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November 29, 2000

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
Response to Request For Additional Information On River Bend License Amendment Request to permit removal of the Inclined Fuel Transfer System Blind Flange (TAC No. MA7827)

References 1) River Bend Station, Unit 1 - Request For Additional Information On River Bend License Amendment Request to permit removal of the Inclined Fuel Transfer System Blind Flange, dated March 23, 2000 (TAC No. MA7827).

File Nos.: G9.5, G9.42

RBEXEC-00-042
RBF1-00-0137
RBG-45562

Gentlemen:

By letter dated December 20, 1999, Entergy Operations, Inc. submitted License Amendment Request (LAR) 99-30, "IFTS Blind Flange". Based on your review of the submittal, a request for additional information (RAI) was issued (Reference 1).

Attachment 1 provides the information requested by reference 1. Attachment 2 is included by EOI to support Attachment 1 in response to question number 3. Attachment 3 provides supplemental information in response to questions related to the human factor review of the submittal that were discussed with the NRC per teleconference on July 13, 2000.

Commitments contained in this response are listed on the Commitment Identification Form in Attachment 4. If you have any additional questions or comments, please contact Mr. G.P. Norris at (225) 336-6391.

A001

Pursuant to 28 U.S.C.A. Section 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 29, 2000.

Very truly yours,

Randall K. Edington

R. K. Edington
Vice President, Operations
River Bend Station
Docket No. 50-458
License No. NPF-47

RKE/RJK/GPN

Attachments (4)

cc:

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Attachment 1

Response to Request For Additional Information On River Bend License Amendment Request to permit removal of the Inclined Fuel Transfer System Blind Flange (TAC No. MA7827)

This License Amendment Request is an inherently risk informed submittal. It is based on crediting the non-safety related IFTS bottom valve for providing the containment. A realistic drywell bypass is credited: the 0.1 ft^2 drywell bypass acceptance criteria of the Technical Specifications is used, vice the 1.0 ft^2 design value credited in the SAR Chapter 6.2 analyses.

As documented below and within Attachment 2, the increase in risk associated with the removal of the IFTS blind flange is very small on an instantaneous basis. The cumulative risk impact is further reduced since the blind flange would be removed for fraction of the time during the operating cycle.

Question 1:

a) Provide an analysis to show the adequacy of the water seal following an SBLOCA as discussed in the RAI; or

b) Without an adequate water seal to perform containment isolation function, it is not clear that a design basis SBLOCA without containment integrity is less severe than a design basis large break LOCA with containment integrity. Provide an analysis to demonstrate that the large break LOCA is indeed the bounding accident for the removal of the blind flange in the IFTS. If not, identify and analyze the consequences of the worst design basis accident and demonstrate compliance with General Design Criterion 54.

Response to Item 1(a):

In developing the original application, the affect of drywell bypass on containment pressure was considered. Per the Standard Review Plan, the drywell or steam bypass evaluation was deemed a "capability" evaluation rather than a design evaluation. As such, the SRP success criteria for the two events are somewhat different. Specifically, the peak containment pressure acceptance criteria for the design basis evaluation is 50% of the containment maximum design pressure, whereas the peak containment pressure acceptance criteria for the capability evaluation is 100% of the containment maximum design pressure.

While it is true that the containment pressure for some small break LOCA events with drywell leakage on the order of the design value may exceed the water seal capability, it is also expected that the drywell bypass will be considerably less than the design value of 1.0 $ft^2 A/\sqrt{K}$. This is due to Technical Specification Surveillance Requirement 3.6.5.1.3 which specifies a drywell leakage limit acceptance criteria of 10% of the design value of 1.0 $A/\sqrt{K}$. The as-tested values have been on the order of 0.01 $A/\sqrt{K}$ which is 10% of the acceptance criteria or 1% of the design value. This performance to the acceptance criteria is implicitly credited due to the inherent risk-informed nature of the RBS submittal. Thus, the expected drywell leakage is much less than the design limit, and as such the peak containment pressure will be much less than the design pressure such that the water seal capability of the IFTS tube and spent fuel pool is not challenged when the IFTS blind flange is removed.

A confirmatory evaluation was performed with the GOTHIC model of the RBS containment. The evaluation looked at a limiting break size (0.10 ft^2), with varying values for drywell leakage (0.0 $ft^2 \leq A/\sqrt{K} \leq 1.0\ ft^2$). The results of the confirmatory evaluation demonstrate with a drywell leakage at the Technical Specification "as-left" limit of 10% of the design limit ($A/\sqrt{K} < 0.10\ ft^2$), the peak containment pressure is less than the water seal capability of the IFTS tube and spent fuel pool when the IFTS blind flange is removed. This encompasses the range of expected drywell leakage values ($A/\sqrt{K} < 0.03\ ft^2$) based upon historical information. While the GOTHIC computer program is not the containment analysis program of record, the results may be used to support the conclusion that the expected leakage value would result in peak pressures in containment below the design value.

Response to Item 1(b):

As discussed in 1(a) above, the water seal will be adequate to prevent the communication of the containment environment with the Fuel Building environment. Therefore, no further response is required.

Question 2:

Following a postulated large break LOCA, the water seal in the IFTS would prevent the containment atmosphere from leaking through the IFTS. However, the water from the upper containment refueling pool could leak through the IFTS to the fuel building regardless of whether the containment atmosphere is leaking or not.

Provide information as to (a) what the impact could be resulting from water transfer under design basis LOCA conditions (large break LOCA of SBLOCA conditions with drywell bypass, whichever is worse case) from the upper containment refueling pool to the fuel building spent fuel pool with the blind flange removed and (b) whether excessive leakage through the IFTS penetration could result in overflow of the spent fuel pool. If water transfer and overflow of the spent fuel pool is possible describe the impact on the dedicated operator, equipment, and post accident radiation levels in the fuel building. This description should identify all the equipment in the fuel building that may be impacted and whether there are any controls in place to protect this equipment.

Response:

Background

Any water leakage through the Inclined Fuel Transfer System can be observed using the pool level indications and associated level alarms. In the past, during IFTS operation, the plant has taken action to identify and repair IFTS system leakage exceeding 1.5 GPM . During Refuel 8, IFTS Operators observed excessive leakage through the system when performing the IFTS PRE-OP AND WEEKLY INTERLOCK OPERABILITY TEST. During the IFTS raise sequence, after the tube was full, and prior to opening the flap valve on the top of the tube, the TUBE FULL indication extinguished after a short period of time indicating that the level in the tube had lowered due to leakage. Evaluation of that leakage determined that the IFTS bottom valve (F42-

HYVF004) was leaking approximately 1.5 GPM. Following rework, post maintenance operational leak testing indicated that bottom valve as left leakage was on the order of 0.005 GPM.

In addition, as stated in River Bend's initial LAR 1999-30 submittal, dated December 20, 1999, the IFTS drain piping motor operated isolation valve will be treated as a primary containment isolation valve. This will ensure that leakage past this valve will be maintained consistent with the leakage rate assumptions of the RBS radiological analysis. River Bend has recently installed test connections at the IFTS drain valve (F42-MOVF003) for the purpose of performing local leak rate testing of this valve. The IFTS bottom valve (F42-HVYF004) is currently within the planned local leak rate test boundary for the drain valve (F42-MOVF003). Since the IFTS bottom valve and the water seal in IFTS, together, are a boundary for the drain valve leak rate test, any bottom valve leakage would be bounded by the results of the test and would be corrected if the leak rate criteria could not be met. Although this is a test that will be performed at expected post accident containment atmosphere pressures and not hydrostatic head with the IFTS tube filled, it will ensure that gross leakage past the valve when the tube is filled and open to the upper containment pools need not be postulated.

Therefore, it is conservatively assumed that for either small or large break LOCA scenarios, leakage in excess of 1.5 GPM is not credible.

(a) In the event of post LOCA leakage from the upper to lower pool, either large or small break, the leakage would be limited to an assumed maximum of 1.5 GPM.
Under design basis accident conditions, the assumed leakage path to the fuel building is solely through the "annulus bypass" leakage. Annulus bypass leakage is a sub-portion of the containment leakage which bypasses the annulus (such as through the containment personnel air locks) and leaks into either the auxiliary or fuel buildings. As a result of Technical Specification Amendment 113, all annulus bypass leakage is now assumed to be released directly to the environment. The current design basis scenario does not consider any liquid leakage term to the fuel building following an accident. However, under design basis conditions the upper containment refueling pool would not be expected to contain any significant amount of fission products since (1) noble gases are insoluble in water and (2) a significant amount of halogens are scrubbed by the suppression pool. Also, any radioactivity contained in the liquid leakage to spent fuel pool would be diluted by the SFP itself. Based on these considerations, such a leakage path would not be a significant contributor to any off-site LOCA dose consequences.

(b) With offsite power available, high level in the lower pool can be dispositioned by pumping to either the main condenser, radwaste or the condensate storage tank via the spent fuel pool purification pumps. For the time period that off site power may not be available, the water can be siphoned by hose to the adjacent cask washdown area. RBS will stage necessary equipment to facilitate this siphoning when the blind flange is removed during power operation. The adjacent cask wash-down is a normally unused and empty area with an available capacity of about 47,000 Gal. For the assumed leakage rate, this provides a 20 day storage capacity. Per EPRI TR-110398 (Losses of Off-Site Power at US Nuclear Power Plants-Through 1997), the median duration for a LOP event is about 1 hour and the longest recorded (Turkey Point-Hurricane Andrew) was about 5.5 days. It is concluded that given the expected and maximum LOP durations, the available capacity of the adjacent cask washdown area, and the maximum postulated leakage rate, that all leakage would be contained within either the spent fuel pool or the cask washdown area. There would be negligible impact upon post accident radiation levels in the fuel building nor would there be adverse impact upon the dedicated operator stationed at the drain valve.

Question 3:

According to the submittal, the licensee indicated that the purpose of this license amendment is to remove IFTS blind flange during power operation to allow a sufficient time for the checkout of the transfer system prior to refueling; the system checkout takes several days. The proposed license amendment would allow the removal of IFTS blind flange at any time during power operation and for any length of time; i.e., 18 months between refueling outages. In light of the possibility of losing containment integrity during an SBLOCA, justify the proposed duration of 18 months without the IFTS blind flange versus the need of only several days.

Response:

A time limit for the blind flange removal was not specified in the submittal due to variable amounts of time that may be required for the checkout of the IFTS system. A system checkout may include operation, inspection, repair, and other related activity. During RF8 at River Bend, it took 14 days of around the clock activity to prepare the system to operate. In addition to the maintenance and inspections that we desire to do in Modes 1, 2 and 3, there is also a need to train and qualify our operators on the system prior to the outage. Presently we must wait until we are in Mode 4 and have the system operating before we can perform the OJT qualification for our operators. This requires the use of valuable outage time and limits the time each operator may spend operating the system to qualify and improve his overall performance. It is our intention to qualify the operator prior to the outage and operate the system to ensure a high level of proficiency on IFTS operations during the outage. We are also considering the need to operate the system during the cycle as part of a preventive maintenance program such that the system does not remain idle for a large portion of the operating cycle.

It is our goal to perform these activities as quickly as practical when the blind flange is removed because of the additional administrative and resource requirements. In addition, River Bend also plans to track the time that the IFTS blind flange is removed during Modes 1,2 and 3. We do not desire to limit the time available for performing these activities. Doing so may force us to curtail some of the activities such that we would not exceed an LCO time frame when the removal of the IFTS blind flange has an acceptable and non-risk-significant affect on the River Bend Probabilistic Safety Assessment.

The evaluation below is to demonstrate removal of the blind flange is non-risk significant. This evaluation uses core damage frequency and large early release fraction as the figures of merit. Core damage frequency (CDF) and large early release fraction (LERF) were chosen as the figures of merit based on guidance from EPRI document EPRI TR-105396, *PSA Applications*

Guide. A detailed evaluation of the affects of the IFTS blind flange removal on the River Bend PSA is provided in Attachment 2.

The removal of the blind flange affects both the Level 1 and Level 2 analysis due to the change in containment failure probability. However, a review of the Level 1 determined that the IFTS blind flange removal would not have a negative affect on the CDF at River Bend. Potential positive affects of the blind flange removal have been conservatively ignored.

The Level 2 analysis evaluated two possible IFTS system configurations. The first is the IFTS system with the blind flange removed, but the IFTS bottom valve closed. In this configuration the IFTS bottom valve effectively serves as part of the containment boundary. This is the configuration proposed in the December 20, 1999, request from River Bend.

The second configuration is the bottom valve open and the upper valve closed. In this configuration the water in the lower pool provides the containment seal, which can withstand approximately 10 psig in containment. However, since the top valve will be closed, initially the only available vent path is through the 4-inch diameter vent line. Given the small area of the vent pipe, this only represents a penetration failure not a large release path. Since at River Bend a 4-inch diameter vent path will not prevent containment pressurization, the containment could continue to pressurize until a gross failure occurs. Operation of the system is procedurally controlled, and is not operated with both valves open at the same time since this would cause the upper pool to drain into the lower pool.

The containment failure probabilities for both cases are contained in Table 1 below.

Case	LERF Freq	LERF Prob	GF Freq	GF Prob	PF Freq	PF Prob	NF Freq	NF Prob
Base Case PSA Level 1 Revision 2D	5.915E-9/yr	0.19%	1.4E-6	0.46	5.9E-7	0.19	1.1E-6	0.35
IFTS Blind Flange Removed with Both Valves Closed	1.223E-8/yr	0.39%	1.7E-6	0.55	3.0E-7	0.10	1.1E-6	0.35
IFTS Blind Flange Removed with Bottom Valve Open	1.223E-8/yr	0.39%	1.7E-6	0.55	7.6E-7	0.24	6.4E-7	0.21

Legend: GF = Gross Containment Failure
PF = Containment Penetration Failure
NF = No Failure

The most significant increase between the Revision 2D case and the IFTS cases is the increase in LERF. The LERF increases by approximately 6.1E-9/year when the blind flange is removed. The increase is due to the decrease in gross containment failure pressure. The lower gross containment failure pressure means that the less severe hydrogen burns contribute more to

LERF which increases the value of LERF. Since the 4 inch diameter vent line will not control containment pressure, venting through the top valve sheave box vent line with the bottom valve open will not prevent gross containment failure given a hydrogen burn. This is why both IFTS cases result in the same LERF frequency.

Most of the analyzed containment failure scenarios at River Bend are a result of long term pressurization events that do not affect LERF. The reduction of the containment failure pressure, due to the IFTS blind flange removal, is not large enough to move these slow pressurization events into the LERF category. The change in containment failure pressure was large enough to move some of the lower-pressure hydrogen burn scenarios into the LERF category. However, due to the low probability of the SBO and events resulting in loss of hydrogen igniters, the increase in instantaneous LERF frequency is only 6.12E-9/yr which represents an approximate 106% change in instantaneous LERF. Due to the River Bend low baseline LERF any change under a 131.5% increase is considered non-risk-significant. This is according to the methodology defined in ERPI document EPRI TR-105396, *PSA Applications Guide.* This change is also well within the 1.0E-7 criteria for LERF changes provided in Reg. Guide 1.174. The average impact on LERF over a fuel cycle is further reduced when the expected time of blind flange removal is considered.

ATTACHMENT 2

Detailed evaluation of the affects of the IFTS blind flange removal on the River Bend PSA

This attachment provides additional information in response to Question 3 of the NRC's Request for Additional Information regarding the River Bend IFTS blind flange removal submittal. The purpose of the evaluation below is to demonstrate removal of the blind flange is non-risk significant without limiting the time that the blind flange is removed. This evaluation uses core damage frequency and large early release fraction as the figures of merit.

River Bend PSA Level 1 and 2 Background Information

Figures of Merit

Core damage frequency (CDF) and large early release fraction (LERF) were chosen as the figures of merit for this evaluation based on guidance from EPRI document EPRI TR-105396, *PSA Applications Guide.* In the Level 1 analysis core damage is defined as a core maximum temperature of 2200 °F. This definition is consistent EPRI guidance. In the Level 2 analysis, sequences are considered LERF sequence if core damage and an unscrubbed release occur within the first six hours of the event, and the release path is a gross containment failure. The six-hour time frame is the assumed time required to implement the emergency response team and take protective actions up to and including area evacuations. Gross containment failures are those failures that are equal to or larger than six inches in diameter. The six-inch diameter failure is considered a gross failure since it will prevent further containment pressurization due to loss of decay heat removal. This is consistent with the definition of a large early release in EPRI TR-105396, which state that " Large is defined as a rapid, unscrubbed release of airborne aerosol fission products to the environment. Early is defined as occurring before the effective implementation of the off-site emergency response and protective actions".

Level 1 PSA – Core Damage Frequency

A fairly detailed discussion of the history and revision to the River Bend Probabilistic Safety Assessment (PSA) models is needed to fully comprehend the affect of the IFTS blind flange removal on the PSA results. River Bend recently revised its Level 2 PSA. The revision was prompted by revisions to the Level 1 PSA. Changes to the Level 1 PSA accounting for plant modifications since the IPE submittal significantly reduced the contribution of Station Blackout (SBO) events to the overall core damage frequency. In the original IPE submittal (PSA Rev. 1), SBO events made up approximately 90% of the core damage frequency. For revision 2 of the Level 1 PSA, SBO events made up only about 10% of the core damage frequency. The reduction in the importance of SBO events contributed to the reduction in overall CDF from 1.55E-5/yr to 3.55E-6/yr.

In revision 1 of the Level 1 PSA, SBO events contributed 1.3E-5/yr to the total CDF. Transient events were the next most significant event, which contributed 1.3E-6/yr to the total CDF. Loss of offsite power (LOSP) and Transient LOCA accounted for 6.7E-7/yr and 2.4E-7/yr of the CDF, respectively. In revision 2 of the Level 1 PSA, transient events were the most significant event, which contributed to 1.93E-6/yr of CDF. LOSP events were the second most important event contributing 5.67E-7/yr to the total CDF. SBO events only contributed 1.44E-7/yr to the CDF, with LOCA and transient induced LOCA accounting for the remaining 1.63E-7/yr of CDF. It can be seen that with the exception of the reduction in the SBO induced CDF, all other CDFs remain relatively consistent between revision 1 and 2 of the Level 1 PSA.

During the process of revising the Level 2 PSA model, the Level 1 model underwent several minor revisions. The major change between revision 2 and revision 2D of the Level 1 PSA was the removal of SBO-like events from the transient sequences with failure of all high and low pressure injection (TQUX and TQUV sequences). The SBO-like events were events in which the standby switchgear failed due to loss of area cooling. Failure of the standby switchgear leads to the loss of power to all safety related equipment including safety related vessel injection systems and hydrogen igniters. Subsequent more sophisticated room heat-up analysis has shown that failure of the area cooling system will not cause the failure of the standby switchgears. Removal of the SBO-like events from the TQUV sequences greatly decreased the importance of these sequences. However, the CDF frequency for TQUX sequences actually increased due to model improvements associated with the CRD and HPCS systems. These changes were significant enough to negate the positive affect on CDF of the elimination of the SBO-like events from the TQUX sequences. For revision 2, the TQUV and TQUX sequences accounted for 47.8% and 6.65% of the total core damage frequency, respectively. For revision 2D, the TQUV sequences only account for 10.01% of the total core damage frequency. However, the importance of the TQUX sequences increased to 21.20% of the CDF. The reduction in TQUV increased the importance of the TW sequences

The TW sequences are transient sequences that involve loss of containment and suppression pool cooling. Loss of these systems leads to containment failure due to overpressurization. The containment failure causes failure of the standby gas treatment system ducting, which leads to Auxiliary Building steaming. The steam in the Auxiliary Building fails the electrical switchgear and Motor Control Centers, which fails RCIC and all low pressure injection due to SRV failure. The Level 1 PRA assumed these TW sequence failures occur at approximately 26 hours into the event based on MAAP analysis. These MAAP analysis assume that the containment failure pressure is 50 psig, similar to the 53 psig containment failure pressure used in RBS Emergency Operating Procedures. The TW sequence accounted for 20.87% of the total core damage probability (CDF contribution of 7.41E-7/year) in revision 2 and 32.76% in revision 2D (CDF contribution of 1.036E-6/year). Note that not all of the increase in the TW sequence is attributed to the decrease in the TQUV sequences importance. A portion of the sequences that were considered SBO-like (loss of all service water) were moved into the TW sequences which increased the TW sequence CDF. The TW sequences are important to the Level 2 analysis in that they lead to containment failure before core damage, albeit late into the event.

Level 2 PSA – Conditional Containment Failure and LERF Probability

The reduction in total CDF and increased importance of the TW sequence had a significant affect on the Large Early Release Fraction (LERF) and the Conditional Containment Failure Probability (CCFP). Revision 0 of the Level 2 PSA in the IPE submittal has a no failure probability of 9.55E-6/yr, a penetration failure of 4.16E-6/yr, and a gross failure of 1.84E-6/yr. Given the large percent of CDF due to SBO events, the SBO events dominate both penetration and gross failure probabilities. Approximately 60% of the SBO sequences result in no containment failure. This is mainly due to the power recovery before vessel failure or before containment failure. Including all events, the Revision 0 conditional probability of no containment failure was 61.6%, the probability of penetration failure was 26.8%, and the gross failure probability was 11.6%. In the revision of the Level 2 PSA, all gross containment failure result in a Large Early Release (LERF). Therefore, the LERF probability was 11.6%.

The gross and penetration failure frequencies for revision 2 of the Level 2 analysis decreased due to the decrease in CDF. However, the reduction in these failure probabilities was not proportional to the reduction in CDF due to changes associated with the revision 2 model, such as the assumption that containment venting is a penetration failure for revision 2. The frequencies of no failure, penetration failure, and gross failure for revision 2 are 4.7E-7/yr, 1.60E-6/yr, and 1.50E-6/yr, receptively. This corresponds to a no failure probability of 13%, a probability of penetration failure of 44%, and a probability of gross failure of 43%. This shows that the reduction in CDF between Level 1 revision 1 and Level 1 revision 2 occurred primarily in the non-LERF sequences. The containment failure absolute frequencies decreased in each category.

The high probability of the containment failure given core damage (87%) is due to the dominance of the SBO-like events (TQUX and TQUV sequences) and the auxiliary building steaming events (TW sequences). Both of these events cause loss of some if not all available vessel injection systems. The loss of these injection systems is unrecoverable and most likely leads to containment failure due to overpressurization from hydrogen or loss of decay heat removal. The SBO-like events contribute heavily to LERF, since the loss of area cooling causes failure of the standby switchgears and therefore vessel injection and hydrogen igniters within the first hour. The SBO-like events account for 98% of the LERF frequency of 4.67E-7/yr. The changes to the Level 1 revision 2D affect all of the failure frequencies due to the elimination of the SBO-like events.

The probability of no containment failure, penetration failure, and gross containment failure for revision 2D of the Level 1 analysis are 1.1E-6/yr, 5.9E-7/yr and 1.4E-6/yr. This corresponds to a no failure probability of 35%, a penetration failure probability of 19% and a gross failure probability of 46%. It can be seen that the elimination of the SBO-like events significantly reduced the containment failure frequency. While approximately 64% of all core damage sequences result in containment failure, the TW sequences comprise approximately one-third of this probability.

The elimination of the SBO-like events also significantly reduced LERF. As stated earlier, the SBO-like events contributed to 98% of LERF based on Revision 2 of the Level 1 PSA. Removal of the SBO-like events leave only containment isolation failure events, containment bypass events, SBO events and events that involve loss of the hydrogen igniters in LERF. Analysis for RBS has shown there is no significant increase in containment pressure within the first 8 hours of an event, unless there is a hydrogen detonation or deflagration. Controlled hydrogen burns, loss of decay heat removal, etc. will not increase the pressure in containment enough in the first 8 hours of an event to threaten containment. Therefore, this only leaves containment isolation failure, SBO and events that include loss of hydrogen igniters which have relatively low probabilities. This can be seen in the reduced LERF frequency of 5.915E-9/yr. This corresponds to a calculated LERF probability of 0.19%.

Summary of Conditional Containment Failure Frequency

Failure	Level 1 Revision 1 with Level 2 Revision 0 (IPE)	Level 1 Revision 2 with Level 2 Revision 1	Level 1 Revision 2D with Level 2 Revision 1
No Failure	9.55E-6/yr	4.70E-7/yr	1.10E-6/yr
Penetration	4.16E-6/yr	1.60E-6/yr	5.90E-7/yr
Gross Containment	1.84E-6/yr	1.50E-6/yr	1.4E-6/yr
LERF	1.84E-6/yr	4.67E-7/yr	5.915E-9/yr

PSA Affects of IFTS Blind Flange Removal

The removal of the blind flange affects both the Level 1 and level 2 analysis due to the change in containment failure probability. Analysis has shown that the IFTS blind flange can withstand a containment pressure of at least 55 psia with the IFTS tube full. A review of the construction of the tube has also indicated that the IFTS will most likely not withstand a pressure much higher than the ultimate pressure capability of the containment structure, approximately 120 psig.

For the Level 1 analysis, a lower IFTS tube failure pressure may lower the CDF due to the dominance of the TW events. A low IFTS failure pressure could decrease the probability of the TW events, since venting of containment through the IFTS tube may prevent Auxiliary Building steaming. Therefore, to be conservative the IFTS tube is assumed to have the same failure pressure as the containment structure for the Level 1 analysis.

For the Level 2 analysis, a lower IFTS tube failure pressure reduces the mean containment penetration failure pressure and mean gross failure pressure. The lower pressures increase the conditional containment failure probabilities and the LERF probability. Therefore, to be conservative a relatively low IFTS tube failure pressure is assumed for the Level 2 analysis. The IFTS evaluation showed that the stresses were well below the allowable stresses for a containment pressure of 55 psia or 40 psig. Since the code allowable stresses are not exceeded at 40 psig, the IFTS probability at this pressure is assumed to be 0%. Based on this, the 95% nonexceedance pressure was assumed to be 50 psig. This gives a IFTS tube mean failure pressure of 62 psig. A detailed discussion of both the Level 1 and Level 2 analyses are provided below.

<u>Level 1 PSA – Core Damage Frequency</u>

Since the Auxiliary Building steaming events are a significant contributor to the Level 1 revision 2D CDF, changes to the plant that affect containment failure pressure may have a significant affect on CDF. Reviews showed that the IFTS system could have a failure pressure similar to that of containment when the lower IFTS valve is closed. However, with the bottom valve open, once the containment pressure reaches approximately 10 psig the containment will begin to vent through the fuel building. If the top IFTS valve is closed, the vent path would be through the IFTS tube via the upper valve sheave box vent. If the top valve is open or assumed failed, the vent path would be strictly through the IFTS tube. Note that interlocks exist to prevent the opening of the IFTS top valve at the same time as the IFTS bottom valve is open; having both valves open at the same time could otherwise result in the transfer of the liquid volume from the containment upper pool to the lower pool.

The size of the vent path is significant for two reasons. First, the size of the vent path determines if the release is large or small. Second, the size of the vent path determines if the vent will prevent further containment pressurization and hydrogen buildup.

With the bottom valve open and the top valve closed, the limiting area for the vent path is the sheave box vent line. The vent line is a four-inch diameter, which at River Bend will not prevent further containment pressurization due to loss of decay heat removal. Therefore, containment would continue to pressurize, albeit at a slightly slower rate, until there is a gross failure. Therefore, the TW events are not affected by the above IFTS configuration. If it is assumed that the top valve is open as well, the vent path from containment to the fuel building will be entirely through the 23-inch diameter IFTS tube. Given the large diameter of this vent path, further containment pressurization would be prevented. This scenario would have a significant affect on the Level 1 results. Since the IFTS tube vent path would vent the containment pressure at 10 psig, additional containment penetration failures would be prevented. Therefore, the Auxiliary building steaming events (TW sequences) would be eliminated significantly reducing CDF. However, the IFTS system is not operated or tested with top and bottom valves open at the same time. Therefore, scenario was not considered. Gross failure of the IFTS tube with the bottom valve closed and the top valve open would produce a vent path similar to having both valves open. This would also prevent the TW events. However the IFTS tube's construction is comparable to that of containment. For these reasons it was determined that the current Level 1 analysis is conservative and that revision to the analysis was not needed to evaluate the affect of the IFTS blind flange removal with the bottom valve closed

Level 2 PSA – Conditional Containment Failure and LERF Probability

The IFTS blind flange removal is important for the Level 2 analysis for the same reason as the Level 1 analysis, namely containment failure pressure. The Level 2 analysis looked at two possible IFTS system configurations. The first is that requested in the December 20, 1999, LAR submittal, of the IFTS system with the blind flange removed, but the IFTS bottom valve closed. In this configuration the top valve could be open, therefore, failure of the IFTS tube would be a gross containment failure. A specific fragility analysis was not performed for the IFTS tube. However, an evaluation showed that the IFTS components could with stand a containment pressure of 40 psig without exceeding the code allowable stresses. The evaluation showed that the stresses were well below the allowable stresses. Therefore, a mean failure pressure of 62 psig as assumed for the IFTS tube.

The second configuration is the lower valve open and the upper valve closed. In this configuration the water in the lower pool provides the containment seal, which can only withstand approximately 10 psig in containment. However, since the top valve will be closed, initially the only available vent path is through the 4-inch vent line. Given the small area of the vent pipe, this only represents a penetration failure vice a gross containment failure. However, since at River Bend a 4-inch diameter vent path will not prevent containment pressurization, the containment could continue to pressurize until a gross failure occurs. The system is not operated with both valves open at the same time since this would cause the upper pool to drain into the lower pool.

The containment failure probabilities are contained in Table 1 below.

Case	LERF Freq	LERF Prob	GF Freq	GF Prob	PF Freq	PF Prob	NF Freq	NF Prob
Base Case PSA Level 1 Revision 2D	5.915E-9/yr	0.19%	1.4E-6	0.46	5.9E-7	0.19	1.1E-6	0.35
IFTS Blind Flange Removed with Both Valves Closed	1.223E-8/yr	0.39%	1.7E-6	0.55	3.0E-7	0.10	1.1E-6	0.35
IFTS Blind Flange Removed with Bottom Valve Open	1.223E-8/yr	0.39%	1.7E-6	0.55	7.6E-7	0.24	6.4E-7	0.21

Legend: GF = Gross Containment Failure
PF = Containment Penetration Failure
NF = No Failure

The most significant increase between the Revision 2D case and the IFTS case is the increase in LERF. The LERF increases by approximately 6.1E-9/year when the blind flange is removed. The increase is due the decrease in gross containment failure pressure. As stated in the Revision 2D Level 2 discussion, the only contributors to the calculated LERF are containment isolation events, SBO and events that involve loss of hydrogen igniters. For these events hydrogen burns leads to relatively high containment pressure ranging from 37 psig to 107.5 psig. The lower gross containment failure pressure means that the less severe hydrogen burns contribute more to LERF which increase the value of LERF. Since a 4 inch diameter vent line will not control containment pressure, venting through the top valve sheave box vent line with the bottom valve open will not prevent gross containment failure given a hydrogen burn. This is why both IFTS cases represent the same LERF and gross containment failure frequencies.

The IFTS cases also both show an increase in the gross failure probability over the Revision 2D case. This change is due to the increased gross failure probability for the cases with the IFTS blind flange removed. The penetration failure probability for the IFTS blind flange removed and both valves closed case shows a significant decrease from the Revision 2D case. This is again due to the increased likelihood of a gross failure at lower pressures. Essentially, this means that failures that were penetration failures for the Revision 2D case are now gross failures for the case of IFTS blind flange remove with both valves closed. For the case of IFTS blind flange removed with the bottom valve open, the probability of penetration failure shows an increase over the Revision 2D case. This is due to the decrease in the failure pressure for a penetration failure to 10 psig for this case.

Due to the small calculated LERF, model completeness should be considered. Anticipated Transients Without Scram (ATWS) and Interfacing System LOCA (ISLOCA) are events that due to their nature would be expected to have a relatively high probability of Large Early Release once the core damage has occurred. However, these events were truncated in the Level 1 analysis and are not included in the calculated CCFP and LERF probability. However, due to the low probability of ATWS and ISLOCA events (< 1E-10/yr) that lead to core damage, inclusion of these events would not have a significant affect on the insights obtained through the calculated CCFP or LERF values.

Conclusion

The removal of the IFTS blind flange has an acceptable and non-risk-significant affect on the River Bend Probabilistic Safety Assessment. The removal of the blind flange potentially lowers the pressure for both penetration failure and gross containment failure. This lower failure pressure may have a potential positive affect on the Level 1 analysis, since it could reduce or eliminate the Auxiliary Building steaming events (TW sequences). This is due to the fact that if the IFTS tube failed before the other containment penetrations or containment shell, the containment atmosphere would vent to the Fuel Building. The pressure relief provided by the venting through the IFTS tube, could prevent additional containment failures, thus preventing the TW events from occurring. The elimination or reduction of the TW events would have a significant affect on the total CDF since these events account for over 30% of the total CDF. However, as discussed above for the Level 1 analysis the IFTS tube failure pressure was conservatively assumed to be equal that of containment. Therefore, it is conservatively assumed there is no affect on the CDF due to removal of the IFTS blind flange. The lower assumed IFTS failure pressure does affect LERF.

Most of the analyzed containment failure scenarios at River Bend are a result of long term pressurization events that do not affect LERF. The reduction of the containment failure due to the IFTS blind flange removed, is not large enough to move these slow pressurization events into the LERF category. The change in containment failure pressure was large enough to move some of the lower-pressure hydrogen burn scenarios into the LERF category. However, due to the low probability of the SBO and events resulting in loss of hydrogen igniters, the increase in LERF frequency is only 6.12E-9/yr which represents an approximate 106% change in LERF. Due the River Bend low baseline LERF any change under a 131.5% increase is considered non-risk-significant. This is according to the methodology defined in ERPI document EPRI TR-105396, *PSA Applications Guide.* This change is also well within the 1.0E-7 criteria for LERF changes provided in Reg. Guide 1.174.

Further, consistent with performance-based approaches to Risk-Informed Regulations, the time that the blind flange would be removed would be tracked and would only be a small fraction of the time River Bend operates at power. For an 18-month operating cycle with a 1-month assumed outage duration, the change in LERF is reduced by a factor of 17 from 6.12E-9/yr to 3.6E-10/yr. The change in penetration and gross containment failure frequencies would also be reduced by the same factor given the assumptions above. This further reduces the risk significance of removal of the IFTS blind flange.

Attachment 3

Supplemental Human Factor information

The following supplemental information is provided in response to questions discussed with the NRC per teleconference on July 13, 2000, related to the human factor review of the submittal.

Those questions are:

How long is the dedicated operator expected to be on location?

During applicability of the Technical Specification, a dedicated operator(s) will be in position any time that the blind flange is removed and the IFTS drain line is not isolated.

A designated operator(s) will remain in position until either a drain valve is closed and will remain closed for an extended period of time, or until the unit is no longer in the applicable condition (Mode 1,2,3).

Rotation of the dedicated operator(s) will be scheduled periodically to minimize fatigue and to help ensure their attentiveness.

Description of the communications link to the main control room.

RBS intends to utilize the communications equipment that is used for maintaining continuous communication with the control room during refueling operations. This system consists of base stations and wireless communication headsets. The dedicated operator will also have access to the plant gaitronics (intercom system) and telephones that are located in the immediate area.

Description of the environment where the dedicated operator will be located (e.g. temperature, humidity, noise level, lighting, radiation).

The location where the dedicated operator is to be stationed is at the bottom floor (70 ft. elevation) of the Fuel Building. This area is served by the Fuel Building Ventilation system, which maintains a moderate temperature typically in the range of 70 to 85 degrees. The waiting area has low to moderate noise levels and is well lit with normal area lighting. The general area where the operator is to be stationed is typically non-contaminated with low dose rates (< 2 mR/hr).

Emergency lighting levels at the location of the dedicated operator:

Emergency lights are installed which light exit areas to the east and southwest of the IFTS drain tank and also in the hallway area to the north where the dedicated operator will be stationed. It was found that the emergency lighting levels on the valve platform are less than desired. Therefore, River Bend will install additional emergency lighting prior to removing the IFTS Blind Flange in Mode 1,2 or 3, in order to provide adequate illumination of the IFTS drain valve platform in the event that any loss of normal power occurs. The dedicated operator will also be provided with portable lighting or flashlight.

Description of the individual manipulations necessary to isolate the valve(s):

The dedicated operator will be stationed in a low dose area, which is behind a concrete wall (not in line of sight), away from the IFTS drain tank. The dedicated operator will remain in continuous contact with the Control Room and the IFTS Operator at the control panel on the Fuel Building 113 ft. elevation. Upon notification to manually close the valve, the operator will proceed to the IFTS drain valve, which is approximately 30 feet from the waiting area located on a valve platform. The operator will then engage the MOV handwheel by depressing a lever and then rotate the handwheel to close the valve.

ATTACHMENT 4

Commitment Identification Form

COMMITMENT	ONE-TIME ACTION*	CONTINUING COMPLIANCE*
When the IFTS blind flange is removed during power operations, RBS will stage necessary equipment to facilitate the siphoning of water from the Spent Fuel Pool into the adjacent cask washdown area in the event that leakage through the IFTS system occurs and offsite power is not available.		X
River Bend will track the time that the IFTS blind flange is removed during Modes 1,2,3.		X
River Bend will install additional emergency lighting prior to removing the IFTS Blind Flange in Mode 1,2 or 3, in order to provide adequate illumination of the IFTS drain valve platform in the event that any loss of normal power occurs.		X

*Check one only