Docket #s
50-445
& 50-446

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Subject:	Response to Question on LAR 03-004 (TXX-04090)
Creation Date:	6/9/04 1:57PM
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From: <jhicks1@txu.com>
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Date: 6/9/04 2:05PM
Subject: Response to Question on LAR 03-004 (TXX-04090)

Attached are the responses to the qustions on LAR 03-004, Revision to TS3.6.3 to extend SR 3.6.3.7 frequency for Containment Purge, Hydrogen Purge and Containment Pressure Relief Valves.

(See attached file: T04090.doc)

CC: <dbuschb1@txu.com>

Ref: 10CFR50.90

CPSES-200401509
Log # TXX-04090
File # 00236

June 9, 2004

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST (LAR) 03-004 REVISION TO TECHNICAL SPECIFICATION (TS) 3.6.3 TO EXTEND SURVEILLANCE REQUIREMENT (SR) 3.6.3.7 FREQUENCY FOR CONTAINMENT PURGE, HYDROGEN PURGE AND CONTAINMENT PRESSURE RELIEF VALVES WITH RESILIENT SEATS (TAC NOS. MC0911/MC0912)

REF: 1) TXU Energy Letter, logged TXX-03078, from C. L. Terry to the U. S. Nuclear Regulatory Commission, dated September 23, 2003

Gentlemen:

In Reference 1, TXU Generating Company LP (TXU Power) submitted a proposed change to the Technical Specification (TS) associated with containment isolation valves (LAR 03-004). The proposed change will revise TS 3.6.3 entitled "Containment Isolation Valves," to extend the frequency of Surveillance Requirement (SR) 3.6.3.7 for the containment purge, hydrogen purge and containment pressure relief valves with resilient seats.

Based on conversations with the NRC staff, TXU Power provides the following information regarding LAR 03-004. The attachment contains the NRC questions and TXU Power's response immediately following each question.

This communication contains no new or revised commitments.

Should you have any questions, please contact Mr. Jack Hicks at (254)897-6725 or email (jhicks1@tux.com).

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

Executed on June 9, 2004.

Sincerely,

TXU Generation Company LP

By: TXU Generation Management Company LLC
Its General Partner

Mike Blevins

By: ____________________
Fred W. Madden
Regulatory Affairs Manager

JCH/jch

Attachment TXU Power Responses to RAI

c - B. S. Mallett, Region IV
W. D. Johnson, Region IV
M. C. Thadani, NRR
Resident Inspectors, CPSES

Ms. Alice Rogers
Bureau of Radiation Control
Texas Department of Public Health
1100 West 49th Street
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ATTACHMENT to TXX-04090

TXU Power Responses to RAI

NRC Question 1:

Describe the two methods mentioned in Section 4.4 of the license amendment request that were used to evaluate the risk significance of the proposed change (ISLOCA methodology and RI-IST methodology). For each methodology, provide calculation details and results that support the conclusion that the proposed change is not risk significant.

TXU Power Response:

The potential of increase in LERF due to the extension in the LLRT test interval was evaluated by two different methodologies. The first used the approach developed by Brookhaven National Laboratory for their NUREG on ISLOCA. The second followed the methodology used for the Risk-Informed IST program implemented at CPSES. These methodologies were chosen because the PRA model does not explicitly consider containment isolation failures for penetrations that have two normally closed valves in series since the failure of spuriously opening or failure to remain close were deemed to be low probability events. The valves under consideration are normally closed and remain closed during power operation. The exceptions to this are the containment pressure relief valves, which are periodically opened. It is their failure to re-close following an event that is the significant containment isolation failure contributor to LERF. This failure mode is unaffected by the requested extension since it is not confirmed by the LLRT.

ISLOCA Methodology

The evaluation for leakage through containment penetrations was accomplished by adapting the generic system failure models found in NUREG/CR-5102, "ISLOCA Evaluation Guidelines," to the specific valve arrangements found at CPSES. The formulas obtained for the generic case of two valves in series were applied to the valve arrangement for these penetrations.

The basic failure model for two valves in series described in the NUREG, can be applied to calculate the average failure frequency of this arrangement provided the proper valve failure modes are selected based on valve arrangements and test practices. The frequency of "excessive leakage" is determined by use of the NUREG equation 9 (page 4-20, derived from equation 12a, Section B.1.2 of Appendix B). The reference equation is adapted to the specific failure modes identified below:

$$I\ (\text{CIV Bypass}) = A * B\ [\lambda_L^2 T + \lambda_R \lambda_L T + 2\lambda_L \lambda_d\ ((dT+1)/2)]$$

Where,

λ_L, λ_R, λ_d denote the mean rate of the 1) internal leakage, 2) disk ruptures and 3) valve fails open, while indicating closed due to failure of internal connections or the limit switch itself. The disk rupture value (λ_R) was taken from the NUREG (A.2.1) based on generic industry data for valve disk failures; specific industry data for PWR MOVs was not identified in the NUREG. The value used in the NUREG is 1.20E-03 per year for disk rupture and that value was used in this evaluation. The valve fails open value (λ_d) used in the NUREG represents a MOV failing open while indicating closed. The value in the NUREG for a MOV is approximately a factor of 5 less than the MOV transfer value for a year value (1.07E-4 vs. 4.71E-4). Therefore, the CPSES PRA value for an AOV transferring over a period of a year will be affected by a similar ratio. This modified value of 4.28E-02 (1.11E-6 * 8760 * (4.71E-04/1.07E-4)) was used in this evaluation. Leakage probabilities of an AOV are also not readily available. However, the NUREG provides a value based on MOV leakage. Since the initial basis for increased testing was due to industry poor performance of these kinds of containment isolation valves, the value for MOVs in the NUREG was increased by a factor of 3 to account for the past industry poor performance. The factor of 3 was chosen based on CPSES past performance of these, which indicated that these penetration perform adequately from a LERF perspective. The revised value for (λ_L) is 1.46E-02 (4.85E-03 * 3) per year.

"d" denotes the demand rate of the valves between test ("d" is assumed to be constant with respect to test interval change, as the number of demands remain unchanged. Therefore for the purge valves d = 1 was assumed and for the relief valves a value of d = 6 for once per 92 days was assumed).

T is the period of time between leak tests and T = ½, every 6 months, for purge valves and T = ¼, every 92days, for the relief valves for the original test interval. T represents the stroke test performed at each refueling outage (T_R = 1.5 years) for the new test interval.

A and B are unitless factors that denote the number of similar lines (i.e., 2 for the purge lines and 1 for the relief line) and the unitless capacity factor determined from the plants operating history. This evaluation assumes a conservative value of 1.0 for capacity factor.

Substituting the values into the equation, the base case for each type of penetration (purge or relief) for the likelihood of the penetration to leak given a core damage event would be:

$I_{(CIV\ Purge)} = 2*1\ [((1.23E\text{-}02)^2 * 0.5) + (1.20E\text{-}03 * 1.23E\text{-}02 * 0.5) + (2*1.23E\text{-}02 * 4.86E\text{-}02) * (((1 * 0.5) + 1) \div 2))] = 4.181E\text{-}04$
$I_{(CIV\ Relief)} = 1*1\ [((1.23E\text{-}02)^2 * 0.25) + (1.20E\text{-}03 * 1.23E\text{-}02 * 0.25) + (2 * 1.23E\text{-}02 * (4.86E\text{-}02) * (((6 * 0.25) + 1) \div 2))] = 2.139E\text{-}04$

The change in test interval as outlined in the LAR would change "T" to be 1.5 years and "d" to be 1 for purge valves and 6 for relief valves between tests. Substituting this value into the equations above, the new likelihood of the penetration to leak given a core damage event would be:

$I_{(CIV\ Purge)} = 1.046E\text{-}03$
$I_{(CIV\ Relief)} = 1.056E\text{-}03$

Using the results above with the current CPSES CDF value of 2E-05, the change in LERF can be estimated to be:

$\Delta LERF = [(I_{(CIV\ Purge)new} * CDF) + (I_{(CIV\ Relief)new} * CDF)] - [(I_{(CIV\ Purge)\ base} * CDF) + (I_{(CIV\ Relief)base} * CDF)]$
$= [(1.046\ \text{-}03 * 2E\text{-}05) + (1.056E\ \text{-}03 * 2E\text{-}05)] - [(4.181E\text{-}04 * 2E\text{-}05) + (2.139E\text{-}04 * 2E\text{-}05)]$
$= 2.939E\text{-}08$

This is less than Reg. Guide 1.174 (ΔLERF < 1E-07) and Reg. Guide 1.177 (ICLERP < 5E-08) guidelines for risk significance.

Risk-Inform IST Methodology

The methodology employed by the Risk-Informed IST program simply assumes a linear increase in failure rate of a component associated with test frequency. For this LAR request, the bounding change in test interval would be from every 92 day (quarterly) to every refueling outage (18 month) or a factor of 6 increase in the failure rate. Since the LAR pertains to a change in LLRT test interval, the failure mode of interest would be that of the normally close penetration leaking a significant amount such that the resulting bypass would be considered large. As seen from the earlier evaluation, no specific or generic leak rate information was found on these types of valves. Therefore, based on past service history, a failure rate of 4.18E-03 was used for each valve. It needs to be noted that the failure rate calculated is for a penetration failing to meet leakage criteria and not on an individual valve basis to meet leakage rate criteria. The one failure noted in the CPSES service history for these valves indicated that upon detail inspection of the 2 series valves, that only one failed to meet the specified limit and that the second valve did meet its acceptance criteria. Therefore, the failure rate of the penetration is the calculated failure rate of a single valve squared as each penetration contains two valves in series.

The change in release frequency can than be calculated using the following formula:

$\Delta LERF = LERF_{new} - LERF_{orignal}$
$= CDF * (\lambda_{new} - \lambda_{orignal})$
$= 1.69E\text{-}05\ (6.29E\text{-}4 - 1.75E\text{-}05) = 1.03E\text{-}8$

Where, $\lambda_{orignal} = (4.18E\text{-}03)^2 = 1.75E\text{-}05$ and $\lambda_{new} = (6 * 4.18E\text{-}3)^2 = 6.29E\text{-}04$

Reg. Guide 1.174 provides risk-acceptance guidelines for risk-informed regulations. It establishes regions and acceptance criteria for each region based on a plant's baseline LERF and the change in LERF of the proposed request. The guide sets a threshold of 1E-07 for delta LERF as being risk insignificant. Reg. Guide 1.177 provides risk-acceptance guidelines for risk-informed regulations associated with Technical Specifications. It provides a threshold of less than 5E-08 for CLERP as being risk insignificant. Therefore based on the calculation above, which assumes that the failure rate of the valves to prevent leakage increase proportionally with the increase in test interval, the change is found to be not risk significant.

Conclusion

Two methods of determining the potential change in LERF are provided in the preceding sections. Each method has been used at CPSES in support of risk informed applications. The ISLOCA methodology is part of the current CPSES PRA model and the RI-IST methodology is part of the CPSES Risk informed IST program. Both methods provide insight into the potential increase in penetration leak rate that may occur with an extension in test interval. Each method provides similar results with respect to risk significance of the proposed change. The increase in test interval from the current 3 month or 6 month to each refueling outage is supported using this risk informed approach. Extending the interval for these valves is not risk significant. The two different methods presented above, which both assumed an increased failure rate of the valves, found the increase in risk (LERF) to be less than Reg. Guide 1.174 (ΔLERF < 1E-07) and Reg. Guide 1.177 (ICLERP < 5E-08) guidelines and the extension in test frequency is considered to be not risk significant.

NRC Question 2:

Identify the approach used by TXU to estimate LERF (e.g., a complete Level 2 PRA, the simplified approach in NUREG/CR-6595, etc.). Provide the LERF prior to implementing the proposed change (baseline LERF), the percentages of its major contributors, and the percentage attributed to containment isolation failure.

TXU Power Response:

The back-end (sometimes called containment) analysis of the CPSES PRA utilizes the approach of a Level II probabilistic risk assessment (PRA). A Level II analysis involves two types of considerations: (1) analyses of physical processes during severe accidents, where degraded core and containment thermo-hydraulic variables are determined along with source terms for the accident progressions, and (2) a probabilistic component where the likelihood of the various outcomes is assessed. The Level I core melt sequences are collected or binned into a Plant Damage State (PDS), such that sequences in a given bin have similar accident progressions and outcomes of similar likelihood. For each PDS there is a containment event tree (CET). The path through each CET begins with a PDS and ends with a CET end-state which is defined by a containment failure mode, time and release fractions. These CET end-states are later binned into release categories. The primary considerations for defining the CPSES release categories are whether: (1) the containment is intact at the time of core melt or whether (2) the release involves a bypassed or unisolated containment. For CPSES, LERF is made up of those release categories that were considered to be large and early as well as those that led to direct containment by-pass (i.e., V-sequences, Containment Isolation failures and SGTR sequences).

The CPSES Large Early Release Frequency (LERF) is 5.31E-07 per year assuming average test and maintenance. The dominant initiating event contributors to LERF are containment failure events (i.e., Loss of Offsite Power/SBO induced events including RCP Seal LOCAs and containment overpressurization events), and containment bypass events (i.e., ISLOCA, SGTR sequences). Loss of Offsite Power/SBO induced events account for approximately 45%, ISLOCAs account for approximately 29% and SGTR accounts for approximately 18% of the total large early release frequency.

The Loss of Offsite Power/SBO initiator results in the loss of systems providing RCP Seal cooling or a loss of RCS primary and secondary cooling as well as the loss of containment protection systems. Both the RCS overpressurization and the induced RCP Seal LOCA scenario involve a loss of inventory inside containment (e.g. inventory in the containment sumps) with a subsequent loss of containment from various failure mechanisms. Containment Isolation valve failures were found to be negligible contributors to containment failure associated with the Loss of Offsite Power/SBO initiator results. The loss of containment provides the release path to the environment.

By definition, the ISLOCA scenarios involve a direct path outside containment for radionuclide release. A failure of the valves on the intermediate pressure injection lines provides a direct path from the RCS to the safeguards building due to the postulated break in the SI piping outside containment. A similar scenario exists for the RHR ISLOCA. For this scenario, a failure of the valves on the RHR suction lines from the RCS hot legs provides a direct path from the RCS to the safeguards building due to the postulated break in the RHR piping outside containment.

NRC Question 3:

In the Level 2 PRA, what is the definition of containment isolation failure? Relate the size of the isolation failure assumed to cause a large release in the PRA to the administrative limits for measured leakage through the valves with resilient seats (12,500 sccm for the containment purge and hydrogen purge valves, and 15,100 sccm for the containment pressure relief valves, as stated in Section 4.2 of the license amendment request).

TXU Power Response:

The CPSES PRA models the various containment penetrations with respect to the function of closing and remaining closed (when isolation is demanded). The failure probability used in the analysis is a combination of generic and plant specific information. Plant specific data is based in part, on acceptance criteria defined by the plant's design/limits. The failure of any one penetration (loss of penetration integrity) is considered a direct by-pass of containment. The Level II analysis evaluates complementary attributes of containment performance, that is, those attributes not (previously) explicitly modeled as part of the penetration integrity function (e.g. containment/liner integrity). These attributes can be described as those that establish the physical integrity of the containment building itself. The CPSES Level II PRA analysis has an end state of radioactive release following core damage. The Large Early Release Frequency (LERF) is defined as a rapid, unscrubbed release of airborne fission products from the plant to the environment that occurs before the effective implementation of the off-site emergency response protective actions. This has been further refined to be release of one containment volume within one hour, which occurs before or within 4 hours of vessel breach. The PRA failure rates are based on the component's ability to perform its function. In this case, the components either would have failed to closed, if opened for the existing modeled failure mode or they would have failed to meet their LLRT requirements for the leakage failure rate used in the evaluation.

For CPSES the overall Containment leakage limit is 1.0 L_a. This includes all sources of leakage. The total of LLRT leakage is 0.6 L_a. The limit is < 0.05 L_a for the 48" and 12" penetrations and < 0.06 L_a for the 18" penetration. These are the bases for the administrative limits referred to in the question. Using the EPRI PSA Applications Guide criteria, to have a containment volume (2,985,000 ft^3) escape within one hour of the event equates to a leakage rate of ~2.18E+8 sccm. This is significantly larger than administrative limits (1.2 to 1.5E+4 sccm) for measured leakage through these valves with resilient seats. In addition, based on the draft SDP for containment (appendix H), a significant leakage rate for LERF has been defined as 100 volume percent per day leakage. The leakage associated with the LLRT acceptance criteria is also significantly less than this threshold.

NRC Question 4:

Describe the significant causes of containment isolation failure (e.g., isolation valves fail to close on demand, isolation valve leakage, etc.) and indicate the approximate percentage that each failure cause contributes to the overall containment isolation failure probability.

TXU Power Response:

The CPSES LERF results indicate that the significant cause of containment isolation failure can be attributed to common cause failure of air-operated valves failing to close on demand. Isolation valve leakage mode is not considered due to the low probability of significant leakage from two normally closed valves in series. As indicated in the response to question number one, containment isolation valve failures are not significant contributors (less than 1%) to LERF.

NRC Question 5:

Describe the time-dependent leakage rate through valves with resilient seats, citing relevant studies or research. How much increase in leakage rate can be expected after extending the current surveillance test interval (3 months or 6 months, depending on valve type) to 18 months? Since (a) the total containment leakage rate is the sum of individual component leakage rates, and (b) the proposed increase in test interval may cause increased leakage rates for valves with resilient seats, the licensee should demonstrate that the proposed 18-month test interval does not increase the total containment leakage rate to the extent that it approaches the size of the isolation failure assumed to cause a large release in the PRA.

TXU Power Response:

As provided in the response to question number one, the leakage rates through these valves were increased based on the increase in the requested test interval. With the proposed extension of test intervals, leakage rates are not expected to change significantly; they should remain at or below the existing administrative limits. This expectation is substantiated by past performance that demonstrates leakage at current test intervals has consistently been observed to be below the administrative limit (see the tabular results from past LLRT). When the administrative limit is not exceeded, no action is required and the valve is typically unaltered between outages when routine maintenance is carried out. This indicates that future leakage rates should be consistent with past experience even if testing frequency is reduced.

Question number three indicated the isolation failure rates assumed to cause a large release are larger than the leakage corresponding to the current LLRT administrative limits by orders of magnitude. The comparison shows PRA assumptions would remain valid even when summing individual component leakage rates. The magnitude of PRA assumptions relative to leakage also allows for evaluation of failures and associated increases should administrative limits be exceeded. Therefore even assuming a linear increase in the leakage limits proportional to the increase in test frequency, these larger leak rates in combination with other existing leak paths would not approach the PRA limit.

CPSES's corrective action and feedback plans will ensure that testing failures are evaluated to determine whether adjustment to the component's test strategy is appropriate. Component corrective action procedures will be in place before any test intervals are extended.

When a component on the extended test interval fails to meet established test criteria, corrective actions will be taken in accordance with the CPSES corrective action program.

For components not meeting the acceptance criteria, a SmartForm or equivalent will be generated. This document initiates the corrective action process. Also, the initiating event for a SmartForm may be from causes other than an unacceptable LLRT test. Programs exist that provide timely information to the LLRT coordinator that the performance of a reliable component may have degraded. The recorded information could then be used to assess whether a significant change in component reliability has occurred such that the component would merit a change in test interval.

The initiating event (for the preparation of a SmartForm) could be any other indication that the component is in a non-conforming condition. The unsatisfactory condition will be evaluated to achieve the following objectives:

(1) Determine the impact on system operability and take appropriate action.
(2) Review the previous test data for the component and all components in the group.
(3) Perform a root cause analysis.
(4) Determine if this is a generic failure. If it is a generic failure whose implications affect a group of components, initiate corrective action for all components in the affected group.
(5) Initiate corrective action for failed LLRT components.
(6) Evaluate the adequacy of the test strategy. If a change is required, review the LLRT test schedule and change as appropriate.

Past Penetration History

The most recent set of test history (from 1999 to present) indicates that there was one failure in the 160 tests performed on the containment penetrations associated with this LAR. A cursory review of the earlier service history indicates that there was no failure of the penetration to meet their LLRT requirements in the additional 79 test performed. Therefore, the revised history would be indicates that there was one failure in 239 tests. It should be noted that the LLRT is a test of the penetration and not of the individual valves in the penetration. The one failure that did occur was found to have been in one of the two valves and that the other valve did maintain pressure.

Unit 1 Penetration MIII-19 (12" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
01/29/03	2590	09/23/99	1625	11/10/96	2500
10/17/02	2900	05/30/99	2420	07/10/95	2410
10/09/02	2450	12/13/98	2690	03/30/95	2560
08/18/02	2500	06/27/98	2400	08/26/94	2470
02/28/02	2580	04/11/98	2510	02/24/94	2480
09/15/01	2550	10/17/97	2510	11/26/93	2530
04/11/01	2750	04/25/97	2490	6/18/93	*3530
11/12/00	2640	10/05/96	2520		
04/30/00	2340	07/12/96	2360		

* High value for this penetration

Unit 2 Penetration MIII-19 (12" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
03/01/03	1524	03/12/99	1430	06/06/95	1523
09/13/02	1603	11/06/98	1406	11/09/94	1833
04/23/02	1776	05/11/98	1497	05/23/94	*4490
01/14/02	3350	11/27/97	1638	01/18/94	3090
03/22/01	1346	09/26/97	1368	06/22/93	2260
02/04/01	1510	03/27/97	1502	02/10/93	2470
10/23/00	1280	09/27/96	1265		
08/20/00	1350	03/27/96	1496		
03/03/00	1360	11/07/95	1669		

* High value for this penetration

Unit 1 Penetration MV-01 (48" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
05/03/03	5040	08/29/99	4700	01/31/96	5720
11/07/02	3820	03/14/99	855	01/11/96	2930
04/13/02	3400	09/20/98	4570	07/11/95	5580

09/23/01	1840	04/21/98	3650	04/09/95	5400
04/17/01	4050	01/16/98	4192	09/08/94	5770
01/12/01	3930	08/08/97	4700	03/08/94	5490
07/30/00	667	02/07/97	4810	12/05/93	5600
02/13/00	4400	10/05/96	5680	03/18/93	*11250
10/20/99	4280	08/16/96	5270	12/17/92	10430

* High value for this penetration

Unit 2 Penetration MV-01 (48" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
03/29/03	1122	04/16/99	714	08/18/95	20
10/10/02	1150	11/07/98	1265	02/14/95	393
04/29/02	2150	05/01/98	844	11/14/95	603
08/18/01	16	12/01/97	22	05/13/94	*9720
03/03/01	1100	08/01/97	101	03/30/94	24
10/27/00	1960	01/31/97	20	10/01/93	702
09/17/00	1375	08/16/96	34	06/21/93	766
04/02/00	289	05/01/96	38	02/26/93	703
10/17/99	217	04/06/96	28		

* High value for this penetration

Unit 1 Penetration MV-02 (48" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
03/08/03	1540	06/06/99	1009	10/10/95	998
11/06/02	5700	12/19/98	719	04/09/95	2750
09/20/02	1310	07/10/98	1180	12/08/94	877
04/05/02	975	04/21/98	3550	06/07/94	1462
10/18/01	840	10/17/97	992	12/05/93	4000
03/22/01	1092	05/09/97	1240	11/26/93	4960
10/22/00	1317	10/05/96	1305	06/18/93	635
05/06/00	893	05/30/96	1353	12/11/92	**6000
09/23/99	769	01/31/96	*99,999/1224		

* Initial failure assigned value of 99,999 - after corrective maintenance of one of the two penetration valves
(stop nut loose) value of 1224 was measured.
** High value for this penetration except for the failure on 01/31/96

Unit 2 Penetration MV-02 (48" penetration, Admin. limit of 12,500 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
03/21/03	520	04/16/99	842	11/22/96	490
10/03/02	480	04/02/99	291	05/02/96	667
04/30/02	682	03/14/99	320	04/06/96	*981
09/21/01	2	02/06/99	410	12/11/95	652
03/18/01	675	07/26/98	772	06/05/95	733
10/27/00	425	02/03/98	660	11/14/94	766
06/25/00	674	12/01/97	833	08/12/94	569
01/22/00	104	10/10/97	456	05/12/94	196
07/25/99	313	05/02/97	672	12/14/93	803

* High value for this penetration

Unit 1 Penetration MV-14 (18" penetration, Admin. limit of 15,100 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
05/10/03	200	01/21/01	209	12/13/98	339
02/14/03	235	11/18/00	330	09/20/98	298
08/30/02	689	08/06/00	317	06/27/98	295
06/09/02	260	05/12/00	279	03/24/98	295
03/16/02	290	02/19/00	195	01/09/98	219
12/23/01	326	11/28/99	1152	10/17/97	251
09/28/01	390	10/21/99	*1320	08/01/97	260
07/08/01	330	09/03/99	419	05/02/97	79
05/06/01	244	03/14/99	187	01/31/97	279

* High value for this penetration

Unit 2 Penetration MV-14 (18" penetration, Admin. limit of 15,100 SCCM) Data (Leakage is in SCCM):

Date	Leakage	Date	Leakage	Date	Leakage
06/06/03	1717	05/12/01	1735	04/23/99	1875
03/16/03	2100	02/18/01	2440	01/24/99	3000
12/21/02	2600	11/26/00	2210	11/01/98	1869
09/28/02	1650	09/03/00	1775	08/15/98	2220
07/06/02	1430	06/10/00	1730	05/10/98	2240
04/04/02	2260	03/19/00	2530	10/26/97	2720
01/20/02	2810	01/08/00	*3330	10/10/97	2010
10/27/01	1618	10/02/99	1910	07/11/97	1890
08/04/01	1560	07/11/99	1447	04/11/97	2480

* High value for this penetration