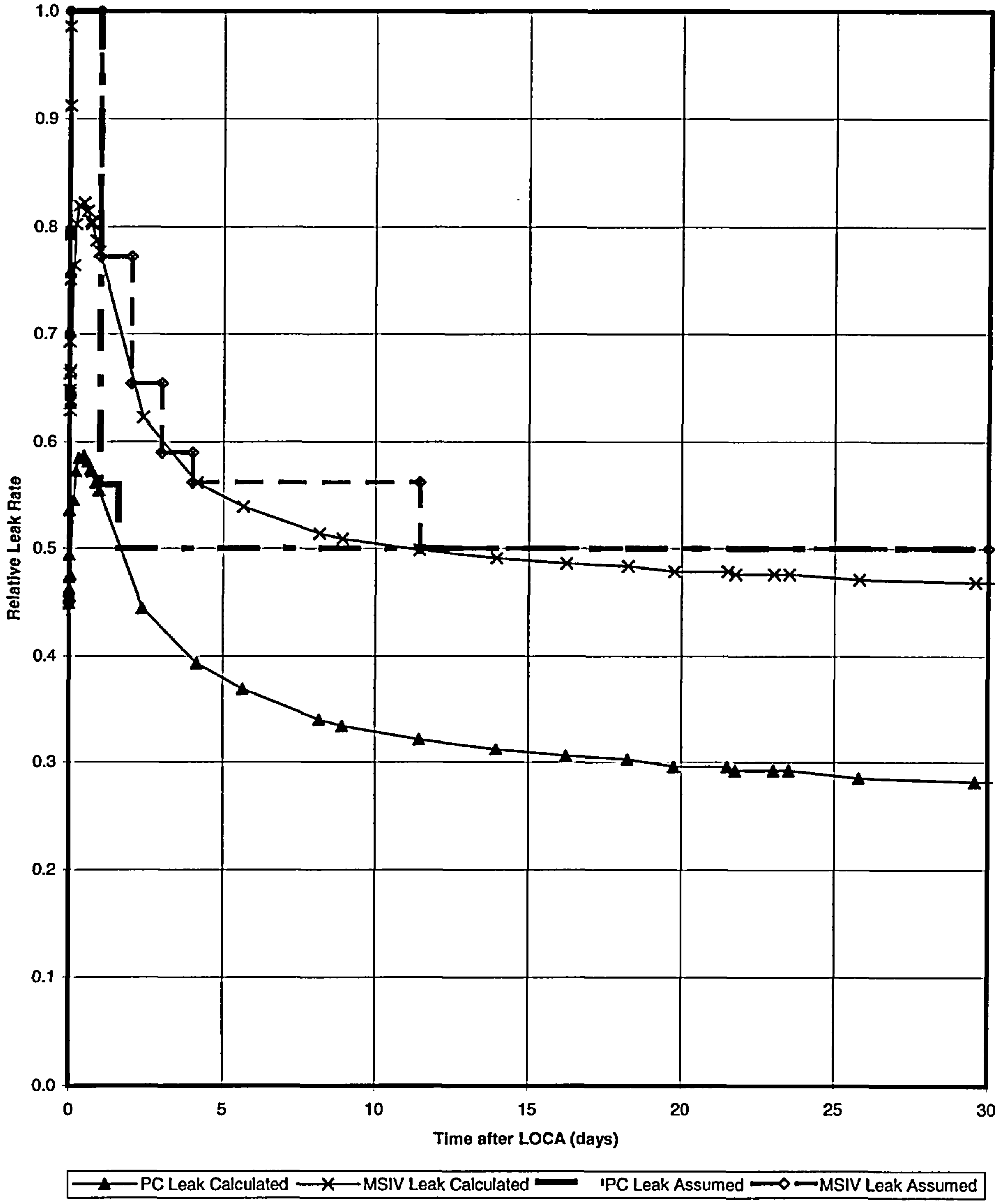
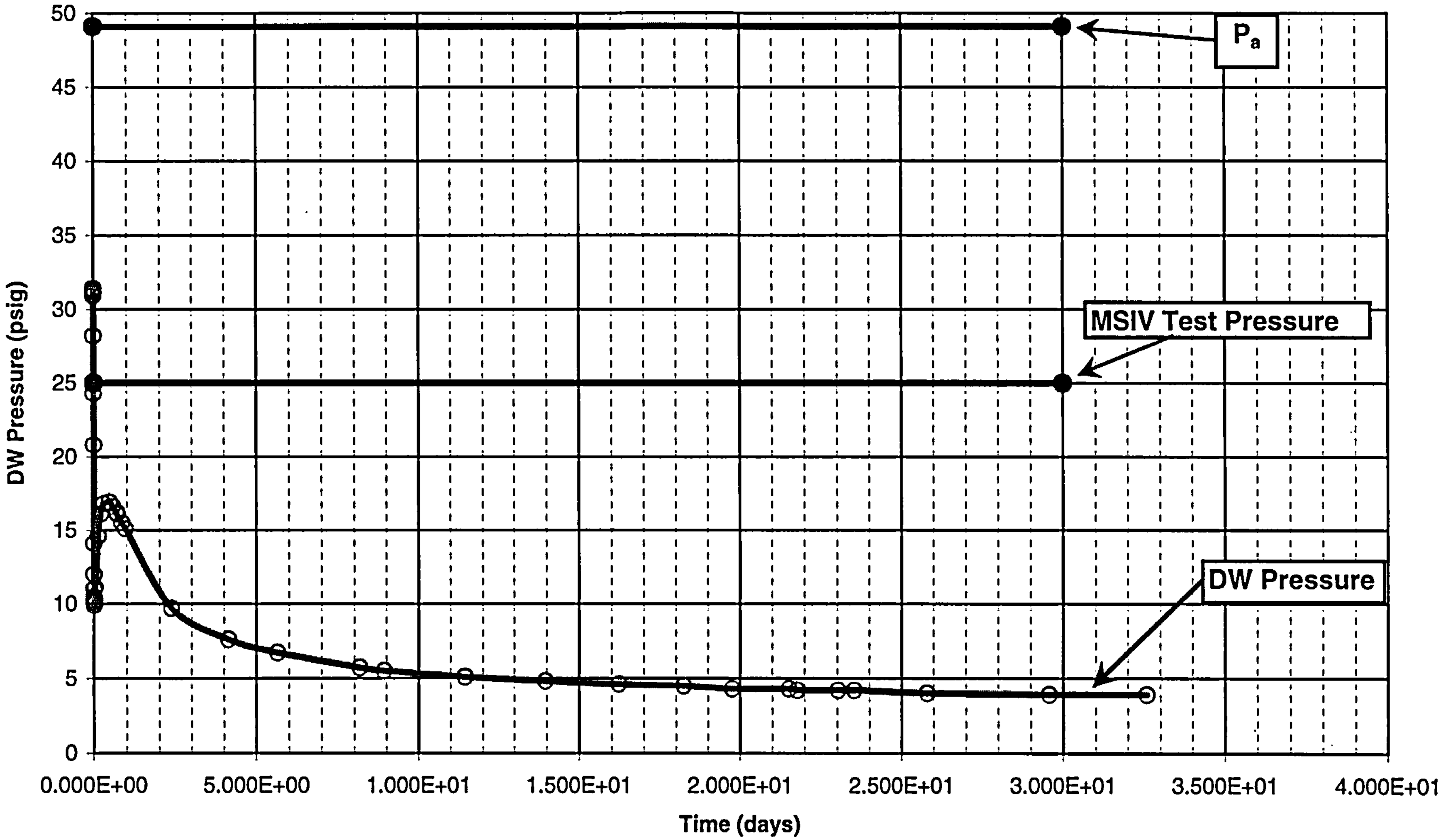


Figure 1: PBAPS Post-LOCA Containment Pressure



Based on SIL-636 Containment Pressure Reevaluation

Time	Time	X Time	DW Pressure	Y DW Pressure	49.1 PC Leak	25 MSIV Leak Fractions		
(sec)	(hrs)	(days)	(psia)	(psig)	Fraction	F 1a	F 7	Worst
0.001	2.778E-07	1.157E-08	1.72E+01	2.50E+00				
18.45996	5.128E-03	2.137E-04	4.93E+01	3.46E+01	0.839	1.176		1.176
45.61621	1.267E-02	5.280E-04	4.57E+01	3.10E+01	0.795	1.114		1.114
52.13184	1.448E-02	6.034E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
65.53809	1.821E-02	7.585E-04	4.61E+01	3.14E+01	0.800	1.121		1.121
69.85059	1.940E-02	8.085E-04	4.61E+01	3.14E+01	0.800	1.121		1.121
73.85059	2.051E-02	8.548E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
77.94434	2.165E-02	9.021E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
82.00684	2.278E-02	9.492E-04	4.60E+01	3.13E+01	0.798	1.119		1.119
86.19434	2.394E-02	9.976E-04	4.59E+01	3.12E+01	0.797	1.117		1.117
91.75684	2.549E-02	1.062E-03	4.58E+01	3.11E+01	0.796	1.115		1.115
97.50684	2.709E-02	1.129E-03	4.58E+01	3.11E+01	0.796	1.115		1.115
109.2256	3.034E-02	1.264E-03	4.56E+01	3.09E+01	0.793	1.112		1.112
212.0022	5.889E-02	2.454E-03	4.29E+01	2.82E+01	0.758	1.062		1.062
308.5225	8.570E-02	3.571E-03	3.90E+01	2.43E+01	0.703	0.986		0.986
410.1475	1.139E-01	4.747E-03	3.55E+01	2.08E+01	0.651	0.912		0.912
516.585	1.435E-01	5.979E-03	2.88E+01	1.41E+01	0.536	0.751		0.751
622.6865	1.730E-01	7.207E-03	2.67E+01	1.20E+01	0.494	0.693		0.693
772.9365	2.147E-01	8.946E-03	2.57E+01	1.10E+01	0.473	0.663		0.663
884.124	2.456E-01	1.023E-02	2.52E+01	1.05E+01	0.462	0.648		0.648
911.9365	2.533E-01	1.055E-02	2.51E+01	1.04E+01	0.460	0.645		0.645
1053.062	2.925E-01	1.219E-02	2.48E+01	1.01E+01	0.454	0.636		0.636
1197.499	3.326E-01	1.386E-02	2.46E+01	9.90E+00	0.449	0.629		0.629
2659.374	7.387E-01	3.078E-02	2.49E+01	1.02E+01	0.456	0.639		0.639
3823.312	1.062E+00	4.425E-02	2.58E+01	1.11E+01	0.475	0.666		0.666
10990.19	3.053E+00	1.272E-01	2.93E+01	1.46E+01	0.545	0.764		0.764
17851.88	4.959E+00	2.066E-01	3.08E+01	1.61E+01	0.573	0.802		0.802
26057.94	7.238E+00	3.016E-01	3.15E+01	1.68E+01	0.585	0.820		0.820
40572.88	1.127E+01	4.696E-01	3.16E+01	1.69E+01	0.587	0.822		0.822
49656.44		5.747E-01	3.13E+01	1.66E+01	0.581	0.815		0.815
58284	1.619E+01	6.746E-01	3.09E+01	1.62E+01	0.574	0.805		0.805
60084	1.669E+01	6.954E-01	3.09E+01	1.62E+01	0.574	0.805		0.805
60984	1.694E+01	7.058E-01	3.08E+01	1.61E+01	0.573	0.802		0.802
73705.72	2.047E+01	8.531E-01	3.02E+01	1.55E+01	0.562	0.787	0.761	0.787
82705.72	2.297E+01	9.572E-01	2.98E+01	1.51E+01	0.555	0.777	0.751	0.777
205409	5.706E+01	2.377E+00	2.44E+01	9.70E+00	0.444	0.623	0.615	0.623
357894	9.942E+01	4.142E+00	2.23E+01	7.60E+00	0.393	0.551	0.562	0.562
488476.8	1.357E+02	5.654E+00	2.14E+01	6.70E+00	0.369	0.518	0.539	0.539
706177.5	1.962E+02	8.173E+00	2.04E+01	5.70E+00	0.341	0.477	0.514	0.514
771500.3	2.143E+02	8.929E+00	2.02E+01	5.50E+00	0.335	0.469	0.509	0.509
989248.3	2.748E+02	1.145E+01	1.98E+01	5.10E+00	0.322	0.452	0.499	0.499
1206853	3.352E+02	1.397E+01	1.95E+01	4.80E+00	0.313	0.438	0.491	0.491
1402727	3.896E+02	1.624E+01	1.93E+01	4.60E+00	0.306	0.429	0.486	0.486
1576860	4.380E+02	1.825E+01	1.92E+01	4.50E+00	0.303	0.424	0.484	0.484
1707418	4.743E+02	1.976E+01	1.90E+01	4.30E+00	0.296	0.415	0.479	0.479
1859488	5.165E+02	2.152E+01	1.90E+01	4.30E+00	0.296	0.415	0.479	0.479
1881188	5.226E+02	2.177E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
1989922	5.528E+02	2.303E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
2033437	5.648E+02	2.354E+01	1.89E+01	4.20E+00	0.292	0.410	0.476	0.476
2228928	6.191E+02	2.580E+01	1.87E+01	4.00E+00	0.285	0.400	0.471	0.471
2555275	7.098E+02	2.957E+01	1.86E+01	3.90E+00	0.282	0.395	0.469	0.469
2815761	7.822E+02	3.259E+01	1.86E+01	3.90E+00	0.282	0.395	0.469	0.469

Test Pressures (psig)

Test Pressures

	Pa (psig)	MSIV (psig)
0.01	49.1	25
30	49.1	25

Stepwise Reduction Credit Plot

time (hrs)	time (days)	PC Leak fraction
0	0	1
24	1	1
24.01	1.0004167	0.56
38	1.5833333	0.56
38.01	1.58375	0.5
720	30	0.5

Stepwise Reduction Credit Plot

time (hrs)	time (days)	MSIV Leak fraction
0	0	1
24	1	1
24.01	1.0004167	0.772
48	2	0.772
48.01	2.0004167	0.654
72	3	0.654
72.01	3.0004167	0.59
96	4	0.59
96.01	4.0004167	0.562
275	11.458333	0.562
275.01	11.45875	0.5
720	30	0.5

Methodology for Determination of Leak Rate Reductions as a Function of Time for PC Leakage

The Leakage Characterization Methodologies considered and evaluated herein are:

Case	Leakage Treatment	Reference, Eq. No.	Leakage Ratio Formulation
1a	Turbulent flow - Darcy's Formula	Ref. 1, Eq. 3-5	$L_x/L_a=[(P_x-P_{norm})/(P_a-P_{norm})]^{0.5}$
1b	Turbulent flow - Darcy's Formula (Ideal Gas)	Ref. 1, Eq. 3-5	$L_x/L_a=[(P_x-P_{norm})*P_x/(T_x+459.7)/((P_a-P_{norm})*P_a/(T_a+459.7))]^{0.5}$
2	Laminar flow	Ref. 1, Eq. 3-6	$L_x/L_a=(P_x-P_{norm})/(P_a-P_{norm})$
3	Molecular Flow - Dong, Bromley & Dushman	Ref. 2, Eq. 2	$L_x/L_a=(P_x-P_{norm})/(P_a-P_{norm})$
4	Laminar Viscous Flow - Grinnell	Ref. 2, Eq. 8	$L_x/L_a=(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)$
5	Turbulant Viscous Flow - Darcy-Weisbach	Ref. 2, Eq. 13	$L_x/L_a=[(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)]^{0.5}$
6	Turbulent Viscous Flow - Knapp & Metzgar	Ref. 2, Eq. 17/18	$L_x/L_a=[(P_x^2-P_{norm}^2)/(P_a^2-P_{norm}^2)]^{4/7}$
7	Compressible Flow - Convergent Passage	Ref. 2, Eq. 21	$L_x/L_a=P_x/P_a$

References:

1 Technical Paper 410, "Flow of Fluids through Valves, Fittings, and Pipe," 1988 Crane

2 TID-20583, "Leakage Characteristics of Steel Containment Vessels and the Analysis of Leakage Rate Determinations," May 1964, AEC

Application of Methodology from PM-1061, Rev. 0, "Determination of Reduced Primary Containment Leakage Rate for AST Implementation" to the MSIV Leakage Pathway

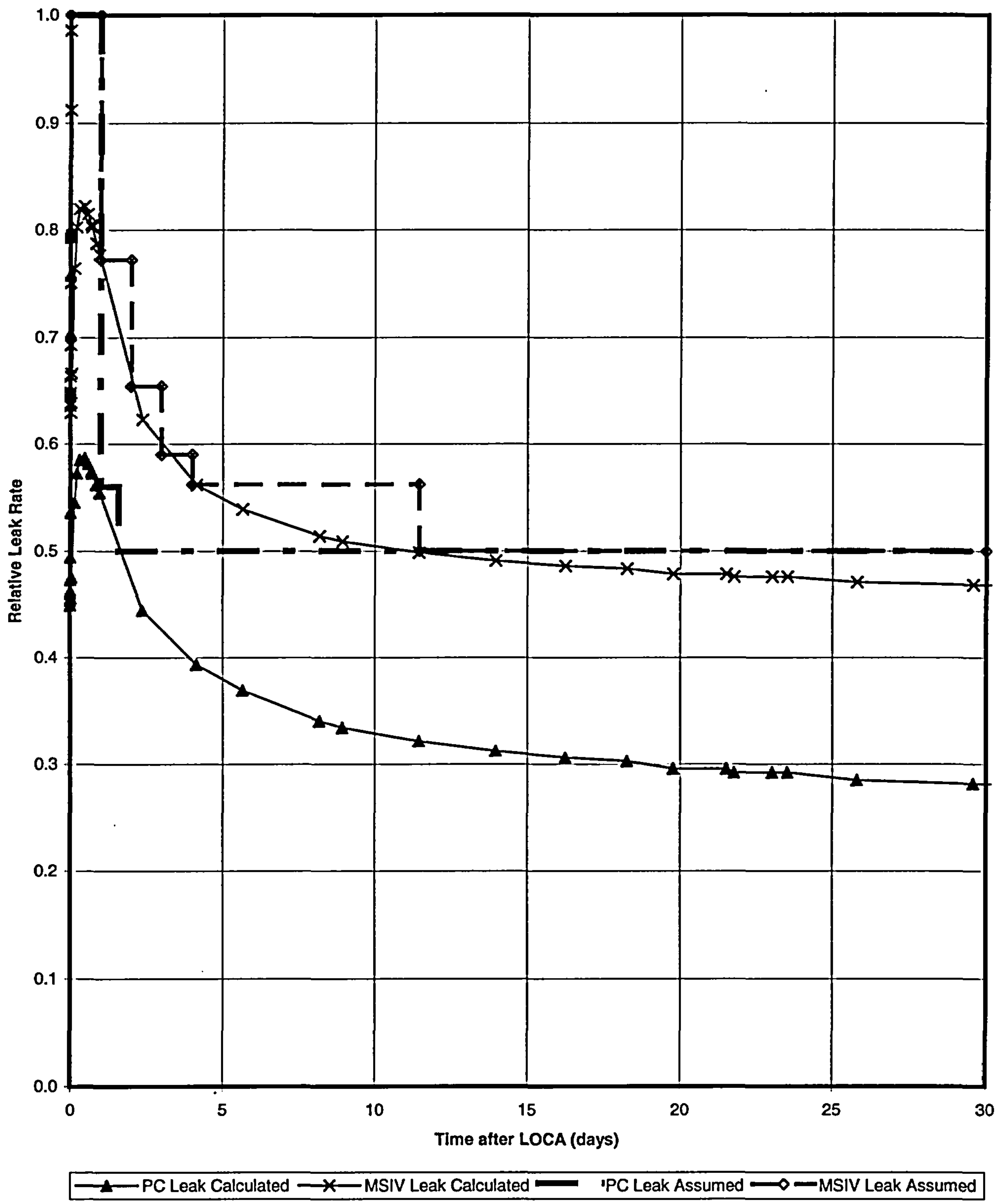
14.7	P_{norm}	= atmospheric air pressure (14.7 psia)
280	T_a	= maximum containment accident temperature (°F)
63.8	P_a	= maximum primary containment accident pressure and LLRT test pressure (psia)
39.7	P_{msiv}	= MSIV minimum test pressure (psia)

time	time	time	time	P_x	T_x	PC Leakage other than MSIVs								MSIV Leakage							
(seconds)	(minutes)	(hours)	(days)	(psia)	(°F)	1a	1b	2	3	4	5	6	7	1a	1b	2	3	4	5	6	7
123.78809	2.06	0.034	0.001	45.3	275	0.79	0.67	0.62	0.62	0.48	0.69	0.65	0.71	1.11	1.19	1.22	1.22	1.35	1.16	1.19	1.14
364.77246	6.08	0.101	0.004	39.6	267	0.71	0.57	0.51	0.51	0.35	0.59	0.55	0.62	1.00	1.01	1.00	1.00	0.99	1.00	1.00	1.00
607.49902	10.12	0.169	0.007	26.9	221	0.50	0.34	0.25	0.25	0.13	0.36	0.31	0.42	0.70	0.60	0.49	0.49	0.37	0.61	0.57	0.68
911.93652	15.20	0.253	0.011	25.1	207	0.46	0.30	0.21	0.21	0.11	0.33	0.28	0.39	0.64	0.54	0.42	0.42	0.30	0.55	0.51	0.63
1775.5615	29.59	0.493	0.021	24.4	194	0.44	0.29	0.20	0.20	0.10	0.31	0.27	0.38	0.62	0.52	0.39	0.39	0.28	0.53	0.48	0.61
3485.8115	58.10	0.968	0.040	25.6	192	0.47	0.32	0.22	0.22	0.11	0.34	0.29	0.40	0.66	0.56	0.44	0.44	0.32	0.57	0.52	0.64
5623.3115	93.72	1.562	0.065	25.6	192	0.47	0.32	0.22	0.22	0.11	0.34	0.29	0.40	0.66	0.56	0.44	0.44	0.32	0.57	0.52	0.64
6958.499	115.97	1.933	0.081	27.8	197	0.52	0.36	0.27	0.27	0.14	0.38	0.33	0.44	0.72	0.64	0.52	0.52	0.41	0.64	0.60	0.70
33311.188	555.19	9.253	0.386	31.7	206	0.59	0.44	0.35	0.35	0.20	0.45	0.40	0.50	0.82	0.78	0.68	0.68	0.58	0.76	0.73	0.80
57384	956.40	15.940	0.664	31	203	0.58	0.42	0.33	0.33	0.19	0.44	0.39	0.49	0.81	0.75	0.65	0.65	0.55	0.74	0.71	0.78
86305.719	1438.43	23.974	0.999	29.4	198	0.55	0.39	0.30	0.30	0.17	0.41	0.36	0.46	0.77	0.70	0.59	0.59	0.48	0.69	0.65	0.74
161816.72	2696.95	44.949	1.873	25.8	181	0.48	0.32	0.23	0.23	0.12	0.34	0.29	0.40	0.67	0.58	0.44	0.44	0.33	0.57	0.53	0.65
248986.28	4149.77	69.163	2.882	23.6	169	0.43	0.28	0.18	0.18	0.09	0.30	0.25	0.37	0.60	0.50	0.36	0.36	0.25	0.50	0.45	0.59
336116.28	5601.94	93.366	3.890	22.5	162	0.40	0.26	0.16	0.16	0.08	0.27	0.23	0.35	0.56	0.46	0.31	0.31	0.21	0.46	0.41	0.57
858595.63	14309.93	238.499	9.937	20	141	0.33	0.20	0.11	0.11	0.05	0.22	0.18	0.31	0.46	0.36	0.21	0.21	0.14	0.37	0.32	0.50
2598751.8	43312.53	721.876	30.078	18.6	127	0.28	0.17	0.08	0.08	0.03	0.18	0.14	0.29	0.39	0.30	0.16	0.16	0.10	0.31	0.26	0.47

Conclusions:

1. PC Leakage other than MSIV is assumed to be reduced to 56% La after 1 day and 50% La after 38 hours based on PM-1061 results.
2. MSIV Leakage reductions are based on the 1a and 7 formulations, whichever is limiting. Sheet "Drywell Pressure Data" and "F2-Leak Rate Reduction" show the step-wise, conservatively bounding assumptions.

Figure 2: Leak Rate Vs. Time, Calculated and Assumed



ATTACHMENT 4

PEACH BOTTOM ATOMIC POWER STATION
UNITS 2 AND 3

Docket Nos. 50-277
50-278

License Nos. DPR-44
DPR-56

Supplement to License Amendment Request for
"PBAPS Alternative Source Term Implementation"

Compact Disc Containing "Attachment 4 -- AST LOCA DF Determination and Pipe Take-offs (150 scfh).xls" Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	PBAPS Unit 3 Determination of MSL Decontamination Factors Due to Iodine Deposition															
2			Unit 3	Unit 3	Unit 3	Unit 3		Unit 3	Unit 3	Unit 3	Unit 3		Unit 3	Unit 3	Unit 3	Unit 3
3			Inboard A	Inboard B	Inboard C	[12]Inboard D		Penetration A	Penetration B	Penetration C	[12]Penetration D		Outboard A	Outboard B	Outboard C	[12]Outboard D
4	[1]Total Pipe Surface Area (ft^2)		687	620	617	0		140	140	140	140		1961	1896	1831	1618
5	[1]Total Pipe Volume (ft^3)		338	305	304	0		69	69	69	69		965	933	901	796
6	[1]Horizontal Total Pipe Surface Area (ft^2)		302	258	255	0		140	140	140	140		1891	1826	1761	1548
7	Horizontal Settling Pipe Surface Area (ft^2)		151.19	128.87	127.60	0.00		69.95	69.95	69.95	69.95		945.54	913.03	880.55	774.04
8	[1]Horizontal Pipe Volume (ft^3)		149	127	126	0		69	69	69	69		931	899	867	762
9	[2]Aerosol Settling Velocity (m/s)		1.170E-03	1.170E-03	1.170E-03	1.170E-03		1.170E-03	1.170E-03	1.170E-03	1.170E-03		1.170E-03	1.170E-03	1.170E-03	1.170E-03
10	Aerosol Settling Velocity (ft/s)		3.839E-03	3.839E-03	3.839E-03	3.839E-03		3.839E-03	3.839E-03	3.839E-03	3.839E-03		3.839E-03	3.839E-03	3.839E-03	3.839E-03
11	[5,6]Elemental Deposition Velocity 0-24hrs (m/sec)		5.359E-06	5.359E-06	5.359E-06	5.359E-06		5.359E-06	5.359E-06	5.359E-06	5.359E-06		5.359E-06	5.359E-06	5.359E-06	5.359E-06
12	[5,6]Elemental Deposition Velocity 24-48hrs (m/sec)		1.248E-05	1.248E-05	1.248E-05	1.248E-05		1.248E-05	1.248E-05	1.248E-05	1.248E-05		1.248E-05	1.248E-05	1.248E-05	1.248E-05
13	[5,6]Elemental Deposition Velocity 48-72hrs (m/sec)		2.897E-05	2.897E-05	2.897E-05	2.897E-05		2.897E-05	2.897E-05	2.897E-05	2.897E-05		2.897E-05	2.897E-05	2.897E-05	2.897E-05
14	[5,6]Elemental Deposition Velocity 72-96hrs (m/sec)		4.630E-05	4.630E-05	4.630E-05	4.630E-05		4.630E-05	4.630E-05	4.630E-05	4.630E-05		4.630E-05	4.630E-05	4.630E-05	4.630E-05
15	[5,6]Elemental Deposition Velocity 96-275hrs (m/sec)		7.945E-05	7.945E-05	7.945E-05	7.945E-05		7.945E-05	7.945E-05	7.945E-05	7.945E-05		7.945E-05	7.945E-05	7.945E-05	7.945E-05
16	[5,6]Elemental Deposition Velocity 275-720hrs (m/sec)		7.945E-05	7.945E-05	7.945E-05	7.945E-05		7.945E-05	7.945E-05	7.945E-05	7.945E-05		7.945E-05	7.945E-05	7.945E-05	7.945E-05
17	Elemental Deposition Velocity 0-24hrs (ft/sec)		1.758E-05	1.758E-05	1.758E-05	1.758E-05		1.758E-05	1.758E-05	1.758E-05	1.758E-05		1.758E-05	1.758E-05	1.758E-05	1.758E-05
18	Elemental Deposition Velocity 24-48hrs (ft/sec)		4.095E-05	4.095E-05	4.095E-05	4.095E-05		4.095E-05	4.095E-05	4.095E-05	4.095E-05		4.095E-05	4.095E-05	4.095E-05	4.095E-05
19	Elemental Deposition Velocity 48-72hrs (ft/sec)		9.503E-05	9.503E-05	9.503E-05	9.503E-05		9.503E-05	9.503E-05	9.503E-05	9.503E-05		9.503E-05	9.503E-05	9.503E-05	9.503E-05
20	Elemental Deposition Velocity 72-96hrs (ft/sec)		1.519E-04	1.519E-04	1.519E-04	1.519E-04		1.519E-04	1.519E-04	1.519E-04	1.519E-04		1.519E-04	1.519E-04	1.519E-04	1.519E-04
21	Elemental Deposition Velocity 96-275hrs (ft/sec)		2.607E-04	2.607E-04	2.607E-04	2.607E-04		2.607E-04	2.607E-04	2.607E-04	2.607E-04		2.607E-04	2.607E-04	2.607E-04	2.607E-04
22	Elemental Deposition Velocity 275-720hrs (ft/sec)		2.607E-04	2.607E-04	2.607E-04	2.607E-04		2.607E-04	2.607E-04	2.607E-04	2.607E-04		2.607E-04	2.607E-04	2.607E-04	2.607E-04
23	[5,6]Organic Deposition Velocity 0-24hrs (m/sec)		5.969E-09	5.969E-09	5.969E-09	5.969E-09		5.969E-09	5.969E-09	5.969E-09	5.969E-09		5.969E-09	5.969E-09	5.969E-09	5.969E-09
24	[5,6]Organic Deposition Velocity 24-48hrs (m/sec)		1.390E-08	1.390E-08	1.390E-08	1.390E-08		1.390E-08	1.390E-08	1.390E-08	1.390E-08		1.390E-08	1.390E-08	1.390E-08	1.390E-08
25	[5,6]Organic Deposition Velocity 48-72hrs (m/sec)		3.226E-08	3.226E-08	3.226E-08	3.226E-08		3.226E-08	3.226E-08	3.226E-08	3.226E-08		3.226E-08	3.226E-08	3.226E-08	3.226E-08
26	[5,6]Organic Deposition Velocity 72-96hrs (m/sec)		5.156E-08	5.156E-08	5.156E-08	5.156E-08		5.156E-08	5.156E-08	5.156E-08	5.156E-08		5.156E-08	5.156E-08	5.156E-08	5.156E-08
27	[5,6]Organic Deposition Velocity 96-275hrs (m/sec)		8.849E-08	8.849E-08	8.849E-08	8.849E-08		8.849E-08	8.849E-08	8.849E-08	8.849E-08		8.849E-08	8.849E-08	8.849E-08	8.849E-08
28	[5,6]Organic Deposition Velocity 275-720hrs (m/sec)		8.849E-08	8.849E-08	8.849E-08	8.849E-08		8.849E-08	8.849E-08	8.849E-08	8.849E-08		8.849E-08	8.849E-08	8.849E-08	8.849E-08
29	Organic Deposition Velocity 0-24hrs (ft/sec)		1.958E-08	1.958E-08	1.958E-08	1.958E-08		1.958E-08	1.958E-08	1.958E-08	1.958E-08		1.958E-08	1.958E-08	1.958E-08	1.958E-08
30	Organic Deposition Velocity 24-48hrs (ft/sec)		4.561E-08	4.561E-08	4.561E-08	4.561E-08		4.561E-08	4.561E-08	4.561E-08	4.561E-08		4.561E-08	4.561E-08	4.561E-08	4.561E-08
31	Organic Deposition Velocity 48-72hrs (ft/sec)		1.058E-07	1.058E-07	1.058E-07	1.058E-07		1.058E-07	1.058E-07	1.058E-07	1.058E-07		1.058E-07	1.058E-07	1.058E-07	1.058E-07
32	Organic Deposition Velocity 72-96hrs (ft/sec)		1.692E-07	1.692E-07	1.692E-07	1.692E-07		1.692E-07	1.692E-07	1.692E-07	1.692E-07		1.692E-07	1.692E-07	1.692E-07	1.692E-07
33	Organic Deposition Velocity 96-275hrs (ft/sec)		2.903E-07	2.903E-07	2.903E-07	2.903E-07		2.903E-07	2.903E-07	2.903E-07	2.903E-07		2.903E-07	2.903E-07	2.903E-07	2.903E-07
34	Organic Deposition Velocity 275-720hrs (ft/sec)		2.903E-07	2.903E-07	2.903E-07	2.903E-07		2.903E-07	2.903E-07	2.903E-07	2.903E-07		2.903E-07	2.903E-07	2.903E-07	2.903E-07
35	Uncorrected Flow Rate (scfh)		0	0	75	75		0	0	75	75		0	0	75	75
36	[11]Artificial Containment Flow Rate 0-2 hrs (cfm)		0.0000	0.0000	0.7736	0.7736		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
37	From Containment Flow Rate 2-24 hrs (cfm)		0.0000	0.0000	0.4375	0.4375		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
38	From Containment Flow Rate 24-48 hrs (cfm)		0.0000	0.0000	0.3377	0.3377		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
39	From Containment Flow Rate 48-72 hrs (cfm)		0.0000	0.0000	0.2861	0.2861		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
40	From Containment Flow Rate 72-96 hrs (cfm)		0.0000	0.0000	0.2581	0.2581		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
41	From Containment Flow Rate 96-275 hrs (cfm)		0.0000	0.0000	0.2459	0.2459		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
42	From Containment Flow Rate 275-720 hrs (cfm)		0.0000	0.0000	0.2187	0.2187		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
43	Pipe Flow Rate 0-24 hrs (cfm)		0.0000	0.0000	0.4375	0.4375		0.0000	0.0000	2.4100	2.4100		0.0000	0.0000	2.4100	2.4100
44	Pipe Flow Rate 24-48 hrs (cfm)		0.0000	0.0000	0.3377	0.3377		0.0000	0.0000	1.5901	1.5901		0.0000	0.0000	1.5901	1.5901
45	Pipe Flow Rate 48-72 hrs (cfm)		0.0000	0.0000	0.2861	0.2861		0.0000	0.0000	1.1767	1.1767		0.0000	0.0000	1.1767	1.1767
46	Pipe Flow Rate 72-96 hrs (cfm)		0.0000	0.0000	0.2581	0.2581		0.0000	0.0000	0.9917	0.9917		0.0000	0.0000	0.9917	0.9917
47	Pipe Flow Rate 96-275 hrs (cfm)		0.0000	0.0000	0.2459	0.2459		0.0000	0.0000	0.8781	0.8781		0.0000	0.0000	0.8781	0.8781
48	Pipe Flow Rate 275-720 hrs (cfm)		0.0000	0.0000	0.2187	0.2187		0.0000	0.0000	0.7813	0.7813		0.0000	0.0000	0.7813	0.7813
49	Pipe Flow Rate 0-24 hrs (cfh)		0.0000	0.0000	26.2489	26.2489		0.0000	0.0000	144.6023	144.6023		0.0000	0.0000	144.6023	144.6023
50	Pipe Flow Rate 24-48 hrs (cfh)		0.0000	0.0000	20.2642	20.2642		0.0000	0.0000	95.4034	95.4034		0.0000	0.0000	95.4034	95.4034
51	Pipe Flow Rate 48-72 hrs (cfh)		0.0000	0.0000	17.1668	17.1668		0.0000	0.0000	70.6023	70.6023		0.0000	0.0000	70.6023	70.6023
52	Pipe Flow Rate 72-96 hrs (cfh)		0.0000	0.0000	15.4869	15.4869		0.0000	0.0000	59.5028	59.5028		0.0000	0.0000	59.5028	59.5028
53	Pipe Flow Rate 96-275 hrs (cfh)		0.0000	0.0000	14.7519	14.7519		0.0000	0.0000	52.6875	52.6875		0.0000	0.0000	52.6875	52.6875
54	Pipe Flow Rate 275-720 hrs (cfh)		0.0000	0.0000	13.1245	13.1245		0.0000	0.0000	46.8750	46.8750		0.0000	0.0000	46.8750	46.8750
55																
56	[3]Aerosol Settling Rate Constant (hr^{-1})		1.40E+01	1.40E+01	1.40E+01	#DIV/0!		1.40E+01	1.40E+01	1.40E+01	1.40E+01		1.40E+01	1.40E+01	1.40E+01	1.40E+01
57	[3]Elemental Deposition Rate Constant 0-24hr (hr^{-1})		1.29E-01	1.29E-01	1.29E-01	#DIV/0!		1.29E-01	1.29E-01	1.29E-01	1.29E-01		1.29E-01	1.29E-01	1.29E-01	1.29E-01
58	[3]Elemental Deposition Rate Constant 24-48hr (hr^{-1})		3.00E-01	3.00E-01	3.00E-01	#DIV/0!		3.00E-01	3.00E-01	3.00E-01	3.00E-01		3.00E-01	3.00E-01	3.00E-01	3.00E-01
59	[3]Elemental Deposition Rate Constant 48-72hr (hr^{-1})		6.95E-01	6.95E-01	6.95E-01	#DIV/0!		6.95E-01	6.95E-01	6.95E-01	6.95E-01		6.95E-01	6.95E-01	6.95E-01	6.95E-01
60	[3]Elemental Deposition Rate Constant 72-96hr (hr^{-1})		1.11E+00	1.11E+00	1.11E+00	#DIV/0!		1.11E+00	1.11E+00	1.11E+00	1.11E+00		1.11E+00	1.11E+00	1.11E+00	1.11E+00
61	[3]Elemental Deposition Rate Constant 96-275hr (hr^{-1})		1.91E+00	1.91E+00	1.91E+00	#DIV/0!		1.91E+00	1.91E+00	1.91E+00	1.91E+00		1.91E+00	1.91E+00	1.91E+00	1.91E+00
62	[3]Elemental Deposition Rate Constant 275-720hr (hr^{-1})		1.91E+00	1.91E+00	1.91E+00	#DIV/0!		1.91E+00	1.91E+00	1.91E+00	1.91E+00		1.91E+00	1.91E+00	1.91E+00	1.91E+00
63	[3]Organic Deposition Rate Constant 0-24hr (hr^{-1})		1.43E-04	1.43E-04	1.43E-04	#DIV/0!		1.43E-04	1.43E-04	1.43E-04	1.43E-04		1.43E-04	1.43E-04	1.43E-04	1.43E-04
64	[3]Organic Deposition Rate Constant 24-48hr (hr^{-1})		3.34E-04	3.34E-04	3.34E-04	#DIV/0!		3.34E-04	3.34E-04	3.34E-04	3.34E-04		3.34E-04	3.34E-04	3.34E-04	3.34E-04
65	[3]Organic Deposition Rate Constant 48-72hr (hr^{-1})		7.74E-04	7.74E-04	7.74E-04	#DIV/0!		7.74E-04	7.74E-04	7.74E-04	7.74E-04		7.74E-04	7.74E-04	7.74E-04	7.74E-04
66	[3]Organic Deposition Rate Constant 72-96hr (hr^{-1})		1.24E-03	1.24E-03	1.24E-03	#DIV/0!		1.24E-03	1.24E-03	1.24E-03	1.24E-03		1.24E-03	1.24E-03	1.24E-03	1.24E-03
67	[3]Organic Deposition Rate Constant 96-275hr (hr^{-1})		2.12E-03	2.12E-03	2.12E-03	#DIV/0!		2.12E-03	2.12E-03	2.12E-03	2.12E-03		2.12E-03	2.12E-03	2.12E-03	2.12E-03
68	3Organic Deposition Rate Constant 275-720hr (hr^{-1})		2.12E-03	2.12E-03	2.12E-03	#DIV/0!		2.12E-03	2.12E-03	2.12E-03	2.12E-03		2.12E-03	2.12E-03	2.12E-03	2.12E-03
69																
70	[4]Aerosol Filter Efficiency (0-24 hrs)		0.00%	0.00%	98.53%	#DIV/0!		0.00%	0.00%	86.99%	86.99%		0.00%	0.00%	98.83%	98.67%
71	[4]Aerosol Filter Efficiency (24-48 hrs)		0.00%	0.00%	98.86%	#DIV/0!		0.00%	0.00%	91.02%	91.02%		0.00%	0.00%	99.22%	99.12%
72	[4]Aerosol Filter Efficiency (48-72 hrs)		0.00%	0.00%	99.04%	#DIV/0!		0.00%	0.00%	93.19%	93.19%		0.00%	0.00%	99.42%	99.34%
73	[4]Aerosol Filter Efficiency (72-96 hrs)		0.00%	0.00%	99.13%	#DIV/0!		0.00%	0.00%	94.20%	94.20%		0.00%	0.00%	99.51%	99.45%
74	4Aerosol Filter Efficiency (96-275 hrs)		0.00%	0.00%	99.17%	#DIV/0!		0.00%	0.00%	94.83%	94.83%		0.00%	0.00%	99.57%	99.51%
75	[4]Aerosol Filter Efficiency (275-720 hrs)		0.00%	0.00%	99.26%	#DIV/0!		0.00%	0.00%	95.37%	95.37%		0.00%	0.00%	99.62%	99.56%
76	[4]Elemental Filter Efficiency (0-24 hrs)		0.00%	0.00%	59.82%	#DIV/0!		0.00%	0.00%	5.77%	5.77%		0.00%	0.00%	44.49%	41.46%
77	[4]Elemental Filter Efficiency (24-48 hrs)		0.00%	0.00%	81.79%	#DIV/0!		0.00%	0.00%	17.77%	17.77%		0.00%	0.00%	73.89%	71.43%
78	[4]Elemental Filter Efficiency (48-72 hrs)		0.00%	0.00%	92.48%	#DIV/0!		0.00%	0.00%	40.40%	40.40%		0.00%	0.00%	89.87%	88.69%
79	[4]Elemental Filter Efficiency (72-96 hrs)		0.00%	0.00%	95.61%	#DIV/0!		0.00%	0.00%	56.25%	56.25%		0.00%	0.00%	94.39%	93.70%
80	[4]Elemental Filter Efficiency (96-275 hrs)		0.00%	0.00%	97.52%	#DIV/0!		0.00%	0.00%	71.36%	71.36%		0.00%	0.00%	97.02%	96.65%
81	[4]Elemental Filter Efficiency (275-720 hrs)		0.00%	0.00%	97.78%	#DIV/0!		0.00%	0.00%	73.69%	73.69%		0.00%	0.00%	97.34%	97.01%
82	[4]Organic Filter Efficiency (0-24 hrs)		0.00%	0.00%	0.17%	#DIV/0!		0.00%	0.00%	0.01%	0.01%		0.00%	0.00%	0.09%	0.08%
83	[4]Organic Filter Efficiency (24-48 hrs)		0.00%	0.00%	0.50%	#DIV/0!		0.00%	0.00%	0.02%	0.02%		0.00%	0.00%	0.31%	0.28%
84	[4]Organic Filter Efficiency (48-72 hrs)		0.00%	0.00%	1.35%	#DIV/0!		0.00%	0.00%	0.08%	0.08%		0.00%	0.00%	0.98%	0.87%
85	[4]Organic Filter Efficiency (72-96 hrs)		0.00%	0.00%	2.37%	#DIV/0!		0.00%	0.00%	0.14%	0.14%		0.00%	0.00%	1.84%	1.63%
86	[4]Organic Filter Efficiency (96-275 hrs)		0.00%	0.00%	4.19%	#DIV/0!		0.00%	0.00%	0.28%	0.28%		0.00%	0.00%	3.51%	3.11%
87	[4]Organic Filter Efficiency (275-720 hrs)		0.00%	0.00%	4.69%	#DIV/0!		0.00%	0.00%	0.31%	0.31%		0.00%	0.00%	3.92%	3.48%
88																
89	[7]Pipe Wall Temperature, 0-24hr (F)	558.00			References:											
90	Pipe Wall Temperature, 0-24hr (K)	565.37			1.	Piping Take-off Summary (attached)										
91	[7]Pipe Wall Temperature, 24-48hr (F)	410.00			2.	USNRC Document AEB-98-03, 12/9/1998, Page A-3, Median Value										
92	Pipe Wall Temperature, 24-48hr (K)	483.15			3.	USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 2										
93	[7]Pipe Wall Temperature, 48-72hr (F)	300.00			4.	USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 4										
94	Pipe Wall Temperature, 48-72hr (K)	422.04			5.	Cline, J.E. "MSIV Leakage Iodine Transport Analysis", 3/26/1991										
95	[7]Pipe Wall Temperature, 72-96hr (F)	250.00			6.	NUREG/CR-6604, RADTRAD Manual, 4/1998; Supplement 1, 6/1999										
96	Pipe Wall Temperature, 72-96hr (K)	394.26			7.	Cline, J.E. 8/1990										
97	[7]Pipe Wall Temperature, 96-275hr (F)	200.00			8.	Condenser Not Credited										
98	Pipe Wall Temperature, 96-275hr (K)	366.48			9.	PBAPS Technical Specification										
99	[7]Pipe Wall Temperature, 275-720hr (F)	200.00			10.	PBAPS Technical Specification										
100	Pipe Wall Temperature, 275-720hr (K)	366.48			11	Value used to simulate an un-mixed drywell/suppression chamber air space for the first 2 hours of the LOCA.										
101	[8]Condenser Temperature, constant (F)	Not Credited			12	Main Steam Line Break of longest Inboard line assumed, with no deposition credit (i.e., 0 area and volume)										
102	Condenser Temperature, constant (K)	Not Credited			13	No extrapolation from Test pressure to P_a applied due to small differential, short time of that differential, and other conservatisms.										
103	Standard Temperature, constant (F)	68														
104	[9]MSIV Test Pressure, constant (psig)	25														
105	Leak Rate Reduction Factor, 0-24hr	1.000														
106	Leak Rate Reduction Factor, 24-48hr	0.772														
107	Leak Rate Reduction Factor, 48-72hr	0.654														
108	Leak Rate Reduction Factor, 72-96hr	0.590														
109	Leak Rate Reduction Factor, 96-275hr	0.562														
110	Leak Rate Reduction Factor, 275-720hr	0.500														
111	[10]Peak P_a Containment Pressure, constant (psig)	49.1														
112	Atmospheric Pressure, constant (psia)	14.7														
113	[13]Extrapolation Factor, constant	1.00														
114																
115																
116																
117																

	A	B	C	D	E	F	G	H
1						PBAPS Unit 3 Determination of MSL Decontamination Factors Due to Iodine Depositio		
2			Unit 3	Unit 3	Unit 3	Unit 3		Unit 3
3			Inboard A	Inboard B	Inboard C	[12]Inboard D		Penetration A
4	rea (ft^2)		='MS Piping Summary'!A37	='MS Piping Summary'!B37	='MS Piping Summary'!C37	0		='MS Piping Summary'!A39
5	ume (ft^3)		='MS Piping Summary'!A38	='MS Piping Summary'!B38	='MS Piping Summary'!C38	0		='MS Piping Summary'!A40
6	rea (ft^2)		='MS Piping Summary'!A28	='MS Piping Summary'!B28	='MS Piping Summary'!C28	0		='MS Piping Summary'!A30
7	rea (ft^2)		=C$6/2	=D$6/2	=E$6/2	=F$6/2		=H$6/2
8	ume (ft^3)		='MS Piping Summary'!A29	='MS Piping Summary'!B29	='MS Piping Summary'!C29	0		='MS Piping Summary'!A31
9	ity (m/s)		0.00117	0.00117	0.00117	0.00117		0.00117
10	ity (ft/s)		=C$9/0.3048	=D$9/0.3048	=E$9/0.3048	=F$9/0.3048		=H$9/0.3048
11	(m/sec)		=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100		=EXP((2809/$B$90)-12.5)/100
12	(m/sec)		=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100		=EXP((2809/$B$92)-12.5)/100
13	(m/sec)		=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100		=EXP((2809/$B$94)-12.5)/100
14	(m/sec)		=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100		=EXP((2809/$B$96)-12.5)/100
15	(m/sec)		=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100		=EXP((2809/$B$98)-12.5)/100
16	(m/sec)		=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100		=EXP((2809/$B$100)-12.5)/100
17	(ft/sec)		=C11/0.3048	=D11/0.3048	=E11/0.3048	=F11/0.3048		=H11/0.3048
18	(ft/sec)		=C12/0.3048	=D12/0.3048	=E12/0.3048	=F12/0.3048		=H12/0.3048
19	(ft/sec)		=C13/0.3048	=D13/0.3048	=E13/0.3048	=F13/0.3048		=H13/0.3048
20	(ft/sec)		=C14/0.3048	=D14/0.3048	=E14/0.3048	=F14/0.3048		=H14/0.3048
21	(ft/sec)		=C15/0.3048	=D15/0.3048	=E15/0.3048	=F15/0.3048		=H15/0.3048
22	(ft/sec)		=C16/0.3048	=D16/0.3048	=E16/0.3048	=F16/0.3048		=H16/0.3048
23	(m/sec)		=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100		=EXP((2809/$B$90)-19.3)/100
24	(m/sec)		=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100		=EXP((2809/$B$92)-19.3)/100
25	(m/sec)		=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100		=EXP((2809/$B$94)-19.3)/100
26	(m/sec)		=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100		=EXP((2809/$B$96)-19.3)/100
27	(m/sec)		=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100		=EXP((2809/$B$98)-19.3)/100
28	(m/sec)		=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100		=EXP((2809/$B$100)-19.3)/100
29	(ft/sec)		=C23/0.3048	=D23/0.3048	=E23/0.3048	=F23/0.3048		=H23/0.3048
30	(ft/sec)		=C24/0.3048	=D24/0.3048	=E24/0.3048	=F24/0.3048		=H24/0.3048
31	(ft/sec)		=C25/0.3048	=D25/0.3048	=E25/0.3048	=F25/0.3048		=H25/0.3048
32	(ft/sec)		=C26/0.3048	=D26/0.3048	=E26/0.3048	=F26/0.3048		=H26/0.3048
33	(ft/sec)		=C27/0.3048	=D27/0.3048	=E27/0.3048	=F27/0.3048		=H27/0.3048
34	(ft/sec)		=C28/0.3048	=D28/0.3048	=E28/0.3048	=F28/0.3048		=H28/0.3048
35	e (scfh)		='BWROG Leak Rate Correction'!A45	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45		='BWROG Leak Rate Correction'!A45
36	rs (cfm)		='BWROG Leak Rate Correction'!A47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!B47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!C47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!D47*'BWROG Leak Rate Correction'!$A$19*$B$113		N/A
37	rs (cfm)		='BWROG Leak Rate Correction'!A47*$B$113	='BWROG Leak Rate Correction'!B47*$B$113	='BWROG Leak Rate Correction'!C47*$B$113	='BWROG Leak Rate Correction'!D47*$B$113		N/A
38	rs (cfm)		=C$37*$B106	=D$37*$B106	=E$37*$B106	=F$37*$B106		N/A
39	rs (cfm)		=C$37*$B107	=D$37*$B107	=E$37*$B107	=F$37*$B107		N/A
40	rs (cfm)		=C$37*$B108	=D$37*$B108	=E$37*$B108	=F$37*$B108		N/A
41	rs (cfm)		=C$37*$B109	=D$37*$B109	=E$37*$B109	=F$37*$B109		N/A
42	rs (cfm)		=C$37*$B110	=D$37*$B110	=E$37*$B110	=F$37*$B110		
43	rs (cfm)		='BWROG Leak Rate Correction'!A47*$B$113	='BWROG Leak Rate Correction'!B47*$B$113	='BWROG Leak Rate Correction'!C47*$B$113	='BWROG Leak Rate Correction'!D47*$B$113		=((H$35*$B$113*(($B89+460)/($B$103+460)))/60)*$
44	rs (cfm)		=C$43*$B106	=D$43*$B106	=E$43*$B106	=F$43*$B106		=((H$35*$B$113*(($B91+460)/($B$103+460)))/60)*$
45	rs (cfm)		=C$43*$B107	=D$43*$B107	=E$43*$B107	=F$43*$B107		=((H$35*$B$113*(($B93+460)/($B$103+460)))/60)*$
46	rs (cfm)		=C$43*$B108	=D$43*$B108	=E$43*$B108	=F$43*$B108		=((H$35*$B$113*(($B95+460)/($B$103+460)))/60)*$
47	rs (cfm)		=C$43*$B109	=D$43*$B109	=E$43*$B109	=F$43*$B109		=((H$35*$B$113*(($B97+460)/($B$103+460)))/60)*$
48	rs (cfm)		=C$43*$B110	=D$43*$B110	=E$43*$B110	=F$43*$B110		=((H$35*$B$113*(($B99+460)/($B$103+460)))/60)*$
49	hrs (cfh)		=C43*60	=D43*60	=E43*60	=F43*60		=H43*60
50	hrs (cfh)		=C44*60	=D44*60	=E44*60	=F44*60		=H44*60
51	hrs (cfh)		=C45*60	=D45*60	=E45*60	=F45*60		=H45*60
52	hrs (cfh)		=C46*60	=D46*60	=E46*60	=F46*60		=H46*60
53	hrs (cfh)		=C47*60	=D47*60	=E47*60	=F47*60		=H47*60
54	hrs (cfh)		=C48*60	=D48*60	=E48*60	=F48*60		=H48*60
55								
56	nt (hr^-1)		=((C$10*C$7)/C$8)*3600	=((D$10*D$7)/D$8)*3600	=((E$10*E$7)/E$8)*3600	=((F$10*F$7)/F$8)*3600		=((H$10*H$7)/H$8)*3600
57	hr (hr^-1)		=((C17*C$4)/C$5)*3600	=((D17*D$4)/D$5)*3600	=((E17*E$4)/E$5)*3600	=((F17*F$4)/F$5)*3600		=((H17*H$4)/H$5)*3600
58	hr (hr^-1)		=((C18*C$4)/C$5)*3600	=((D18*D$4)/D$5)*3600	=((E18*E$4)/E$5)*3600	=((F18*F$4)/F$5)*3600		=((H18*H$4)/H$5)*3600
59	hr (hr^-1)		=((C19*C$4)/C$5)*3600	=((D19*D$4)/D$5)*3600	=((E19*E$4)/E$5)*3600	=((F19*F$4)/F$5)*3600		=((H19*H$4)/H$5)*3600
60	hr (hr^-1)		=((C20*C$4)/C$5)*3600	=((D20*D$4)/D$5)*3600	=((E20*E$4)/E$5)*3600	=((F20*F$4)/F$5)*3600		=((H20*H$4)/H$5)*3600
61	hr (hr^-1)		=((C21*C$4)/C$5)*3600	=((D21*D$4)/D$5)*3600	=((E21*E$4)/E$5)*3600	=((F21*F$4)/F$5)*3600		=((H21*H$4)/H$5)*3600
62	hr (hr^-1)		=((C22*C$4)/C$5)*3600	=((D22*D$4)/D$5)*3600	=((E22*E$4)/E$5)*3600	=((F22*F$4)/F$5)*3600		=((H22*H$4)/H$5)*3600
63	hr (hr^-1)		=((C29*C$4)/C$5)*3600	=((D29*D$4)/D$5)*3600	=((E29*E$4)/E$5)*3600	=((F29*F$4)/F$5)*3600		=((H29*H$4)/H$5)*3600
64	hr (hr^-1)		=((C30*C$4)/C$5)*3600	=((D30*D$4)/D$5)*3600	=((E30*E$4)/E$5)*3600	=((F30*F$4)/F$5)*3600		=((H30*H$4)/H$5)*3600
65	hr (hr^-1)		=((C31*C$4)/C$5)*3600	=((D31*D$4)/D$5)*3600	=((E31*E$4)/E$5)*3600	=((F31*F$4)/F$5)*3600		=((H31*H$4)/H$5)*3600
66	hr (hr^-1)		=((C32*C$4)/C$5)*3600	=((D32*D$4)/D$5)*3600	=((E32*E$4)/E$5)*3600	=((F32*F$4)/F$5)*3600		=((H32*H$4)/H$5)*3600
67	hr (hr^-1)		=((C33*C$4)/C$5)*3600	=((D33*D$4)/D$5)*3600	=((E33*E$4)/E$5)*3600	=((F33*F$4)/F$5)*3600		=((H33*H$4)/H$5)*3600
68	hr (hr^-1)		=((C34*C$4)/C$5)*3600	=((D34*D$4)/D$5)*3600	=((E34*E$4)/E$5)*3600	=((F34*F$4)/F$5)*3600		=((H34*H$4)/H$5)*3600
69								
70	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C49))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D49))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E49))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F49))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H49))))
71	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C50))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D50))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E50))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F50))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H50))))
72	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C51))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D51))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E51))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F51))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H51))))
73	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C52))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D52))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E52))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F52))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H52))))
74	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C53))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D53))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E53))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F53))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H53))))
75	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C54))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D54))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E54))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F54))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H54))))
76	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C57*C$5)/C49))))	=IF(D$35=0,0,1-(1/(1+((D57*D$5)/D49))))	=IF(E$35=0,0,1-(1/(1+((E57*E$5)/E49))))	=IF(F$35=0,0,1-(1/(1+((F57*F$5)/F49))))		=IF(H$35=0,0,1-(1/(1+((H57*H$5)/H49))))
77	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C58*C$5)/C50))))	=IF(D$35=0,0,1-(1/(1+((D58*D$5)/D50))))	=IF(E$35=0,0,1-(1/(1+((E58*E$5)/E50))))	=IF(F$35=0,0,1-(1/(1+((F58*F$5)/F50))))		=IF(H$35=0,0,1-(1/(1+((H58*H$5)/H50))))
78	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C59*C$5)/C51))))	=IF(D$35=0,0,1-(1/(1+((D59*D$5)/D51))))	=IF(E$35=0,0,1-(1/(1+((E59*E$5)/E51))))	=IF(F$35=0,0,1-(1/(1+((F59*F$5)/F51))))		=IF(H$35=0,0,1-(1/(1+((H59*H$5)/H51))))
79	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C60*C$5)/C52))))	=IF(D$35=0,0,1-(1/(1+((D60*D$5)/D52))))	=IF(E$35=0,0,1-(1/(1+((E60*E$5)/E52))))	=IF(F$35=0,0,1-(1/(1+((F60*F$5)/F52))))		=IF(H$35=0,0,1-(1/(1+((H60*H$5)/H52))))
80	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C61*C$5)/C53))))	=IF(D$35=0,0,1-(1/(1+((D61*D$5)/D53))))	=IF(E$35=0,0,1-(1/(1+((E61*E$5)/E53))))	=IF(F$35=0,0,1-(1/(1+((F61*F$5)/F53))))		=IF(H$35=0,0,1-(1/(1+((H61*H$5)/H53))))
81	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C62*C$5)/C54))))	=IF(D$35=0,0,1-(1/(1+((D62*D$5)/D54))))	=IF(E$35=0,0,1-(1/(1+((E62*E$5)/E54))))	=IF(F$35=0,0,1-(1/(1+((F62*F$5)/F54))))		=IF(H$35=0,0,1-(1/(1+((H62*H$5)/H54))))
82	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C63*C$5)/C49))))	=IF(D$35=0,0,1-(1/(1+((D63*D$5)/D49))))	=IF(E$35=0,0,1-(1/(1+((E63*E$5)/E49))))	=IF(F$35=0,0,1-(1/(1+((F63*F$5)/F49))))		=IF(H$35=0,0,1-(1/(1+((H63*H$5)/H49))))
83	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C64*C$5)/C50))))	=IF(D$35=0,0,1-(1/(1+((D64*D$5)/D50))))	=IF(E$35=0,0,1-(1/(1+((E64*E$5)/E50))))	=IF(F$35=0,0,1-(1/(1+((F64*F$5)/F50))))		=IF(H$35=0,0,1-(1/(1+((H64*H$5)/H50))))
84	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C65*C$5)/C51))))	=IF(D$35=0,0,1-(1/(1+((D65*D$5)/D51))))	=IF(E$35=0,0,1-(1/(1+((E65*E$5)/E51))))	=IF(F$35=0,0,1-(1/(1+((F65*F$5)/F51))))		=IF(H$35=0,0,1-(1/(1+((H65*H$5)/H51))))
85	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C66*C$5)/C52))))	=IF(D$35=0,0,1-(1/(1+((D66*D$5)/D52))))	=IF(E$35=0,0,1-(1/(1+((E66*E$5)/E52))))	=IF(F$35=0,0,1-(1/(1+((F66*F$5)/F52))))		=IF(H$35=0,0,1-(1/(1+((H66*H$5)/H52))))
86	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C67*C$5)/C53))))	=IF(D$35=0,0,1-(1/(1+((D67*D$5)/D53))))	=IF(E$35=0,0,1-(1/(1+((E67*E$5)/E53))))	=IF(F$35=0,0,1-(1/(1+((F67*F$5)/F53))))		=IF(H$35=0,0,1-(1/(1+((H67*H$5)/H53))))
87	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C68*C$5)/C54))))	=IF(D$35=0,0,1-(1/(1+((D68*D$5)/D54))))	=IF(E$35=0,0,1-(1/(1+((E68*E$5)/E54))))	=IF(F$35=0,0,1-(1/(1+((F68*F$5)/F54))))		=IF(H$35=0,0,1-(1/(1+((H68*H$5)/H54))))
88								
89	24hr (F)	='BWROG Leak Rate Correction'!A5			References:			
90	24hr (K)	=(B89-32)*(5/9)+273.15				[1] Piping Take-off Summary (attached)		
91	48hr (F)	='BWROG Leak Rate Correction'!A6				[2] USNRC Document AEB-98-03, 12/9/1998, Page A-3, Median Value		
92	48hr (K)	=(B91-32)*(5/9)+273.15				[3] USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 2		
93	72hr (F)	='BWROG Leak Rate Correction'!A7				[4] USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 4		
94	72hr (K)	=(B93-32)*(5/9)+273.15				[5] Cline, J.E. "MSIV Leakage Iodine Transport Analysis", 3/26/1991		
95	96hr (F)	='BWROG Leak Rate Correction'!A8				[6] NUREG/CR-6604, RADTRAD Manual, 4/1998, Supplement 1, 6/1999		
96	96hr (K)	=(B95-32)*(5/9)+273.15				[7] Cline, J.E. 8/1990		
97	75hr (F)	='BWROG Leak Rate Correction'!A9				[8] Condenser Not Credited		
98	75hr (K)	=(B97-32)*(5/9)+273.15				[9] PBAPS Technical Specification		
99	20hr (F)	='BWROG Leak Rate Correction'!A10				[10] PBAPS Technical Specification		
100	20hr (K)	=(B99-32)*(5/9)+273.15				[11] Value used to simulate an un-mixed drywell/suppression chamber air space for the first 2		
101	stant (F)	Not Credited				[12] Main Steam Line Break of longest inboard line assumed, with no deposition credit (i.e., 0		
102	stant (K)	=IF(B101="Not Credited", "Not Credited", (B101-32)*(5/9)+273.15)				[13] No extrapolation from Test pressure to P_a applied due to small differential, short time of t		
103	stant (F)	='BWROG Leak Rate Correction'!A4						
104	nt (psig)	25						
105	, 0-24hr	1						
106	24-48hr	0.772						
107	48-72hr	0.654						
108	72-96hr	0.59						
109	6-275hr	0.562						
110	5-720hr	0.5						
111	nt (psig)	49.1						
112	nt (psia)	='BWROG Leak Rate Correction'!A11						
113	onstant	1						

	I	J	K	L	M	N	O	P
1								
2	Unit 3	Unit 3	Unit 3		Unit 3	Unit 3	Unit 3	Unit 3
3	Penetration B	Penetration C	Penetration D		Outboard A	Outboard B	Outboard C	Outboard D
4	='MS Piping Summary'!B39	='MS Piping Summary'!C39	='MS Piping Summary'!D39		='MS Piping Summary'!A41	='MS Piping Summary'!B41	='MS Piping Summary'!C41	='MS Piping Summary'!D41
5	='MS Piping Summary'!B40	='MS Piping Summary'!C40	='MS Piping Summary'!D40		='MS Piping Summary'!A42	='MS Piping Summary'!B42	='MS Piping Summary'!C42	='MS Piping Summary'!D42
6	='MS Piping Summary'!B30	='MS Piping Summary'!C30	='MS Piping Summary'!D30		='MS Piping Summary'!A32	='MS Piping Summary'!B32	='MS Piping Summary'!C32	='MS Piping Summary'!D32
7	=I$6/2	=J$6/2	=K$6/2		=M$6/2	=N$6/2	=O$6/2	=P$6/2
8	='MS Piping Summary'!B31	='MS Piping Summary'!C31	='MS Piping Summary'!D31		='MS Piping Summary'!A33	='MS Piping Summary'!B33	='MS Piping Summary'!C33	='MS Piping Summary'!D33
9	0.00117	0.00117	0.00117		0.00117	0.00117	0.00117	0.00117
10	=I$9/0.3048	=J$9/0.3048	=K$9/0.3048		=M$9/0.3048	=N$9/0.3048	=O$9/0.3048	=P$9/0.3048
11	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100		=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100
12	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100		=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100
13	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100		=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100
14	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100		=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100
15	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100		=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100
16	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100		=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100
17	=I11/0.3048	=J11/0.3048	=K11/0.3048		=M11/0.3048	=N11/0.3048	=O11/0.3048	=P11/0.3048
18	=I12/0.3048	=J12/0.3048	=K12/0.3048		=M12/0.3048	=N12/0.3048	=O12/0.3048	=P12/0.3048
19	=I13/0.3048	=J13/0.3048	=K13/0.3048		=M13/0.3048	=N13/0.3048	=O13/0.3048	=P13/0.3048
20	=I14/0.3048	=J14/0.3048	=K14/0.3048		=M14/0.3048	=N14/0.3048	=O14/0.3048	=P14/0.3048
21	=I15/0.3048	=J15/0.3048	=K15/0.3048		=M15/0.3048	=N15/0.3048	=O15/0.3048	=P15/0.3048
22	=I16/0.3048	=J16/0.3048	=K16/0.3048		=M16/0.3048	=N16/0.3048	=O16/0.3048	=P16/0.3048
23	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100		=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100
24	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100		=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100
25	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100		=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100
26	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100		=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100
27	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100		=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100
28	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100		=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100
29	=I23/0.3048	=J23/0.3048	=K23/0.3048		=M23/0.3048	=N23/0.3048	=O23/0.3048	=P23/0.3048
30	=I24/0.3048	=J24/0.3048	=K24/0.3048		=M24/0.3048	=N24/0.3048	=O24/0.3048	=P24/0.3048
31	=I25/0.3048	=J25/0.3048	=K25/0.3048		=M25/0.3048	=N25/0.3048	=O25/0.3048	=P25/0.3048
32	=I26/0.3048	=J26/0.3048	=K26/0.3048		=M26/0.3048	=N26/0.3048	=O26/0.3048	=P26/0.3048
33	=I27/0.3048	=J27/0.3048	=K27/0.3048		=M27/0.3048	=N27/0.3048	=O27/0.3048	=P27/0.3048
34	=I28/0.3048	=J28/0.3048	=K28/0.3048		=M28/0.3048	=N28/0.3048	=O28/0.3048	=P28/0.3048
35	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45		='BWROG Leak Rate Correction'!A45	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45
36	N/A	N/A	N/A		N/A	N/A	N/A	N/A
37	N/A	N/A	N/A		N/A	N/A	N/A	N/A
38	N/A	N/A	N/A		N/A	N/A	N/A	N/A
39	N/A	N/A	N/A		N/A	N/A	N/A	N/A
40	N/A	N/A	N/A		N/A	N/A	N/A	N/A
41	N/A	N/A	N/A		N/A	N/A	N/A	N/A
42	N/A	N/A	N/A		N/A	N/A	N/A	N/A
43	=((I$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B89+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B89+460)/($B$103+460)))/60)*$
44	=((I$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B91+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B91+460)/($B$103+460)))/60)*$
45	=((I$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B93+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B93+460)/($B$103+460)))/60)*$
46	=((I$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B95+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B95+460)/($B$103+460)))/60)*$
47	=((I$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B97+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B97+460)/($B$103+460)))/60)*$
48	=((I$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B99+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B99+460)/($B$103+460)))/60)*$
49	=I43*60	=J43*60	=K43*60		=M43*60	=N43*60	=O43*60	=P43*60
50	=I44*60	=J44*60	=K44*60		=M44*60	=N44*60	=O44*60	=P44*60
51	=I45*60	=J45*60	=K45*60		=M45*60	=N45*60	=O45*60	=P45*60
52	=I46*60	=J46*60	=K46*60		=M46*60	=N46*60	=O46*60	=P46*60
53	=I47*60	=J47*60	=K47*60		=M47*60	=N47*60	=O47*60	=P47*60
54	=I48*60	=J48*60	=K48*60		=M48*60	=N48*60	=O48*60	=P48*60
55								
56	=((I$10*I$7)/I$8)*3600	=((J$10*J$7)/J$8)*3600	=((K$10*K$7)/K$8)*3600		=((M$10*M$7)/M$8)*3600	=((N$10*N$7)/N$8)*3600	=((O$10*O$7)/O$8)*3600	=((P$10*P$7)/P$8)*3600
57	=((I17*I$4)/I$5)*3600	=((J17*J$4)/J$5)*3600	=((K17*K$4)/K$5)*3600		=((M17*M$4)/M$5)*3600	=((N17*N$4)/N$5)*3600	=((O17*O$4)/O$5)*3600	=((P17*P$4)/P$5)*3600
58	=((I18*I$4)/I$5)*3600	=((J18*J$4)/J$5)*3600	=((K18*K$4)/K$5)*3600		=((M18*M$4)/M$5)*3600	=((N18*N$4)/N$5)*3600	=((O18*O$4)/O$5)*3600	=((P18*P$4)/P$5)*3600
59	=((I19*I$4)/I$5)*3600	=((J19*J$4)/J$5)*3600	=((K19*K$4)/K$5)*3600		=((M19*M$4)/M$5)*3600	=((N19*N$4)/N$5)*3600	=((O19*O$4)/O$5)*3600	=((P19*P$4)/P$5)*3600
60	=((I20*I$4)/I$5)*3600	=((J20*J$4)/J$5)*3600	=((K20*K$4)/K$5)*3600		=((M20*M$4)/M$5)*3600	=((N20*N$4)/N$5)*3600	=((O20*O$4)/O$5)*3600	=((P20*P$4)/P$5)*3600
61	=((I21*I$4)/I$5)*3600	=((J21*J$4)/J$5)*3600	=((K21*K$4)/K$5)*3600		=((M21*M$4)/M$5)*3600	=((N21*N$4)/N$5)*3600	=((O21*O$4)/O$5)*3600	=((P21*P$4)/P$5)*3600
62	=((I22*I$4)/I$5)*3600	=((J22*J$4)/J$5)*3600	=((K22*K$4)/K$5)*3600		=((M22*M$4)/M$5)*3600	=((N22*N$4)/N$5)*3600	=((O22*O$4)/O$5)*3600	=((P22*P$4)/P$5)*3600
63	=((I29*I$4)/I$5)*3600	=((J29*J$4)/J$5)*3600	=((K29*K$4)/K$5)*3600		=((M29*M$4)/M$5)*3600	=((N29*N$4)/N$5)*3600	=((O29*O$4)/O$5)*3600	=((P29*P$4)/P$5)*3600
64	=((I30*I$4)/I$5)*3600	=((J30*J$4)/J$5)*3600	=((K30*K$4)/K$5)*3600		=((M30*M$4)/M$5)*3600	=((N30*N$4)/N$5)*3600	=((O30*O$4)/O$5)*3600	=((P30*P$4)/P$5)*3600
65	=((I31*I$4)/I$5)*3600	=((J31*J$4)/J$5)*3600	=((K31*K$4)/K$5)*3600		=((M31*M$4)/M$5)*3600	=((N31*N$4)/N$5)*3600	=((O31*O$4)/O$5)*3600	=((P31*P$4)/P$5)*3600
66	=((I32*I$4)/I$5)*3600	=((J32*J$4)/J$5)*3600	=((K32*K$4)/K$5)*3600		=((M32*M$4)/M$5)*3600	=((N32*N$4)/N$5)*3600	=((O32*O$4)/O$5)*3600	=((P32*P$4)/P$5)*3600
67	=((I33*I$4)/I$5)*3600	=((J33*J$4)/J$5)*3600	=((K33*K$4)/K$5)*3600		=((M33*M$4)/M$5)*3600	=((N33*N$4)/N$5)*3600	=((O33*O$4)/O$5)*3600	=((P33*P$4)/P$5)*3600
68	=((I34*I$4)/I$5)*3600	=((J34*J$4)/J$5)*3600	=((K34*K$4)/K$5)*3600		=((M34*M$4)/M$5)*3600	=((N34*N$4)/N$5)*3600	=((O34*O$4)/O$5)*3600	=((P34*P$4)/P$5)*3600
69								
70	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I49))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J49))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K49))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M49))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N49))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O49))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P49))))
71	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I50))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J50))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K50))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M50))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N50))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O50))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P50))))
72	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I51))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J51))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K51))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M51))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N51))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O51))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P51))))
73	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I52))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J52))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K52))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M52))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N52))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O52))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P52))))
74	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I53))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J53))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K53))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M53))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N53))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O53))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P53))))
75	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I54))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J54))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K54))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M54))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N54))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O54))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P54))))
76	=IF(I$35=0,0,1-(1/(1+((I57*I$5)/I49))))	=IF(J$35=0,0,1-(1/(1+((J57*J$5)/J49))))	=IF(K$35=0,0,1-(1/(1+((K57*K$5)/K49))))		=IF(M$35=0,0,1-(1/(1+((M57*M$5)/M49))))	=IF(N$35=0,0,1-(1/(1+((N57*N$5)/N49))))	=IF(O$35=0,0,1-(1/(1+((O57*O$5)/O49))))	=IF(P$35=0,0,1-(1/(1+((P57*P$5)/P49))))
77	=IF(I$35=0,0,1-(1/(1+((I58*I$5)/I50))))	=IF(J$35=0,0,1-(1/(1+((J58*J$5)/J50))))	=IF(K$35=0,0,1-(1/(1+((K58*K$5)/K50))))		=IF(M$35=0,0,1-(1/(1+((M58*M$5)/M50))))	=IF(N$35=0,0,1-(1/(1+((N58*N$5)/N50))))	=IF(O$35=0,0,1-(1/(1+((O58*O$5)/O50))))	=IF(P$35=0,0,1-(1/(1+((P58*P$5)/P50))))
78	=IF(I$35=0,0,1-(1/(1+((I59*I$5)/I51))))	=IF(J$35=0,0,1-(1/(1+((J59*J$5)/J51))))	=IF(K$35=0,0,1-(1/(1+((K59*K$5)/K51))))		=IF(M$35=0,0,1-(1/(1+((M59*M$5)/M51))))	=IF(N$35=0,0,1-(1/(1+((N59*N$5)/N51))))	=IF(O$35=0,0,1-(1/(1+((O59*O$5)/O51))))	=IF(P$35=0,0,1-(1/(1+((P59*P$5)/P51))))
79	=IF(I$35=0,0,1-(1/(1+((I60*I$5)/I52))))	=IF(J$35=0,0,1-(1/(1+((J60*J$5)/J52))))	=IF(K$35=0,0,1-(1/(1+((K60*K$5)/K52))))		=IF(M$35=0,0,1-(1/(1+((M60*M$5)/M52))))	=IF(N$35=0,0,1-(1/(1+((N60*N$5)/N52))))	=IF(O$35=0,0,1-(1/(1+((O60*O$5)/O52))))	=IF(P$35=0,0,1-(1/(1+((P60*P$5)/P52))))
80	=IF(I$35=0,0,1-(1/(1+((I61*I$5)/I53))))	=IF(J$35=0,0,1-(1/(1+((J61*J$5)/J53))))	=IF(K$35=0,0,1-(1/(1+((K61*K$5)/K53))))		=IF(M$35=0,0,1-(1/(1+((M61*M$5)/M53))))	=IF(N$35=0,0,1-(1/(1+((N61*N$5)/N53))))	=IF(O$35=0,0,1-(1/(1+((O61*O$5)/O53))))	=IF(P$35=0,0,1-(1/(1+((P61*P$5)/P53))))
81	=IF(I$35=0,0,1-(1/(1+((I62*I$5)/I54))))	=IF(J$35=0,0,1-(1/(1+((J62*J$5)/J54))))	=IF(K$35=0,0,1-(1/(1+((K62*K$5)/K54))))		=IF(M$35=0,0,1-(1/(1+((M62*M$5)/M54))))	=IF(N$35=0,0,1-(1/(1+((N62*N$5)/N54))))	=IF(O$35=0,0,1-(1/(1+((O62*O$5)/O54))))	=IF(P$35=0,0,1-(1/(1+((P62*P$5)/P54))))
82	=IF(I$35=0,0,1-(1/(1+((I63*I$5)/I49))))	=IF(J$35=0,0,1-(1/(1+((J63*J$5)/J49))))	=IF(K$35=0,0,1-(1/(1+((K63*K$5)/K49))))		=IF(M$35=0,0,1-(1/(1+((M63*M$5)/M49))))	=IF(N$35=0,0,1-(1/(1+((N63*N$5)/N49))))	=IF(O$35=0,0,1-(1/(1+((O63*O$5)/O49))))	=IF(P$35=0,0,1-(1/(1+((P63*P$5)/P49))))
83	=IF(I$35=0,0,1-(1/(1+((I64*I$5)/I50))))	=IF(J$35=0,0,1-(1/(1+((J64*J$5)/J50))))	=IF(K$35=0,0,1-(1/(1+((K64*K$5)/K50))))		=IF(M$35=0,0,1-(1/(1+((M64*M$5)/M50))))	=IF(N$35=0,0,1-(1/(1+((N64*N$5)/N50))))	=IF(O$35=0,0,1-(1/(1+((O64*O$5)/O50))))	=IF(P$35=0,0,1-(1/(1+((P64*P$5)/P50))))
84	=IF(I$35=0,0,1-(1/(1+((I65*I$5)/I51))))	=IF(J$35=0,0,1-(1/(1+((J65*J$5)/J51))))	=IF(K$35=0,0,1-(1/(1+((K65*K$5)/K51))))		=IF(M$35=0,0,1-(1/(1+((M65*M$5)/M51))))	=IF(N$35=0,0,1-(1/(1+((N65*N$5)/N51))))	=IF(O$35=0,0,1-(1/(1+((O65*O$5)/O51))))	=IF(P$35=0,0,1-(1/(1+((P65*P$5)/P51))))
85	=IF(I$35=0,0,1-(1/(1+((I66*I$5)/I52))))	=IF(J$35=0,0,1-(1/(1+((J66*J$5)/J52))))	=IF(K$35=0,0,1-(1/(1+((K66*K$5)/K52))))		=IF(M$35=0,0,1-(1/(1+((M66*M$5)/M52))))	=IF(N$35=0,0,1-(1/(1+((N66*N$5)/N52))))	=IF(O$35=0,0,1-(1/(1+((O66*O$5)/O52))))	=IF(P$35=0,0,1-(1/(1+((P66*P$5)/P52))))
86	=IF(I$35=0,0,1-(1/(1+((I67*I$5)/I53))))	=IF(J$35=0,0,1-(1/(1+((J67*J$5)/J53))))	=IF(K$35=0,0,1-(1/(1+((K67*K$5)/K53))))		=IF(M$35=0,0,1-(1/(1+((M67*M$5)/M53))))	=IF(N$35=0,0,1-(1/(1+((N67*N$5)/N53))))	=IF(O$35=0,0,1-(1/(1+((O67*O$5)/O53))))	=IF(P$35=0,0,1-(1/(1+((P67*P$5)/P53))))
87	=IF(I$35=0,0,1-(1/(1+((I68*I$5)/I54))))	=IF(J$35=0,0,1-(1/(1+((J68*J$5)/J54))))	=IF(K$35=0,0,1-(1/(1+((K68*K$5)/K54))))		=IF(M$35=0,0,1-(1/(1+((M68*M$5)/M54))))	=IF(N$35=0,0,1-(1/(1+((N68*N$5)/N54))))	=IF(O$35=0,0,1-(1/(1+((O68*O$5)/O54))))	=IF(P$35=0,0,1-(1/(1+((P68*P$5)/P54))))
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	A	B	C	D	E	F	G	H	I	J	K	L
1	**Determination of Inboard MSIV Leak Rates using NEDC-31858P and NEDC-32091 Methodology**											
2												
3	**Constants**											
4	68	Standard Temperature (°F)										
5	558	Main Steam Pipe Wall Temp 0-24 hours (°F)										
6	410	Main Steam Pipe Wall Temp 24-48 hours (°F)										
7	300	Main Steam Pipe Wall Temp 48-72 hours (°F)										
8	250	Main Steam Pipe Wall Temp 72-96 hours (°F)										
9	200	Main Steam Pipe Wall Temp 96-157 hours (°F)										
10	200	Main Steam Pipe Wall Temp 157-720 hours (°F)										
11	14.7	Conversion Factor (atm to psi)										
12												
13	**Containment Volumes**											
14	159,000	Drywell Volume (ft^3)										
15	127,700	Wetwell Volume (ft^3)										
16	7,200	Reactor Vessel (ft3) space above nominal water level vs. {GE 14,000 ft^3 value}										
17	293,900	Total Volume (ft^3)										
18	8322.3663	Total Volume (m^3)										
19	1.7684	Ratio of Total Volume to Drywell Volume including RPV										
20												
21	**Containment Temperatures and Pressures per Containment Analysis for RSLB in PM-1061, R0**											
22												
23	276	DW Temp (°F) at minimum DW-WW differential (at ~ 69 seconds)										
24	131	WW Temp (°F) at minimum DW-WW differential (at ~ 69 seconds)										
25	213.0	Average Bulk Temperature (°F)										
26												
27	46.1	DW Pressure (psia) {use for pressure vessel as well}										
28	43.9	WW Pressure (psia)										
29	45.1	Average Bulk Pressure (psia)										
30	3.07	Average Bulk Pressure (atmospheres)										
31												
32	**Hydrogen Contribution from Zirconium Water Reaction**											
33	764	assemblies					{PBAPS Value}					
34	102.00	lbs Zr/assembly					{NEDC-31858P}					
35	7.87	cubic feet H_2 per lb Zr					{NEDC-31858P}					
36	0.20	fraction of Zr undergoing metal water reaction					{NEDC-31858P}					
37	122658.67	Total Hydrogen (ft^3)					{Calculated PBAPS Value}					
38	167782.42	Corrected to bulk average temperature					{Calculated PBAPS Value}					
39	0.5708827	Partial Pressure of Hydrogen (atmospheres)					{Calculated PBAPS Value}					
40												
41	**3.64**	**Total {H_2, N_2, H_2O} Pressure (atmospheres)**					{Calculated PBAPS Value}					
42												
43	**Inboard Leak Rate Determination per NEDC-32091, Section B.1.3, Duane Arnold Example based.**											
44	**A**	**B**	**C**	**D**								
45	**0**	**0**	**75**	**75**	**Containment Leak Rate (scfh) {use as basis for outboard flow rate}**							
46	**0**	**0**	**0.21435**	**0.21435**	**Leak Rate in %/day**							
47	**0.0000**	**0.0000**	**0.4375**	**0.4375**	**Inboard Leak Flow Rate (cfm)**							
48	**0.0000**	**0.0000**	**26.2489**	**26.2489**	**Inboard Leak Flow Rate (cfh)**							
49												
50	**Note that no extrapolation from test pressure to Pa is required based on the NEDC-31858P note**											
51	**that these containment conditions are essentially equivalent to test conditions.**											

	A	B	C	D	E	F	G
1	**Main Steam Piping Summary**						
2	23.624	Main Steam 24 inch pipe ID					
3							
4	A	B	C	D			
5	**PBAPS Unit 2**						
6	**Nodalization (Horizontals)**						
7							
8	296	254	254	300	**Node 1 Surface Area (sq. ft.)**		
9	146	125	125	148	**Node 1 Volume (cu. ft.)**		
10	153	140	140	153	**Node 2 Surface Area (sq. ft.)**		
11	75	69	69	75	**Node 2 Volume (cu. ft.)**		
12	1794	1838	1882	1927	**Node 3 Surface Area (sq. ft.)**		
13	883	905	926	948	**Node 3 Volume (cu. ft.)**		
14							
15	**Nodalization (Totals)**						
16							
17	667	616	616	671	**Node 1 Surface Area (sq. ft.)**		
18	328	303	303	330	**Node 1 Volume (cu. ft.)**		
19	153	140	140	153	**Node 2 Surface Area (sq. ft.)**		
20	75	69	69	75	**Node 2 Volume (cu. ft.)**		
21	1863	1907	1952	1997	**Node 3 Surface Area (sq. ft.)**		
22	917	939	961	983	**Node 3 Volume (cu. ft.)**		
23							
24	A	B	C	D			
25	**PBAPS Unit 3**						
26	**Nodalization (Horizontals)**						
27							
28	302	258	255	307	**Node 1 Surface Area (sq. ft.)**		
29	149	127	126	151	**Node 1 Volume (cu. ft.)**		
30	140	140	140	140	**Node 2 Surface Area (sq. ft.)**		
31	69	69	69	69	**Node 2 Volume (cu. ft.)**		
32	1891	1826	1761	1548	**Node 3 Surface Area (sq. ft.)**		
33	931	899	867	762	**Node 3 Volume (cu. ft.)**		
34							
35	**Nodalization (Totals)**						
36							
37	687	620	617	685	**Node 1 Surface Area (sq. ft.)**		
38	338	305	304	337	**Node 1 Volume (cu. ft.)**		
39	140	140	140	140	**Node 2 Surface Area (sq. ft.)**		
40	69	69	69	69	**Node 2 Volume (cu. ft.)**		
41	1961	1896	1831	1618	**Node 3 Surface Area (sq. ft.)**		
42	965	933	901	796	**Node 3 Volume (cu. ft.)**		
43	**Unit 3, Lines C and D are considered bounding because they minimize the**						
44	**most important Node 3 outboard piping components.**						
45	**Break is assumed in Line D, because of its minimum outboard piping, and**						
46	**maximum inboard piping loss.**						

	A	B	C	D	E	F	G
1	**PBAPS Unit 2 Main Steam Line A**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	4.81	9.77	4.81	9.77
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	9.896	20.11	9.896	20.11
14		Inboard	FALSE	42.57	86.50	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	15.86	32.22	15.86	32.22
17		Penetration	TRUE	75.18	152.75	75.18	152.75
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.24	69.57	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	155.29	315.52	155.29	315.52
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	471.97	958.96	471.97	958.96
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	147.44	299.57	147.44	299.57
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	56.21	114.21	56.21	114.21
28							
29			**Totals**	1320.476	2682.99	1103.60	2242.32
30							
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	328.30	667.04	145.66	295.95
38			**Penetration (Node 2)**	75.18	152.75	75.18	152.75
39			**Outboard (Node 3)**	917	1863.19	882.76	1793.62
40							
41			**Totals**	1320.48	2682.99	1103.60	2242.32

	A	B	C	D	E	F	G
1	**PBAPS Unit 2 Main Steam Line B**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	20.68	42.02	20.68	42.02
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.26	69.61	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	143.6	291.77	143.6	291.77
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	461.8	938.30	461.8	938.30
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	178.89	363.47	178.89	363.47
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	68.39	138.96	68.39	138.96
29							
30			**Totals**	1311.02	2663.77	1098.47	2231.91
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	303.38	616.42	125.09	254.16
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	938.79	1907.46	904.53	1837.85
40							
41			**Totals**	1311.02	2663.77	1098.47	2231.91

PBAPS Unit 2 Main Steam Line C

	A	B	C	D	E	F	G
1	PBAPS Unit 2 Main Steam Line C						
2							
3	Inner Diameter (in.)=	23.624					
4							
5						Horizontal	Horizontal
6		Location	Horizontal	Volume (ft^3)	Surface Area (ft^2)	Volume (ft^3)	Surface Area (ft^2)
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.1	95.70	47.1	95.70
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	20.68	42.02	20.68	42.02
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.26	69.61	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	131.94	268.08	131.94	268.08
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	451.66	917.70	451.66	917.70
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	210.35	427.40	210.35	427.40
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	80.57	163.70	80.57	163.70
29							
30			Totals	1332.85	2708.13	1120.30	2276.26
31							
32							
33							
34						Horizontal	Horizontal
35				Total Volume	Total Surface	Volume	Surface Area
36				(ft^3)	Area (ft^2)	(ft^3)	(ft^2)
37			Inboard (Node 1)	303.37	616.40	125.08	254.14
38			Penetration (Node 2)	68.85	139.89	68.85	139.89
39			Outboard (Node 3)	960.63	1951.84	926.37	1882.23
40							
41			Totals	1332.85	2708.13	1120.30	2276.26

PBAPS Unit 2 Main Steam Line D

	A	B	C	D	E	F	G
1	PBAPS Unit 2 Main Steam Line D						
2							
3	Inner Diameter (in.)=	23.624					
4							
5						Horizontal	Horizontal
6		Location	Horizontal	Volume (ft^3)	Surface Area (ft^2)	Volume (ft^3)	Surface Area (ft^2)
7		Inboard	TRUE	4.32	8.78	4.32	8.78
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	12.424	25.24	12.424	25.24
14		Inboard	FALSE	42.87	87.10	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	15.71	31.92	15.71	31.92
17		Penetration	TRUE	75.18	152.75	75.18	152.75
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.56	70.22	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	120.03	243.88	120.03	243.88
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	441.52	897.09	441.52	897.09
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	242.08	491.87	242.08	491.87
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	92.75	188.45	92.75	188.45
28							
29			Totals	1388.454	2821.11	1170.95	2379.18
30							
31							
32							
33							
34						Horizontal	Horizontal
35				Total Volume	Total Surface	Volume	Surface Area
36				(ft^3)	Area (ft^2)	(ft^3)	(ft^2)
37			Inboard (Node 1)	330.48	671.49	147.54	299.78
38			Penetration (Node 2)	75.18	152.75	75.18	152.75
39			Outboard (Node 3)	982.79	1996.86	948.23	1926.64
40							
41			Totals	1388.45	2821.11	1170.95	2379.18

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line A**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	4.81	9.77	4.81	9.77
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	9.896	20.11	9.896	20.11
14		Inboard	FALSE	49.15	99.86	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	19.03	38.67	19.03	38.67
17		Penetration	TRUE	68.85	139.89	68.85	139.89
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.26	69.61	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	120.28	244.39	120.28	244.39
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	424.02	861.54	424.02	861.54
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	241.83	491.36	241.83	491.36
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	92.75	188.45	92.75	188.45
28							
29			**Totals**	1371.886	2787.44	1148.41	2333.37
30							
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	338.05	686.85	148.83	302.39
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	964.99	1960.70	930.73	1891.09
40							
41			**Totals**	1371.89	2787.44	1148.41	2333.37

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line B**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	22.44	45.59	22.44	45.59
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.5	70.10	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	131.94	268.08	131.94	268.08
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	424.02	861.54	424.02	861.54
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	210.35	427.40	210.35	427.40
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	80.57	163.70	80.57	163.70
29							
30			**Totals**	1307.22	2656.05	1094.43	2223.70
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	305.14	619.99	126.85	257.74
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	933.23	1896.17	898.73	1826.07
40							
41			**Totals**	1307.22	2656.05	1094.43	2223.70

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line C**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	21.19	43.05	21.19	43.05
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.5	70.10	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	143.6	291.77	143.6	291.77
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	424.02	861.54	424.02	861.54
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	178.89	363.47	178.89	363.47
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	68.39	138.96	68.39	138.96
29							
30			**Totals**	1273.99	2588.53	1061.20	2156.18
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	303.89	617.45	125.60	255.20
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	901.25	1831.19	866.75	1761.09
40							
41			**Totals**	1273.99	2588.53	1061.20	2156.18

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line D**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	4.32	8.78	4.32	8.78
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	12.424	25.24	12.424	25.24
14		Inboard	FALSE	46.44	94.36	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	19.03	38.67	19.03	38.67
17		Penetration	TRUE	68.85	139.89	68.85	139.89
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.56	70.22	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	155.29	315.52	155.29	315.52
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	351.12	713.42	351.12	713.42
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	147.44	299.57	147.44	299.57
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	56.21	114.21	56.21	114.21
28							
29			**Totals**	1202.694	2443.67	981.62	1994.50
30							
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37		**Inboard (Node 1)**		337.37	685.49	150.86	306.53
38		**Penetration (Node 2)**		68.85	139.89	68.85	139.89
39		**Outboard (Node 3)**		796.47	1618.29	761.91	1548.07
40							
41			**Totals**	1202.69	2443.67	981.62	1994.50

	A	B	C	D	E	F	G	H
1						PBAPS Unit 3 Determination of MSL Decontamination Factors Due to Iodine Depositio		
2			Unit 3	Unit 3	Unit 3	Unit 3		Unit 3
3			Inboard A	Inboard B	Inboard C	Inboard D		Penetration A
4	rea (ft^2)		='MS Piping Summary'!A37	='MS Piping Summary'!B37	='MS Piping Summary'!C37	0		='MS Piping Summary'!A39
5	ume (ft^3)		='MS Piping Summary'!A38	='MS Piping Summary'!B38	='MS Piping Summary'!C38	0		='MS Piping Summary'!A40
6	rea (ft^2)		='MS Piping Summary'!A28	='MS Piping Summary'!B28	='MS Piping Summary'!C28	0		='MS Piping Summary'!A30
7	rea (ft^2)		=C$6/2	=D$6/2	=E$6/2	=F$6/2		=H$6/2
8	ume (ft^3)		='MS Piping Summary'!A29	='MS Piping Summary'!B29	='MS Piping Summary'!C29	0		='MS Piping Summary'!A31
9	ity (m/s)		0.00117	0.00117	0.00117	0.00117		0.00117
10	ity (ft/s)		=C$9/0.3048	=D$9/0.3048	=E$9/0.3048	=F$9/0.3048		=H$9/0.3048
11	(m/sec)		=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100		=EXP((2809/$B$90)-12.5)/100
12	(m/sec)		=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100		=EXP((2809/$B$92)-12.5)/100
13	(m/sec)		=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100		=EXP((2809/$B$94)-12.5)/100
14	(m/sec)		=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100		=EXP((2809/$B$96)-12.5)/100
15	(m/sec)		=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100		=EXP((2809/$B$98)-12.5)/100
16	(m/sec)		=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100		=EXP((2809/$B$100)-12.5)/100
17	(ft/sec)		=C11/0.3048	=D11/0.3048	=E11/0.3048	=F11/0.3048		=H11/0.3048
18	(ft/sec)		=C12/0.3048	=D12/0.3048	=E12/0.3048	=F12/0.3048		=H12/0.3048
19	(ft/sec)		=C13/0.3048	=D13/0.3048	=E13/0.3048	=F13/0.3048		=H13/0.3048
20	(ft/sec)		=C14/0.3048	=D14/0.3048	=E14/0.3048	=F14/0.3048		=H14/0.3048
21	(ft/sec)		=C15/0.3048	=D15/0.3048	=E15/0.3048	=F15/0.3048		=H15/0.3048
22	(ft/sec)		=C16/0.3048	=D16/0.3048	=E16/0.3048	=F16/0.3048		=H16/0.3048
23	(m/sec)		=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100		=EXP((2809/$B$90)-19.3)/100
24	(m/sec)		=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100		=EXP((2809/$B$92)-19.3)/100
25	(m/sec)		=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100		=EXP((2809/$B$94)-19.3)/100
26	(m/sec)		=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100		=EXP((2809/$B$96)-19.3)/100
27	(m/sec)		=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100		=EXP((2809/$B$98)-19.3)/100
28	(m/sec)		=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100		=EXP((2809/$B$100)-19.3)/100
29	(ft/sec)		=C23/0.3048	=D23/0.3048	=E23/0.3048	=F23/0.3048		=H23/0.3048
30	(ft/sec)		=C24/0.3048	=D24/0.3048	=E24/0.3048	=F24/0.3048		=H24/0.3048
31	(ft/sec)		=C25/0.3048	=D25/0.3048	=E25/0.3048	=F25/0.3048		=H25/0.3048
32	(ft/sec)		=C26/0.3048	=D26/0.3048	=E26/0.3048	=F26/0.3048		=H26/0.3048
33	(ft/sec)		=C27/0.3048	=D27/0.3048	=E27/0.3048	=F27/0.3048		=H27/0.3048
34	(ft/sec)		=C28/0.3048	=D28/0.3048	=E28/0.3048	=F28/0.3048		=H28/0.3048
35	e (scfh)		='BWROG Leak Rate Correction'!A45	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45		='BWROG Leak Rate Correction'!A45
36	rs (cfm)		='BWROG Leak Rate Correction'!A47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!B47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!C47*'BWROG Leak Rate Correction'!$A$19*$B$113	='BWROG Leak Rate Correction'!D47*'BWROG Leak Rate Correction'!$A$19*$B$113		N/A
37	rs (cfm)		='BWROG Leak Rate Correction'!A47*$B$113	='BWROG Leak Rate Correction'!B47*$B$113	='BWROG Leak Rate Correction'!C47*$B$113	='BWROG Leak Rate Correction'!D47*$B$113		N/A
38	rs (cfm)		=C$37*$B106	=D$37*$B106	=E$37*$B106	=F$37*$B106		N/A
39	rs (cfm)		=C$37*$B107	=D$37*$B107	=E$37*$B107	=F$37*$B107		N/A
40	rs (cfm)		=C$37*$B108	=D$37*$B108	=E$37*$B108	=F$37*$B108		N/A
41	rs (cfm)		=C$37*$B109	=D$37*$B109	=E$37*$B109	=F$37*$B109		N/A
42	rs (cfm)		=C$37*$B110	=D$37*$B110	=E$37*$B110	=F$37*$B110		N/A
43	rs (cfm)		='BWROG Leak Rate Correction'!A47*$B$113	='BWROG Leak Rate Correction'!B47*$B$113	='BWROG Leak Rate Correction'!C47*$B$113	='BWROG Leak Rate Correction'!D47*$B$113		=((H$35*$B$113*(($B89+460)/($B$103+460)))/60)*$
44	rs (cfm)		=C$43*$B106	=D$43*$B106	=E$43*$B106	=F$43*$B106		=((H$35*$B$113*(($B91+460)/($B$103+460)))/60)*$
45	rs (cfm)		=C$43*$B107	=D$43*$B107	=E$43*$B107	=F$43*$B107		=((H$35*$B$113*(($B93+460)/($B$103+460)))/60)*$
46	rs (cfm)		=C$43*$B108	=D$43*$B108	=E$43*$B108	=F$43*$B108		=((H$35*$B$113*(($B95+460)/($B$103+460)))/60)*$
47	rs (cfm)		=C$43*$B109	=D$43*$B109	=E$43*$B109	=F$43*$B109		=((H$35*$B$113*(($B97+460)/($B$103+460)))/60)*$
48	rs (cfm)		=C$43*$B110	=D$43*$B110	=E$43*$B110	=F$43*$B110		=((H$35*$B$113*(($B99+460)/($B$103+460)))/60)*$
49	hrs (cfh)		=C43*60	=D43*60	=E43*60	=F43*60		=H43*60
50	hrs (cfh)		=C44*60	=D44*60	=E44*60	=F44*60		=H44*60
51	hrs (cfh)		=C45*60	=D45*60	=E45*60	=F45*60		=H45*60
52	hrs (cfh)		=C46*60	=D46*60	=E46*60	=F46*60		=H46*60
53	hrs (cfh)		=C47*60	=D47*60	=E47*60	=F47*60		=H47*60
54	hrs (cfh)		=C48*60	=D48*60	=E48*60	=F48*60		=H48*60
55								
56	nt (hr^{-1})		=((C$10*C$7)/C$8)*3600	=((D$10*D$7)/D$8)*3600	=((E$10*E$7)/E$8)*3600	=((F$10*F$7)/F$8)*3600		=((H$10*H$7)/H$8)*3600
57	hr (hr^{-1})		=((C17*C$4)/C$5)*3600	=((D17*D$4)/D$5)*3600	=((E17*E$4)/E$5)*3600	=((F17*F$4)/F$5)*3600		=((H17*H$4)/H$5)*3600
58	hr (hr^{-1})		=((C18*C$4)/C$5)*3600	=((D18*D$4)/D$5)*3600	=((E18*E$4)/E$5)*3600	=((F18*F$4)/F$5)*3600		=((H18*H$4)/H$5)*3600
59	hr (hr^{-1})		=((C19*C$4)/C$5)*3600	=((D19*D$4)/D$5)*3600	=((E19*E$4)/E$5)*3600	=((F19*F$4)/F$5)*3600		=((H19*H$4)/H$5)*3600
60	hr (hr^{-1})		=((C20*C$4)/C$5)*3600	=((D20*D$4)/D$5)*3600	=((E20*E$4)/E$5)*3600	=((F20*F$4)/F$5)*3600		=((H20*H$4)/H$5)*3600
61	hr (hr^{-1})		=((C21*C$4)/C$5)*3600	=((D21*D$4)/D$5)*3600	=((E21*E$4)/E$5)*3600	=((F21*F$4)/F$5)*3600		=((H21*H$4)/H$5)*3600
62	hr (hr^{-1})		=((C22*C$4)/C$5)*3600	=((D22*D$4)/D$5)*3600	=((E22*E$4)/E$5)*3600	=((F22*F$4)/F$5)*3600		=((H22*H$4)/H$5)*3600
63	hr (hr^{-1})		=((C29*C$4)/C$5)*3600	=((D29*D$4)/D$5)*3600	=((E29*E$4)/E$5)*3600	=((F29*F$4)/F$5)*3600		=((H29*H$4)/H$5)*3600
64	hr (hr^{-1})		=((C30*C$4)/C$5)*3600	=((D30*D$4)/D$5)*3600	=((E30*E$4)/E$5)*3600	=((F30*F$4)/F$5)*3600		=((H30*H$4)/H$5)*3600
65	hr (hr^{-1})		=((C31*C$4)/C$5)*3600	=((D31*D$4)/D$5)*3600	=((E31*E$4)/E$5)*3600	=((F31*F$4)/F$5)*3600		=((H31*H$4)/H$5)*3600
66	hr (hr^{-1})		=((C32*C$4)/C$5)*3600	=((D32*D$4)/D$5)*3600	=((E32*E$4)/E$5)*3600	=((F32*F$4)/F$5)*3600		=((H32*H$4)/H$5)*3600
67	hr (hr^{-1})		=((C33*C$4)/C$5)*3600	=((D33*D$4)/D$5)*3600	=((E33*E$4)/E$5)*3600	=((F33*F$4)/F$5)*3600		=((H33*H$4)/H$5)*3600
68	hr (hr^{-1})		=((C34*C$4)/C$5)*3600	=((D34*D$4)/D$5)*3600	=((E34*E$4)/E$5)*3600	=((F34*F$4)/F$5)*3600		=((H34*H$4)/H$5)*3600
69								
70	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C49))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D49))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E49))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F49))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H49))))
71	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C50))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D50))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E50))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F50))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H50))))
72	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C51))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D51))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E51))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F51))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H51))))
73	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C52))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D52))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E52))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F52))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H52))))
74	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C53))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D53))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E53))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F53))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H53))))
75	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C$56*C$8)/C54))))	=IF(D$35=0,0,1-(1/(1+((D$56*D$8)/D54))))	=IF(E$35=0,0,1-(1/(1+((E$56*E$8)/E54))))	=IF(F$35=0,0,1-(1/(1+((F$56*F$8)/F54))))		=IF(H$35=0,0,1-(1/(1+((H$56*H$8)/H54))))
76	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C57*C$5)/C49))))	=IF(D$35=0,0,1-(1/(1+((D57*D$5)/D49))))	=IF(E$35=0,0,1-(1/(1+((E57*E$5)/E49))))	=IF(F$35=0,0,1-(1/(1+((F57*F$5)/F49))))		=IF(H$35=0,0,1-(1/(1+((H57*H$5)/H49))))
77	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C58*C$5)/C50))))	=IF(D$35=0,0,1-(1/(1+((D58*D$5)/D50))))	=IF(E$35=0,0,1-(1/(1+((E58*E$5)/E50))))	=IF(F$35=0,0,1-(1/(1+((F58*F$5)/F50))))		=IF(H$35=0,0,1-(1/(1+((H58*H$5)/H50))))
78	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C59*C$5)/C51))))	=IF(D$35=0,0,1-(1/(1+((D59*D$5)/D51))))	=IF(E$35=0,0,1-(1/(1+((E59*E$5)/E51))))	=IF(F$35=0,0,1-(1/(1+((F59*F$5)/F51))))		=IF(H$35=0,0,1-(1/(1+((H59*H$5)/H51))))
79	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C60*C$5)/C52))))	=IF(D$35=0,0,1-(1/(1+((D60*D$5)/D52))))	=IF(E$35=0,0,1-(1/(1+((E60*E$5)/E52))))	=IF(F$35=0,0,1-(1/(1+((F60*F$5)/F52))))		=IF(H$35=0,0,1-(1/(1+((H60*H$5)/H52))))
80	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C61*C$5)/C53))))	=IF(D$35=0,0,1-(1/(1+((D61*D$5)/D53))))	=IF(E$35=0,0,1-(1/(1+((E61*E$5)/E53))))	=IF(F$35=0,0,1-(1/(1+((F61*F$5)/F53))))		=IF(H$35=0,0,1-(1/(1+((H61*H$5)/H53))))
81	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C62*C$5)/C54))))	=IF(D$35=0,0,1-(1/(1+((D62*D$5)/D54))))	=IF(E$35=0,0,1-(1/(1+((E62*E$5)/E54))))	=IF(F$35=0,0,1-(1/(1+((F62*F$5)/F54))))		=IF(H$35=0,0,1-(1/(1+((H62*H$5)/H54))))
82	-24 hrs)		=IF(C$35=0,0,1-(1/(1+((C63*C$5)/C49))))	=IF(D$35=0,0,1-(1/(1+((D63*D$5)/D49))))	=IF(E$35=0,0,1-(1/(1+((E63*E$5)/E49))))	=IF(F$35=0,0,1-(1/(1+((F63*F$5)/F49))))		=IF(H$35=0,0,1-(1/(1+((H63*H$5)/H49))))
83	-48 hrs)		=IF(C$35=0,0,1-(1/(1+((C64*C$5)/C50))))	=IF(D$35=0,0,1-(1/(1+((D64*D$5)/D50))))	=IF(E$35=0,0,1-(1/(1+((E64*E$5)/E50))))	=IF(F$35=0,0,1-(1/(1+((F64*F$5)/F50))))		=IF(H$35=0,0,1-(1/(1+((H64*H$5)/H50))))
84	-72 hrs)		=IF(C$35=0,0,1-(1/(1+((C65*C$5)/C51))))	=IF(D$35=0,0,1-(1/(1+((D65*D$5)/D51))))	=IF(E$35=0,0,1-(1/(1+((E65*E$5)/E51))))	=IF(F$35=0,0,1-(1/(1+((F65*F$5)/F51))))		=IF(H$35=0,0,1-(1/(1+((H65*H$5)/H51))))
85	-96 hrs)		=IF(C$35=0,0,1-(1/(1+((C66*C$5)/C52))))	=IF(D$35=0,0,1-(1/(1+((D66*D$5)/D52))))	=IF(E$35=0,0,1-(1/(1+((E66*E$5)/E52))))	=IF(F$35=0,0,1-(1/(1+((F66*F$5)/F52))))		=IF(H$35=0,0,1-(1/(1+((H66*H$5)/H52))))
86	275 hrs)		=IF(C$35=0,0,1-(1/(1+((C67*C$5)/C53))))	=IF(D$35=0,0,1-(1/(1+((D67*D$5)/D53))))	=IF(E$35=0,0,1-(1/(1+((E67*E$5)/E53))))	=IF(F$35=0,0,1-(1/(1+((F67*F$5)/F53))))		=IF(H$35=0,0,1-(1/(1+((H67*H$5)/H53))))
87	720 hrs)		=IF(C$35=0,0,1-(1/(1+((C68*C$5)/C54))))	=IF(D$35=0,0,1-(1/(1+((D68*D$5)/D54))))	=IF(E$35=0,0,1-(1/(1+((E68*E$5)/E54))))	=IF(F$35=0,0,1-(1/(1+((F68*F$5)/F54))))		=IF(H$35=0,0,1-(1/(1+((H68*H$5)/H54))))
88								
89	24hr (F)	='BWROG Leak Rate Correction'!A5			References:			
90	24hr (K)	=(B89-32)*(5/9)+273.15				[1] Piping Take-off Summary (attached)		
91	48hr (F)	='BWROG Leak Rate Correction'!A6				[2] USNRC Document AEB-98-03, 12/9/1998, Page A-3, Median Value		
92	48hr (K)	=(B91-32)*(5/9)+273.15				[3] USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 2		
93	72hr (F)	='BWROG Leak Rate Correction'!A7				[4] USNRC Document AEB-98-03, 12/9/1998, Page A-2, Formula 4		
94	72hr (K)	=(B93-32)*(5/9)+273.15				[5] Cline, J E. "MSIV Leakage Iodine Transport Analysis", 3/26/1991		
95	96hr (F)	='BWROG Leak Rate Correction'!A8				[6] NUREG/CR-6604, RADTRAD Manual, 4/1998; Supplement 1, 6/1999		
96	96hr (K)	=(B95-32)*(5/9)+273.15				[7] Cline, J E. 8/1990		
97	75hr (F)	='BWROG Leak Rate Correction'!A9				[8] Condenser Not Credited		
98	75hr (K)	=(B97-32)*(5/9)+273.15				[9] PBAPS Technical Specification		
99	20hr (F)	='BWROG Leak Rate Correction'!A10				[10] PBAPS Technical Specification		
100	20hr (K)	=(B99-32)*(5/9)+273.15				[11] Value used to simulate an un-mixed drywell/suppression chamber air space for the first 2		
101	tant (F)	Not Credited				[12] Main Steam Line Break of longest inboard line assumed, with no deposition credit (i.e., 0		
102	tant (K)	=IF(B101="Not Credited", "Not Credited", (B101-32)*(5/9)+273.15)				[13] No extrapolation from Test pressure to P_a applied due to small differential, short time of t		
103	tant (F)	='BWROG Leak Rate Correction'!A4						
104	nt (psig)	25						
105	, 0-24hr	1						
106	24-48hr	0.772						
107	48-72hr	0.654						
108	72-96hr	0.59						
109	6-275hr	0.562						
110	5-720hr	0.5						
111	nt (psig)	49.1						
112	nt (psia)	='BWROG Leak Rate Correction'!A11						
113	onstant	1						

	I	J	K	L	M	N	O	P
1								
2	Unit 3	Unit 3	Unit 3		Unit 3	Unit 3	Unit 3	Unit 3
3	Penetration B	Penetration C	Penetration D		Outboard A	Outboard B	Outboard C	Outboard D
4	='MS Piping Summary'!B39	='MS Piping Summary'!C39	='MS Piping Summary'!D39		='MS Piping Summary'!A41	='MS Piping Summary'!B41	='MS Piping Summary'!C41	='MS Piping Summary'!D41
5	='MS Piping Summary'!B40	='MS Piping Summary'!C40	='MS Piping Summary'!D40		='MS Piping Summary'!A42	='MS Piping Summary'!B42	='MS Piping Summary'!C42	='MS Piping Summary'!D42
6	='MS Piping Summary'!B30	='MS Piping Summary'!C30	='MS Piping Summary'!D30		='MS Piping Summary'!A32	='MS Piping Summary'!B32	='MS Piping Summary'!C32	='MS Piping Summary'!D32
7	=I$6/2	=J$6/2	=K$6/2		=M$6/2	=N$6/2	=O$6/2	=P$6/2
8	='MS Piping Summary'!B31	='MS Piping Summary'!C31	='MS Piping Summary'!D31		='MS Piping Summary'!A33	='MS Piping Summary'!B33	='MS Piping Summary'!C33	='MS Piping Summary'!D33
9	0.00117	0.00117	0.00117		0.00117	0.00117	0.00117	0.00117
10	=I$9/0.3048	=J$9/0.3048	=K$9/0.3048		=M$9/0.3048	=N$9/0.3048	=O$9/0.3048	=P$9/0.3048
11	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100		=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100	=EXP((2809/$B$90)-12.5)/100
12	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100		=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100	=EXP((2809/$B$92)-12.5)/100
13	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100		=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100	=EXP((2809/$B$94)-12.5)/100
14	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100		=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100	=EXP((2809/$B$96)-12.5)/100
15	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100		=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100	=EXP((2809/$B$98)-12.5)/100
16	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100		=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100	=EXP((2809/$B$100)-12.5)/100
17	=I11/0.3048	=J11/0.3048	=K11/0.3048		=M11/0.3048	=N11/0.3048	=O11/0.3048	=P11/0.3048
18	=I12/0.3048	=J12/0.3048	=K12/0.3048		=M12/0.3048	=N12/0.3048	=O12/0.3048	=P12/0.3048
19	=I13/0.3048	=J13/0.3048	=K13/0.3048		=M13/0.3048	=N13/0.3048	=O13/0.3048	=P13/0.3048
20	=I14/0.3048	=J14/0.3048	=K14/0.3048		=M14/0.3048	=N14/0.3048	=O14/0.3048	=P14/0.3048
21	=I15/0.3048	=J15/0.3048	=K15/0.3048		=M15/0.3048	=N15/0.3048	=O15/0.3048	=P15/0.3048
22	=I16/0.3048	=J16/0.3048	=K16/0.3048		=M16/0.3048	=N16/0.3048	=O16/0.3048	=P16/0.3048
23	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100		=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100	=EXP((2809/$B$90)-19.3)/100
24	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100		=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100	=EXP((2809/$B$92)-19.3)/100
25	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100		=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100	=EXP((2809/$B$94)-19.3)/100
26	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100		=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100	=EXP((2809/$B$96)-19.3)/100
27	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100		=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100	=EXP((2809/$B$98)-19.3)/100
28	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100		=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100	=EXP((2809/$B$100)-19.3)/100
29	=I23/0.3048	=J23/0.3048	=K23/0.3048		=M23/0.3048	=N23/0.3048	=O23/0.3048	=P23/0.3048
30	=I24/0.3048	=J24/0.3048	=K24/0.3048		=M24/0.3048	=N24/0.3048	=O24/0.3048	=P24/0.3048
31	=I25/0.3048	=J25/0.3048	=K25/0.3048		=M25/0.3048	=N25/0.3048	=O25/0.3048	=P25/0.3048
32	=I26/0.3048	=J26/0.3048	=K26/0.3048		=M26/0.3048	=N26/0.3048	=O26/0.3048	=P26/0.3048
33	=I27/0.3048	=J27/0.3048	=K27/0.3048		=M27/0.3048	=N27/0.3048	=O27/0.3048	=P27/0.3048
34	=I28/0.3048	=J28/0.3048	=K28/0.3048		=M28/0.3048	=N28/0.3048	=O28/0.3048	=P28/0.3048
35	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45		='BWROG Leak Rate Correction'!A45	='BWROG Leak Rate Correction'!B45	='BWROG Leak Rate Correction'!C45	='BWROG Leak Rate Correction'!D45
36	N/A	N/A	N/A		N/A	N/A	N/A	N/A
37	N/A	N/A	N/A		N/A	N/A	N/A	N/A
38	N/A	N/A	N/A		N/A	N/A	N/A	N/A
39	N/A	N/A	N/A		N/A	N/A	N/A	N/A
40	N/A	N/A	N/A		N/A	N/A	N/A	N/A
41	N/A	N/A	N/A		N/A	N/A	N/A	N/A
42	N/A	N/A	N/A		N/A	N/A	N/A	N/A
43	=((I$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B89+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B89+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B89+460)/($B$103+460)))/60)*$
44	=((I$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B91+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B91+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B91+460)/($B$103+460)))/60)*$
45	=((I$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B93+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B93+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B93+460)/($B$103+460)))/60)*$
46	=((I$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B95+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B95+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B95+460)/($B$103+460)))/60)*$
47	=((I$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B97+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B97+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B97+460)/($B$103+460)))/60)*$
48	=((I$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((J$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((K$35*$B$113*(($B99+460)/($B$103+460)))/60)*$		=((M$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((N$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((O$35*$B$113*(($B99+460)/($B$103+460)))/60)*$	=((P$35*$B$113*(($B99+460)/($B$103+460)))/60)*$
49	=I43*60	=J43*60	=K43*60		=M43*60	=N43*60	=O43*60	=P43*60
50	=I44*60	=J44*60	=K44*60		=M44*60	=N44*60	=O44*60	=P44*60
51	=I45*60	=J45*60	=K45*60		=M45*60	=N45*60	=O45*60	=P45*60
52	=I46*60	=J46*60	=K46*60		=M46*60	=N46*60	=O46*60	=P46*60
53	=I47*60	=J47*60	=K47*60		=M47*60	=N47*60	=O47*60	=P47*60
54	=I48*60	=J48*60	=K48*60		=M48*60	=N48*60	=O48*60	=P48*60
55								
56	=((I$10*I$7)/I$8)*3600	=((J$10*J$7)/J$8)*3600	=((K$10*K$7)/K$8)*3600		=((M$10*M$7)/M$8)*3600	=((N$10*N$7)/N$8)*3600	=((O$10*O$7)/O$8)*3600	=((P$10*P$7)/P$8)*3600
57	=((I17*I$4)/I$5)*3600	=((J17*J$4)/J$5)*3600	=((K17*K$4)/K$5)*3600		=((M17*M$4)/M$5)*3600	=((N17*N$4)/N$5)*3600	=((O17*O$4)/O$5)*3600	=((P17*P$4)/P$5)*3600
58	=((I18*I$4)/I$5)*3600	=((J18*J$4)/J$5)*3600	=((K18*K$4)/K$5)*3600		=((M18*M$4)/M$5)*3600	=((N18*N$4)/N$5)*3600	=((O18*O$4)/O$5)*3600	=((P18*P$4)/P$5)*3600
59	=((I19*I$4)/I$5)*3600	=((J19*J$4)/J$5)*3600	=((K19*K$4)/K$5)*3600		=((M19*M$4)/M$5)*3600	=((N19*N$4)/N$5)*3600	=((O19*O$4)/O$5)*3600	=((P19*P$4)/P$5)*3600
60	=((I20*I$4)/I$5)*3600	=((J20*J$4)/J$5)*3600	=((K20*K$4)/K$5)*3600		=((M20*M$4)/M$5)*3600	=((N20*N$4)/N$5)*3600	=((O20*O$4)/O$5)*3600	=((P20*P$4)/P$5)*3600
61	=((I21*I$4)/I$5)*3600	=((J21*J$4)/J$5)*3600	=((K21*K$4)/K$5)*3600		=((M21*M$4)/M$5)*3600	=((N21*N$4)/N$5)*3600	=((O21*O$4)/O$5)*3600	=((P21*P$4)/P$5)*3600
62	=((I22*I$4)/I$5)*3600	=((J22*J$4)/J$5)*3600	=((K22*K$4)/K$5)*3600		=((M22*M$4)/M$5)*3600	=((N22*N$4)/N$5)*3600	=((O22*O$4)/O$5)*3600	=((P22*P$4)/P$5)*3600
63	=((I29*I$4)/I$5)*3600	=((J29*J$4)/J$5)*3600	=((K29*K$4)/K$5)*3600		=((M29*M$4)/M$5)*3600	=((N29*N$4)/N$5)*3600	=((O29*O$4)/O$5)*3600	=((P29*P$4)/P$5)*3600
64	=((I30*I$4)/I$5)*3600	=((J30*J$4)/J$5)*3600	=((K30*K$4)/K$5)*3600		=((M30*M$4)/M$5)*3600	=((N30*N$4)/N$5)*3600	=((O30*O$4)/O$5)*3600	=((P30*P$4)/P$5)*3600
65	=((I31*I$4)/I$5)*3600	=((J31*J$4)/J$5)*3600	=((K31*K$4)/K$5)*3600		=((M31*M$4)/M$5)*3600	=((N31*N$4)/N$5)*3600	=((O31*O$4)/O$5)*3600	=((P31*P$4)/P$5)*3600
66	=((I32*I$4)/I$5)*3600	=((J32*J$4)/J$5)*3600	=((K32*K$4)/K$5)*3600		=((M32*M$4)/M$5)*3600	=((N32*N$4)/N$5)*3600	=((O32*O$4)/O$5)*3600	=((P32*P$4)/P$5)*3600
67	=((I33*I$4)/I$5)*3600	=((J33*J$4)/J$5)*3600	=((K33*K$4)/K$5)*3600		=((M33*M$4)/M$5)*3600	=((N33*N$4)/N$5)*3600	=((O33*O$4)/O$5)*3600	=((P33*P$4)/P$5)*3600
68	=((I34*I$4)/I$5)*3600	=((J34*J$4)/J$5)*3600	=((K34*K$4)/K$5)*3600		=((M34*M$4)/M$5)*3600	=((N34*N$4)/N$5)*3600	=((O34*O$4)/O$5)*3600	=((P34*P$4)/P$5)*3600
69								
70	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I49))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J49))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K49))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M49))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N49))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O49))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P49))))
71	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I50))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J50))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K50))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M50))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N50))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O50))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P50))))
72	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I51))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J51))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K51))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M51))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N51))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O51))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P51))))
73	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I52))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J52))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K52))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M52))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N52))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O52))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P52))))
74	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I53))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J53))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K53))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M53))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N53))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O53))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P53))))
75	=IF(I$35=0,0,1-(1/(1+((I$56*I$8)/I54))))	=IF(J$35=0,0,1-(1/(1+((J$56*J$8)/J54))))	=IF(K$35=0,0,1-(1/(1+((K$56*K$8)/K54))))		=IF(M$35=0,0,1-(1/(1+((M$56*M$8)/M54))))	=IF(N$35=0,0,1-(1/(1+((N$56*N$8)/N54))))	=IF(O$35=0,0,1-(1/(1+((O$56*O$8)/O54))))	=IF(P$35=0,0,1-(1/(1+((P$56*P$8)/P54))))
76	=IF(I$35=0,0,1-(1/(1+((I57*I$5)/I49))))	=IF(J$35=0,0,1-(1/(1+((J57*J$5)/J49))))	=IF(K$35=0,0,1-(1/(1+((K57*K$5)/K49))))		=IF(M$35=0,0,1-(1/(1+((M57*M$5)/M49))))	=IF(N$35=0,0,1-(1/(1+((N57*N$5)/N49))))	=IF(O$35=0,0,1-(1/(1+((O57*O$5)/O49))))	=IF(P$35=0,0,1-(1/(1+((P57*P$5)/P49))))
77	=IF(I$35=0,0,1-(1/(1+((I58*I$5)/I50))))	=IF(J$35=0,0,1-(1/(1+((J58*J$5)/J50))))	=IF(K$35=0,0,1-(1/(1+((K58*K$5)/K50))))		=IF(M$35=0,0,1-(1/(1+((M58*M$5)/M50))))	=IF(N$35=0,0,1-(1/(1+((N58*N$5)/N50))))	=IF(O$35=0,0,1-(1/(1+((O58*O$5)/O50))))	=IF(P$35=0,0,1-(1/(1+((P58*P$5)/P50))))
78	=IF(I$35=0,0,1-(1/(1+((I59*I$5)/I51))))	=IF(J$35=0,0,1-(1/(1+((J59*J$5)/J51))))	=IF(K$35=0,0,1-(1/(1+((K59*K$5)/K51))))		=IF(M$35=0,0,1-(1/(1+((M59*M$5)/M51))))	=IF(N$35=0,0,1-(1/(1+((N59*N$5)/N51))))	=IF(O$35=0,0,1-(1/(1+((O59*O$5)/O51))))	=IF(P$35=0,0,1-(1/(1+((P59*P$5)/P51))))
79	=IF(I$35=0,0,1-(1/(1+((I60*I$5)/I52))))	=IF(J$35=0,0,1-(1/(1+((J60*J$5)/J52))))	=IF(K$35=0,0,1-(1/(1+((K60*K$5)/K52))))		=IF(M$35=0,0,1-(1/(1+((M60*M$5)/M52))))	=IF(N$35=0,0,1-(1/(1+((N60*N$5)/N52))))	=IF(O$35=0,0,1-(1/(1+((O60*O$5)/O52))))	=IF(P$35=0,0,1-(1/(1+((P60*P$5)/P52))))
80	=IF(I$35=0,0,1-(1/(1+((I61*I$5)/I53))))	=IF(J$35=0,0,1-(1/(1+((J61*J$5)/J53))))	=IF(K$35=0,0,1-(1/(1+((K61*K$5)/K53))))		=IF(M$35=0,0,1-(1/(1+((M61*M$5)/M53))))	=IF(N$35=0,0,1-(1/(1+((N61*N$5)/N53))))	=IF(O$35=0,0,1-(1/(1+((O61*O$5)/O53))))	=IF(P$35=0,0,1-(1/(1+((P61*P$5)/P53))))
81	=IF(I$35=0,0,1-(1/(1+((I62*I$5)/I54))))	=IF(J$35=0,0,1-(1/(1+((J62*J$5)/J54))))	=IF(K$35=0,0,1-(1/(1+((K62*K$5)/K54))))		=IF(M$35=0,0,1-(1/(1+((M62*M$5)/M54))))	=IF(N$35=0,0,1-(1/(1+((N62*N$5)/N54))))	=IF(O$35=0,0,1-(1/(1+((O62*O$5)/O54))))	=IF(P$35=0,0,1-(1/(1+((P62*P$5)/P54))))
82	=IF(I$35=0,0,1-(1/(1+((I63*I$5)/I49))))	=IF(J$35=0,0,1-(1/(1+((J63*J$5)/J49))))	=IF(K$35=0,0,1-(1/(1+((K63*K$5)/K49))))		=IF(M$35=0,0,1-(1/(1+((M63*M$5)/M49))))	=IF(N$35=0,0,1-(1/(1+((N63*N$5)/N49))))	=IF(O$35=0,0,1-(1/(1+((O63*O$5)/O49))))	=IF(P$35=0,0,1-(1/(1+((P63*P$5)/P49))))
83	=IF(I$35=0,0,1-(1/(1+((I64*I$5)/I50))))	=IF(J$35=0,0,1-(1/(1+((J64*J$5)/J50))))	=IF(K$35=0,0,1-(1/(1+((K64*K$5)/K50))))		=IF(M$35=0,0,1-(1/(1+((M64*M$5)/M50))))	=IF(N$35=0,0,1-(1/(1+((N64*N$5)/N50))))	=IF(O$35=0,0,1-(1/(1+((O64*O$5)/O50))))	=IF(P$35=0,0,1-(1/(1+((P64*P$5)/P50))))
84	=IF(I$35=0,0,1-(1/(1+((I65*I$5)/I51))))	=IF(J$35=0,0,1-(1/(1+((J65*J$5)/J51))))	=IF(K$35=0,0,1-(1/(1+((K65*K$5)/K51))))		=IF(M$35=0,0,1-(1/(1+((M65*M$5)/M51))))	=IF(N$35=0,0,1-(1/(1+((N65*N$5)/N51))))	=IF(O$35=0,0,1-(1/(1+((O65*O$5)/O51))))	=IF(P$35=0,0,1-(1/(1+((P65*P$5)/P51))))
85	=IF(I$35=0,0,1-(1/(1+((I66*I$5)/I52))))	=IF(J$35=0,0,1-(1/(1+((J66*J$5)/J52))))	=IF(K$35=0,0,1-(1/(1+((K66*K$5)/K52))))		=IF(M$35=0,0,1-(1/(1+((M66*M$5)/M52))))	=IF(N$35=0,0,1-(1/(1+((N66*N$5)/N52))))	=IF(O$35=0,0,1-(1/(1+((O66*O$5)/O52))))	=IF(P$35=0,0,1-(1/(1+((P66*P$5)/P52))))
86	=IF(I$35=0,0,1-(1/(1+((I67*I$5)/I53))))	=IF(J$35=0,0,1-(1/(1+((J67*J$5)/J53))))	=IF(K$35=0,0,1-(1/(1+((K67*K$5)/K53))))		=IF(M$35=0,0,1-(1/(1+((M67*M$5)/M53))))	=IF(N$35=0,0,1-(1/(1+((N67*N$5)/N53))))	=IF(O$35=0,0,1-(1/(1+((O67*O$5)/O53))))	=IF(P$35=0,0,1-(1/(1+((P67*P$5)/P53))))
87	=IF(I$35=0,0,1-(1/(1+((I68*I$5)/I54))))	=IF(J$35=0,0,1-(1/(1+((J68*J$5)/J54))))	=IF(K$35=0,0,1-(1/(1+((K68*K$5)/K54))))		=IF(M$35=0,0,1-(1/(1+((M68*M$5)/M54))))	=IF(N$35=0,0,1-(1/(1+((N68*N$5)/N54))))	=IF(O$35=0,0,1-(1/(1+((O68*O$5)/O54))))	=IF(P$35=0,0,1-(1/(1+((P68*P$5)/P54))))
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	A	B	C	D	E	F	G	H	I	J	K	L
1	**Determination of Inboard MSIV Leak Rates using NEDC-31858P and NEDC-32091 Methodology**											
2												
3	**Constants**											
4	68	Standard Temperature (°F)										
5	558	Main Steam Pipe Wall Temp 0-24 hours (°F)										
6	410	Main Steam Pipe Wall Temp 24-48 hours (°F)										
7	300	Main Steam Pipe Wall Temp 48-72 hours (°F)										
8	250	Main Steam Pipe Wall Temp 72-96 hours (°F)										
9	200	Main Steam Pipe Wall Temp 96-157 hours (°F)										
10	200	Main Steam Pipe Wall Temp 157-720 hours (°F)										
11	14.7	Conversion Factor (atm to psi)										
12												
13	**Containment Volumes**											
14	159,000	Drywell Volume (ft^3)										
15	127,700	Wetwell Volume (ft^3)										
16	7,200	Reactor Vessel (ft3) space above nominal water level vs. {GE 14,000 ft^3 value}										
17	293,900	Total Volume (ft^3)										
18	8322.3663	Total Volume (m^3)										
19	1.7684	Ratio of Total Volume to Drywell Volume including RPV										
20												
21	**Containment Temperatures and Pressures per Containment Analysis for RSLB in PM-1061, R0**											
22												
23	276	DW Temp (°F) at minimum DW-WW differential (at ~ 69 seconds)										
24	131	WW Temp (°F) at minimum DW-WW differential (at ~ 69 seconds)										
25	213.0	Average Bulk Temperature (°F)										
26												
27	46.1	DW Pressure (psia) {use for pressure vessel as well}										
28	43.9	WW Pressure (psia)										
29	45.1	Average Bulk Pressure (psia)										
30	3.07	Average Bulk Pressure (atmospheres)										
31												
32	**Hydrogen Contribution from Zirconium Water Reaction**											
33	764	assemblies					{PBAPS Value}					
34	102.00	lbs Zr/assembly					{NEDC-31858P}					
35	7.87	cubic feet H_2 per lb Zr					{NEDC-31858P}					
36	0.20	fraction of Zr undergoing metal water reaction					{NEDC-31858P}					
37	122658.67	Total Hydrogen (ft^3)					{Calculated PBAPS Value}					
38	167782.42	Corrected to bulk average temperature					{Calculated PBAPS Value}					
39	0.5708827	Partial Pressure of Hydrogen (atmospheres)					{Calculated PBAPS Value}					
40												
41	**3.64**	**Total {H_2, N_2, H_2O} Pressure (atmospheres)**					{Calculated PBAPS Value}					
42												
43	**Inboard Leak Rate Determination per NEDC-32091, Section B.1.3, Duane Arnold Example based.**											
44	**A**	**B**	**C**	**D**								
45	0	0	75	75	**Containment Leak Rate (scfh) {use as basis for outboard flow rate}**							
46	0	0	0.21435	0.21435	**Leak Rate in %/day**							
47	0.0000	0.0000	0.4375	0.4375	**Inboard Leak Flow Rate (cfm)**							
48	0.0000	0.0000	26.2489	26.2489	**Inboard Leak Flow Rate (cfh)**							
49												
50	**Note that no extrapolation from test pressure to Pa is required based on the NEDC-31858P note**											
51	**that these containment conditions are essentially equivalent to test conditions.**											

	A	B	C	D	E	F	G
1	**Main Steam Piping Summary**						
2	23.624	Main Steam 24 inch pipe ID					
3							
4	**A**	**B**	**C**	**D**			
5	**PBAPS Unit 2**						
6	**Nodalization (Horizontals)**						
7							
8	296	254	254	300	**Node 1 Surface Area (sq. ft.)**		
9	146	125	125	148	**Node 1 Volume (cu. ft.)**		
10	153	140	140	153	**Node 2 Surface Area (sq. ft.)**		
11	75	69	69	75	**Node 2 Volume (cu. ft.)**		
12	1794	1838	1882	1927	**Node 3 Surface Area (sq. ft.)**		
13	883	905	926	948	**Node 3 Volume (cu. ft.)**		
14							
15	**Nodalization (Totals)**						
16							
17	667	616	616	671	**Node 1 Surface Area (sq. ft.)**		
18	328	303	303	330	**Node 1 Volume (cu. ft.)**		
19	153	140	140	153	**Node 2 Surface Area (sq. ft.)**		
20	75	69	69	75	**Node 2 Volume (cu. ft.)**		
21	1863	1907	1952	1997	**Node 3 Surface Area (sq. ft.)**		
22	917	939	961	983	**Node 3 Volume (cu. ft.)**		
23							
24	**A**	**B**	**C**	**D**			
25	**PBAPS Unit 3**						
26	**Nodalization (Horizontals)**						
27							
28	302	258	255	307	**Node 1 Surface Area (sq. ft.)**		
29	149	127	126	151	**Node 1 Volume (cu. ft.)**		
30	140	140	140	140	**Node 2 Surface Area (sq. ft.)**		
31	69	69	69	69	**Node 2 Volume (cu. ft.)**		
32	1891	1826	1761	1548	**Node 3 Surface Area (sq. ft.)**		
33	931	899	867	762	**Node 3 Volume (cu. ft.)**		
34							
35	**Nodalization (Totals)**						
36							
37	687	620	617	685	**Node 1 Surface Area (sq. ft.)**		
38	338	305	304	337	**Node 1 Volume (cu. ft.)**		
39	140	140	140	140	**Node 2 Surface Area (sq. ft.)**		
40	69	69	69	69	**Node 2 Volume (cu. ft.)**		
41	1961	1896	1831	1618	**Node 3 Surface Area (sq. ft.)**		
42	965	933	901	796	**Node 3 Volume (cu. ft.)**		
43	**Unit 3, Lines C and D are considered bounding because they minimize the**						
44	**most important Node 3 outboard piping components.**						
45	**Break is assumed in Line D, because of its minimum outboard piping, and**						
46	**maximum inboard piping loss.**						

PBAPS Unit 2 Main Steam Line A

	A	B	C	D	E	F	G
1	PBAPS Unit 2 Main Steam Line A						
2							
3	Inner Diameter (in.)=	23.624					
4							
5						Horizontal	Horizontal
6		Location	Horizontal	Volume (ft^3)	Surface Area (ft^2)	Volume (ft^3)	Surface Area (ft^2)
7		Inboard	TRUE	4.81	9.77	4.81	9.77
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	9.896	20.11	9.896	20.11
14		Inboard	FALSE	42.57	86.50	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	15.86	32.22	15.86	32.22
17		Penetration	TRUE	75.18	152.75	75.18	152.75
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.24	69.57	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	155.29	315.52	155.29	315.52
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	471.97	958.96	471.97	958.96
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	147.44	299.57	147.44	299.57
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	56.21	114.21	56.21	114.21
28							
29			Totals	1320.476	2682.99	1103.60	2242.32
30							
31							
32							
33							
34						Horizontal	Horizontal
35				Total Volume	Total Surface	Volume	Surface Area
36				(ft^3)	Area (ft^2)	(ft^3)	(ft^2)
37			Inboard (Node 1)	328.30	667.04	145.66	295.95
38			Penetration (Node 2)	75.18	152.75	75.18	152.75
39			Outboard (Node 3)	917	1863.19	882.76	1793.62
40							
41			Totals	1320.48	2682.99	1103.60	2242.32

	A	B	C	D	E	F	G
1	**PBAPS Unit 2 Main Steam Line B**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	20.68	42.02	20.68	42.02
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.26	69.61	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	143.6	291.77	143.6	291.77
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	461.8	938.30	461.8	938.30
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	178.89	363.47	178.89	363.47
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	68.39	138.96	68.39	138.96
29							
30			**Totals**	1311.02	2663.77	1098.47	2231.91
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	303.38	616.42	125.09	254.16
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	938.79	1907.46	904.53	1837.85
40							
41			**Totals**	1311.02	2663.77	1098.47	2231.91

	A	B	C	D	E	F	G
1	**PBAPS Unit 2 Main Steam Line C**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.1	95.70	47.1	95.70
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	20.68	42.02	20.68	42.02
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.26	69.61	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	131.94	268.08	131.94	268.08
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	451.66	917.70	451.66	917.70
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	210.35	427.40	210.35	427.40
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	80.57	163.70	80.57	163.70
29							
30			**Totals**	1332.85	2708.13	1120.30	2276.26
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	303.37	616.40	125.08	254.14
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	960.63	1951.84	926.37	1882.23
40							
41			**Totals**	1332.85	2708.13	1120.30	2276.26

	A	B	C	D	E	F	G
1	**PBAPS Unit 2 Main Steam Line D**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	4.32	8.78	4.32	8.78
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	12.424	25.24	12.424	25.24
14		Inboard	FALSE	42.87	87.10	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	15.71	31.92	15.71	31.92
17		Penetration	TRUE	75.18	152.75	75.18	152.75
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.56	70.22	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	120.03	243.88	120.03	243.88
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	441.52	897.09	441.52	897.09
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	242.08	491.87	242.08	491.87
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	92.75	188.45	92.75	188.45
28							
29			**Totals**	1388.454	2821.11	1170.95	2379.18
30							
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	330.48	671.49	147.54	299.78
38			**Penetration (Node 2)**	75.18	152.75	75.18	152.75
39			**Outboard (Node 3)**	982.79	1996.86	948.23	1926.64
40							
41			**Totals**	1388.45	2821.11	1170.95	2379.18

PBAPS Unit 3 Main Steam Line A

	A	B	C	D	E	F	G
1	PBAPS Unit 3 Main Steam Line A						
2							
3	Inner Diameter (in.)=	23.624					
4							
5						Horizontal	Horizontal
6		Location	Horizontal	Volume (ft^3)	Surface Area (ft^2)	Volume (ft^3)	Surface Area (ft^2)
7		Inboard	TRUE	4.81	9.77	4.81	9.77
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	9.896	20.11	9.896	20.11
14		Inboard	FALSE	49.15	99.86	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	19.03	38.67	19.03	38.67
17		Penetration	TRUE	68.85	139.89	68.85	139.89
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.26	69.61	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	120.28	244.39	120.28	244.39
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	424.02	861.54	424.02	861.54
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	241.83	491.36	241.83	491.36
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	92.75	188.45	92.75	188.45
28							
29			Totals	1371.886	2787.44	1148.41	2333.37
30							
31							
32							
33							
34						Horizontal	Horizontal
35				Total Volume	Total Surface	Volume	Surface Area
36				(ft^3)	Area (ft^2)	(ft^3)	(ft^2)
37			Inboard (Node 1)	338.05	686.85	148.83	302.39
38			Penetration (Node 2)	68.85	139.89	68.85	139.89
39			Outboard (Node 3)	964.99	1960.70	930.73	1891.09
40							
41			Totals	1371.89	2787.44	1148.41	2333.37

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line B**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	22.44	45.59	22.44	45.59
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.5	70.10	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	131.94	268.08	131.94	268.08
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	424.02	861.54	424.02	861.54
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	210.35	427.40	210.35	427.40
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	80.57	163.70	80.57	163.70
29							
30			**Totals**	1307.22	2656.05	1094.43	2223.70
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	305.14	619.99	126.85	257.74
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	933.23	1896.17	898.73	1826.07
40							
41			**Totals**	1307.22	2656.05	1094.43	2223.70

	A	B	C	D	E	F	G
1	**PBAPS Unit 3 Main Steam Line C**						
2							
3	**Inner Diameter (in.)=**	23.624					
4							
5						**Horizontal**	**Horizontal**
6		**Location**	**Horizontal**	**Volume (ft^3)**	**Surface Area (ft^2)**	**Volume (ft^3)**	**Surface Area (ft^2)**
7		Inboard	TRUE	5.45	11.07	5.45	11.07
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.03	203.24	0	0.00
10		Inboard	FALSE	35.57	72.27	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	47.11	95.72	47.11	95.72
13		Inboard	TRUE	10.37	21.07	10.37	21.07
14		Inboard	FALSE	42.69	86.74	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	10.37	21.07	10.37	21.07
17		Inboard	TRUE	21.19	43.05	21.19	43.05
18		Penetration	TRUE	68.85	139.89	68.85	139.89
19		Outboard	TRUE	10.37	21.07	10.37	21.07
20		Outboard	FALSE	34.5	70.10	0	0.00
21		Outboard	TRUE	10.37	21.07	10.37	21.07
22		Outboard	TRUE	143.6	291.77	143.6	291.77
23		Outboard	TRUE	10.37	21.07	10.37	21.07
24		Outboard	TRUE	424.02	861.54	424.02	861.54
25		Outboard	TRUE	10.37	21.07	10.37	21.07
26		Outboard	TRUE	178.89	363.47	178.89	363.47
27		Outboard	TRUE	10.37	21.07	10.37	21.07
28		Outboard	TRUE	68.39	138.96	68.39	138.96
29							
30			**Totals**	1273.99	2588.53	1061.20	2156.18
31							
32							
33							
34						**Horizontal**	**Horizontal**
35				**Total Volume**	**Total Surface**	**Volume**	**Surface Area**
36				**(ft^3)**	**Area (ft^2)**	**(ft^3)**	**(ft^2)**
37			**Inboard (Node 1)**	303.89	617.45	125.60	255.20
38			**Penetration (Node 2)**	68.85	139.89	68.85	139.89
39			**Outboard (Node 3)**	901.25	1831.19	866.75	1761.09
40							
41			**Totals**	1273.99	2588.53	1061.20	2156.18

PBAPS Unit 3 Main Steam Line D

	A	B	C	D	E	F	G
1	PBAPS Unit 3 Main Steam Line D						
2							
3	Inner Diameter (in.)=	23.624					
4							
5						Horizontal	Horizontal
6		Location	Horizontal	Volume (ft^3)	Surface Area (ft^2)	Volume (ft^3)	Surface Area (ft^2)
7		Inboard	TRUE	4.32	8.78	4.32	8.78
8		Inboard	TRUE	10.37	21.07	10.37	21.07
9		Inboard	FALSE	100.55	204.30	0	0.00
10		Inboard	FALSE	39.52	80.30	0	0.00
11		Inboard	TRUE	10.37	21.07	10.37	21.07
12		Inboard	TRUE	83.98	170.63	83.98	170.63
13		Inboard	TRUE	12.424	25.24	12.424	25.24
14		Inboard	FALSE	46.44	94.36	0	0.00
15		Inboard	TRUE	10.37	21.07	10.37	21.07
16		Inboard	TRUE	19.03	38.67	19.03	38.67
17		Penetration	TRUE	68.85	139.89	68.85	139.89
18		Outboard	TRUE	10.37	21.07	10.37	21.07
19		Outboard	FALSE	34.56	70.22	0	0.00
20		Outboard	TRUE	10.37	21.07	10.37	21.07
21		Outboard	TRUE	155.29	315.52	155.29	315.52
22		Outboard	TRUE	10.37	21.07	10.37	21.07
23		Outboard	TRUE	351.12	713.42	351.12	713.42
24		Outboard	TRUE	10.37	21.07	10.37	21.07
25		Outboard	TRUE	147.44	299.57	147.44	299.57
26		Outboard	TRUE	10.37	21.07	10.37	21.07
27		Outboard	TRUE	56.21	114.21	56.21	114.21
28							
29			Totals	1202.694	2443.67	981.62	1994.50
30							
31							
32							
33							
34						Horizontal	Horizontal
35				Total Volume	Total Surface	Volume	Surface Area
36				(ft^3)	Area (ft^2)	(ft^3)	(ft^2)
37		Inboard (Node 1)		337.37	685.49	150.86	306.53
38		Penetration (Node 2)		68.85	139.89	68.85	139.89
39		Outboard (Node 3)		796.47	1618.29	761.91	1548.07
40							
41			Totals	1202.69	2443.67	981.62	1994.50