Florida Power & Light Company, P. O. Box 14000, Juno Beach, FL 33408-0420

FPL

APR - 2 2002

L-2002-061
10 CFR 50.54(f)

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to NRC Bulletin 2002-01
Reactor Pressure Vessel Head Degradation and Reactor
Coolant Pressure Boundary Integrity

On March 18, 2002, the NRC issued Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity." FPL hereby supplies the information requested within 15 days and 60 days of issuance of the Bulletin.

Attachment 1 provides the St. Lucie response and Attachment 2 provides the Turkey Point response to the Bulletin. In addition, Attachment 2 provides results of the recently completed Turkey Point Unit 4 inspection of the reactor pressure vessel head, and satisfies the information requested for 30 days after plant restart following the next inspection.

FPL has completed bare metal visual inspections of Turkey Point Units 3 and 4 and St. Lucie Unit 2. The results show that the reactor vessel heads are free of any leakage coming from the reactor vessel head penetrations at each unit. In addition, no boron accumulations were identified. St. Lucie Unit 1 is scheduled for a bare metal head visual inspection in the Fall of 2002. The FPL administered Boric Acid Wastage Surveillance Program and FPL's heightened awareness of the adverse effects of boric acid leakage on carbon steel surfaces provide reasonable assurance that leakage would be detected on the reactor vessel head long before degradation of any significance could occur.

The attached information is provided pursuant to the requirements of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f).

Should there be any questions on this response, please contact us.

Very truly yours,

J. A. Stall
Senior Vice President, Nuclear
and Chief Nuclear Officer

Attachments

cc: Regional Administrator, Region II, USNRC

A095

STATE OF FLORIDA)
)ss.
COUNTY OF PALM BEACH)

J. A. Stall being first duly sworn, deposes and says:

That he is Senior Vice President, Nuclear and Chief Nuclear Officer, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

J. A. Stall

Subscribed and sworn to before me this

2 day of APRIL, 2002,

Roberta S. Economy

Name of Notary Public (Type or Print)

Roberta S. Economy
MY COMMISSION # DD007295 EXPIRES
June 1, 2005
BONDED THRU TROY FAIN INSURANCE, INC.

J.A. Stall is personally known to me.

ATTACHMENT 1

Bulletin 2002-01 Response for St. Lucie Units 1 and 2

On March 18, 2002, the NRC issued Bulletin 2002-01[1], "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity." The Bulletin requests licensees to provide (1) information related to the integrity of the reactor coolant pressure boundary including the reactor pressure vessel head and the extent to which inspection and maintenance programs have been undertaken to satisfy applicable regulatory requirements, and (2) the basis for concluding that plants satisfy applicable regulatory requirements related to the structural integrity of the reactor coolant pressure boundary and future inspections will ensure continued compliance with applicable regulatory requirements.

Florida Power and Light Company (FPL) hereby supplies the information requested within 15 days and 60 days of the Bulletin with respect to St. Lucie Units 1 and 2.

NRC Question 1: *Within 15 days of the date of this bulletin, all PWR addressees are required to provide the following:*

A. *a summary of the reactor pressure vessel head inspection and maintenance programs that have been implemented at your plant,*

FPL Response to NRC Question 1.A: A summary of inspection and maintenance programs for the St. Lucie Units 1 and 2 reactor pressure vessel heads is as follows:

St. Lucie Unit 2 has completed its bare metal "effective" visual inspection that FPL committed to in the response to NRC Bulletin 2001-01[2, 3, 4]. The inspection of the top of the reactor vessel head surface and 360° around the 102 reactor vessel head penetrations was completed in December of 2001. Access under the metal encased blanket insulation was achieved through access holes in the reactor vessel head cooling shroud and insulation. This allowed access to all the reactor vessel head penetrations including the head vent line. The inspection was conducted visually with the aid of a remote video camera to look for any signs of boric acid leakage. The video inspection revealed limited debris on the reactor vessel head with no boron accumulations or boron deposits around the penetrations as defined by the experience at Oconee and ANO as referenced by EPRI[5]. After the initial inspection, those locations with limited debris were revisited and the debris was removed or relocated to ensure a full view of each penetration. No evidence of boric acid wastage was observed during the inspection. The top of the reactor pressure vessel head inspection provided reasonable assurance that boric acid wastage would be identified prior to posing an undue risk. In addition, the Boric Acid Wastage Surveillance Program (described below) has not identified any leakage on the St. Lucie Unit 2 reactor vessel head since this bare metal inspection was performed in December of 2001.

St. Lucie Unit 1 has not yet performed the 100% visual bare head inspection as identified in the response to NRC Bulletin 2001-01[3,4]. However, FPL routinely inspects the general reactor pressure vessel head area during planned and unplanned outages as outlined in the Boric Acid Wastage Surveillance Program described below.

In April of 2001, prior to restarting from a refueling outage at St. Lucie Unit 1, the NRC alerted the industry of concerns regarding the potential generic implications of the reactor vessel head penetration cracking at Oconee Nuclear Station Unit 3[6]. A proactive visual

inspection of the accessible bare head surface around two peripheral head penetrations was performed and a special pre-inspection briefing was held with the inspectors performing leak inspection (as part of the Boric Acid Wastage Surveillance Program described below) of the St. Lucie Unit 1 reactor vessel head area at normal operating temperature and pressure, prior to returning to service. No evidence of leakage on the head was identified.

In November of 2001, during an unscheduled outage at St. Lucie Unit 1, personnel performed a walk down of the Unit 1 reactor vessel head area to look for interferences or restrictions that could hamper the planned Fall 2002 inspection of the reactor vessel head area around the head penetrations identified in the St. Lucie response to NRC Bulletin 2001-01 [3,4]. The area inside the reactor vessel head cooling shroud was viewed and insulation around several peripheral ICI penetrations was moved to view limited portions of the bare reactor vessel head. The areas of the walk down inspection were photographed for future job planning. No evidence of boric acid accumulation on the reactor vessel head or head insulation was identified.

St. Lucie Unit 1 is scheduled to shut down for a refueling outage in September of 2002. During this outage, a complete bare metal efective visual inspection of the reactor vessel head is planned around the 78 reactor vessel head penetrations as committed to in the FPL response to NRC Bulletin 2001-01 [3,4]. Access will be made to allow a direct visual or remote camera-aided examination, looking for any signs of boric acid leakage. The results of that inspection will be reported, as requested in NRC Bulletin 2002-01.

A summary of the Boric Acid Wastage Surveillance Program is provided below:

As required by NRC Generic Letter 88-05[7],"Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," FPL developed the Boric Acid Wastage Surveillance Program for St. Lucie Units 1 and 2. This program addressed the generic letter program requirements including: (1) the determination of principal locations where coolant leaks smaller than allowable specification limits could cause degradation of the pressure boundary by boric acid corrosion, (2) methods for conducting examinations that are integrated into VT-2 exams conducted during system pressure tests, and (3) corrective actions to prevent recurrences of this type of leakage. As a result of FPL's first hand experience with a reactor vessel head leak at Turkey Point Unit 4[8], FPL has maintained a heightened awareness of the adverse effects of boric acid leakage on carbon steel surfaces and has taken significant steps to prevent the recurrence of this type of problem.

The Boric Acid Wastage Surveillance Program at St. Lucie Units 1 and 2 was implemented utilizing the plant procedures described below:

An operating procedure for Reactor Coolant System (RCS) visual inspection is conducted at the beginning of refueling outages and for all heatups prior to entering Mode 2. These procedures identify the specific areas to perform inspections including the reactor vessel head area (above the insulation), reactor vessel head o-ring seating surface, reactor coolant gas vent system, control rod drive mechanisms, ICI flanges and the general area around the reactor vessel. These inspections support technical specifications and ASME Section XI requirements, and are also used to meet post maintenance testing requirements. These procedures also contain the specific locations of all the small bore alloy 600 nozzles in the pressurizer and RCS loop piping and the conditions for inspecting these locations.

An operating procedure is used for monitoring RCS leakage and recording the data on surveillance data sheets. This procedure specifies that RCS leakage calculations are performed by control room operators once per day. Leakage in excess of 1.0 gpm requires

investigation by procedure. By practice, any increasing trend in RCS leakage, well below this limit, is evaluated.

Supplemental procedures, which are also credited for this program, include:

An operating procedure for performing RCS ASME leakage tests which establishes the requirements and acceptance criteria for the performance of pressure tests under which VT-2 visual examinations are conducted per ASME Section XI.

An operating procedure for performing ASME Section XI pressure tests for Class 2 & 3 systems establishes the requirements and acceptance criteria for the performance of pressure tests under which VT-2 visual examinations are conducted per ASME Section XI.

An operating procedure for performing reactor auxiliary building fluid systems periodic leak tests is used to inspect for leakage from designated piping systems outside containment every 18 months. The systems and components inspected are: Safety Injection System (Units 1 & 2), Containment Spray System (Units 1 & 2), Post Accident Sampling System (Units 1 & 2), and Reactor Drain Tank outlet piping (Unit 1).

An administrative procedure for Condition Reports is used to document non-conformances and conditions adverse to quality, such as significant material loss due to boric acid corrosion resulting from system leakage. This procedure requires determination of probable cause, corrective actions and actions to prevent recurrence.

In addition to the above program, FPL also has a Nuclear Division Policy that requires the nuclear plant Site Vice President to personally review and approve any return to operation of a unit with known leakage from the reactor coolant system. The policy recognizes that plant technical specifications are bounding, and will ensure that structures, systems and components important to safety are in proper working order for safe operation. However, the policy provides additional guidance and consideration to ensure maximum unit reliability by avoiding operation of the plant where there is a high likelihood of a future forced shutdown. This policy was implemented to ensure that the circumstances that occurred at Turkey Point Unit 4 in 1987[8] are not repeated.

NRC Question 1.B: *an evaluation of the ability of your inspection and maintenance programs to identify degradation of the reactor pressure vessel head including, thinning, pitting, or other forms of degradation such as the degradation of the reactor pressure vessel head observed at Davis-Besse,*

FPL Response to NRC Question 1.B: The inspections and Boric Acid Wastage Surveillance Program described in the response to 1.A. above, are effective at identifying leakage that could cause degradation to the reactor coolant system (RCS), including the reactor vessel head surface, due to boric acid corrosion. The Boric Acid Wastage Surveillance Program has been effective at identifying leaks from small bore alloy 600 instrument nozzles in the pressurizer and reactor coolant system (RCS) piping. This program has identified leakage from alloy 600 locations in the pressurizer in 1993 and 1994 at St. Lucie Unit 2, and the RCS hot leg piping in St. Lucie Unit 2 in 1995 and St. Lucie Unit 1 in 2001. In each case the leakage was identified before any measurable boric acid wastage could occur, repairs were implemented, and the integrity of the RCS pressure boundary was restored.

A comparison between the Davis-Besse and St. Lucie reactor vessel head design and FPL's past experience provides reasonable assurance that the implementation of the inspection program at St. Lucie would have identified this type of leakage before the degradation observed at Davis-Besse could have occurred.

Davis-Besse design features and operating details:

- The B&W designed Davis-Besse unit uses a flanged and gasketed connection for all 69 of its CRDM penetrations. These connections have had recurring leaks unlike the St. Lucie design.

- Davis-Besse reportedly identified leaks on top of their reactor vessel head during their 1998 and 2000 refueling outages as noted in NRC Information Notice IN 2002-11[9]. The leaks were concluded to be coming from the gasket connections of multiple CRDMs. Davis-Besse performed a limited cleanup of the reactor vessel head at that time. No equivalent above the head leakage has been identified at St. Lucie Units 1 and 2.

- IN 2002-11 indicated that a review of the Davis-Besse videotapes of the 1998 and 2000 inspections revealed "no evidence of leakage from RPV head nozzles, although many areas of the RPV head were not accessible because of persistent boric acid deposits that the licensee did not clean because of ALARA issues (including the region around nozzle 3)." This confirms that boric acid accumulation on the reactor vessel head surface was present at Davis-Besse for multiple cycles of operation.

- Davis-Besse was ranked as having high susceptibility to Primary Water Stress Corrosion Cracking (PWSCC) with 3.1 effective full power years (EFPYs) from the benchmarked Oconee Unit 3 plant in the industry response to NRC Bulletin 2001-01[10].

St. Lucie design features and operating details:

- St. Lucie Units 1 and 2 each use threaded and seal welded connections for the control element drive mechanism (CEDM) housings (69 for Unit 1 and 91 for Unit 2) that are mounted on the reactor vessel head penetrations. The CEDMs have a mechanical vent assembly at the top but these connections are essentially leak free and therefore any boric acid accumulation from these locations is an abnormal condition. The Incore Instrumentation (ICI) penetrations (8 for St. Lucie Unit 1 and 10 for St Lucie Unit 2) have been replaced on both units with a Quickloc design that utilizes a grafoil seal. Due to these design features, leakage from these connections to the reactor vessel head surface is unlikely. However, any leakage would be reported and dispositioned in accordance with the St. Lucie corrective action program.

- The FPL staff at St. Lucie has maintained a heightened awareness of the potential for degradation from boric acid leakage on carbon steel components including the reactor vessel head due to FPL's experience with leakage at Turkey Point[8] in 1987. This heightened awareness and an effective Boric Acid Wastage Surveillance Program has resulted in leakage being quickly detected from small bore alloy 600 instrument penetrations in the pressurizer in 1993 and 1994 at St. Lucie Unit 2, and the RCS hot leg piping in St. Lucie Unit 2 in 1995 and St. Lucie Unit 1 in 2001. In all cases at St. Lucie, the leakage was identified and the nozzles were replaced before any measurable degradation to the carbon steel surface could occur.

- The area at the ICI assemblies and some adjacent CEDM housings inside the shroud down to the top of the close fitting RV head insulation is visible at every refueling outage during the disassembly of the ICI connections prior to head lift. This general area is also inspected for leaks at startup per an operating procedure, as part of the Boric Acid Wastage Surveillance Program described above.

- Two recent walk down inspections of the area on top of the St. Lucie Unit 1 reactor vessel head, including some accessible bare metal surfaces were conducted in April and November of 2001 with no indication of boric acid accumulation identified.

- St. Lucie Units 1 and 2 were both closely ranked as having moderate susceptibility to PWSCC with 10.3 and 11.3 EFPYs respectively, from the benchmarked Oconee Unit 3 plant, in the industry response to NRC Bulletin 2001-01[10]. St. Lucie Unit 2 has already completed its bare metal inspection of reactor vessel head penetrations and the findings showed no leakage or boric acid accumulations as identified in the response to question 1.A.

Based on the design of CEDM connections to the reactor vessel head penetrations at St. Lucie Units 1 and 2, the potential for leakage from above the reactor vessel head is greatly reduced as compared to Davis-Besse. Both St. Lucie Unit 1 and 2 are similarly ranked as being moderately susceptible to PWSCC in the industry response to NRC Bulletin 2001-01 and the results from the St. Lucie Unit 2 inspection showed no evidence of leakage. Additionally, the FPL administered Boric Acid Wastage Surveillance Program and FPL's heightened awareness of the adverse effects of boric acid leakage on carbon steel surfaces provide reasonable assurance that leakage would be detected on the reactor vessel head long before degradation similar to that detected at Davis-Besse could occur.

NRC Question 1.C: *a description of any condition identified (chemical deposits, head degradation) through the inspection and maintenance programs described in 1.A. that could have led to degradation and the corrective actions taken to address such conditions,*

FPL Response to NRC Question 1.C: In December of 2001, St. Lucie Unit 2 completed a bare metal reactor vessel head inspection as identified in Question 1.A above. The results of that inspection revealed a head that was free of any degraded condition resulting from the prior years of service. In addition, the Boric Acid Wastage Surveillance Program (described above in the response to Question 1.A) has not identified any leakage on the St. Lucie Unit 2 reactor vessel head since this bare metal inspection was performed in December of 2001.

A review of historical events did not identify any previous degradation on the St. Lucie Unit 1 reactor vessel head. A complete inspection of the St. Lucie Unit 1 head will be completed in the Fall of 2002 as identified in the St. Lucie response to NRC Bulletin 2001-01 [3,4].

St. Lucie Unit 1 has had the following leaks identified on or in the vicinity of the reactor vessel head. None of the events identified below in 1978, 1995, 1996, 1999, or 2001 resulted in any measurable degradation to the reactor vessel and any boric acid accumulation has been removed. The details of these events are described below.

In November of 1978[11], while Unit 1 was shutdown during an unplanned maintenance outage, 2000 gallons of reactor coolant system (RCS) water containing boric acid was released into containment from the containment spray system. The area most susceptible to effects from the spray is the 62 foot elevation (highest floor elevation). Although the

reactor vessel head is accessible from the 62-foot elevation, it was protected from direct spray by the missile shield and as a result, essentially no boric acid accumulation on the reactor vessel head could have occurred. In addition, since the spray event occurred during shutdown, there is no mechanism to concentrate the low level of boric acid contained in the water spray. A cleanup and investigation of plant equipment inside containment showed no damage as a result of the spray down.

In August of 1995[12], while starting up, the Unit 1 containment spray system was inadvertently initiated which resulted in a spray-down of containment with approximately 10,000 gallons containing 180 lbs. of boric acid. The event occurred in a very short time (approximately 3 minutes) and most all of the water was recovered in the containment sump (Approximately 1000 gallons remained due to drying action and pooling). The area most susceptible to effects from the spray is the 62 foot elevation (highest floor elevation) and above. Although the reactor vessel head is accessible from the 62-foot elevation, it was protected from direct spray by the missile shield and as a result, essentially no boric acid accumulation on the reactor vessel head could have occurred. The unit startup was suspended and a cleanup of containment was performed to eliminate standing borated water. Additionally some systems were rinsed with low chloride water to further reduce boric acid surface concentration. An evaluation was performed to show that the uniform distribution of boric acid would result in essentially no corrosion degradation to the carbon steel systems.

In May of 1996, during the Unit 1 refueling outage that followed the 1995 spray-down event, inspection of the reactor vessel flange and area adjacent to the reactor vessel closure studs revealed metallic and non-metallic debris and brownish rust colored particles on the flange surface. The debris was concluded to have been washed from under the insulation, possibly from the prior containment spray event and clean water cleanup. Since the debris was rust colored, it was concluded not to have been the result of boric acid accumulation or a leak from the reactor coolant system. The debris was cleaned from the reactor vessel head flange area. During the 1997 refueling outage the reactor vessel head flange area was abrasively blasted and coated to prevent potential rust particles from affecting the reactor vessel o-ring sealing surface. No degradation to the reactor vessel head flange surface was noted during this effort.

In September of 1999, during refueling at Unit 1, leakage was noted at one of the five mechanical Swagelok nuts that seal the incore instrumentation (ICI) detectors on the #1 ICI penetration assembly and the castle nut on the heated junction thermocouple (HJTC) flange. The leakage noted was minor and the boric acid buildup was confined to one Swagelok nut on the flange surface and the HJTC flange. No boric acid accumulation was noted on the reactor vessel head surface. The accumulation was removed from the stainless steel flanges and an inservice leak check was performed at plant startup to verify the mechanical joint was leak free.

In April of 2001, while raising water level in the RCS following a refueling outage at Unit 1, leakage was noted from several of the incore instrumentation (ICI) flange mechanical Quickloc nuts on the reactor vessel head under static water pressure conditions. The cause of the leaks was attributed to improperly installing the Quickloc compression nut on the compression collar. The nuts were properly installed and the leaks stopped. Since the unit was in cold shutdown, no boric acid accumulation resulted from the leaks and no degradation occurred. A cleaning of the ICI flanges was performed as part of the reinstallation. A final leak check was performed at operating pressure prior to startup and the mechanical Quickloc joints were determined to be leak free.

NRC Question 1.D: *your schedule, plans, and basis for future inspections of the reactor pressure vessel head and penetration nozzles. This should include the inspection method(s), scope, frequency, qualification requirements, and acceptance criteria,*

FPL Response to NRC Question 1.D: FPL committed to perform inspections in response to NRC Bulletin 2001-01. St. Lucie Unit 2 completed a remote visual bare metal inspection (VT-2) of the reactor vessel head in December of 2001. The findings showed no leakage or boric acid accumulations were present as identified in the response to question 1.A. St. Lucie Unit 1 will perform a similar inspection, as defined in the FPL response to Bulletin 2001-01 [3,4] during its Fall 2002 refueling outage (SL1-18).

For subsequent inspections, FPL is planning to follow the guidance that will be supplied by the ASME Boiler and Pressure Vessel Code, Section XI. An ASME task group, on Alloy 600/182 cracking, is preparing recommendations on reactor vessel head examinations for the Main Section XI Committee for incorporation into the ASME Code. This work should be complete by the end of 2002. All aspects of inspection such as methods, scope, frequency, qualification requirements, and acceptance criteria will be addressed. FPL has representation at these meetings and will continue to participate.

FPL is also a member of the EPRI Material Reliability Program (MRP) which is tasked with following this issue and providing recommendations to assure safe operation and integrity of the reactor coolant pressure boundary.

NRC Question 1.E: *your conclusion regarding whether there is reasonable assurance that regulatory requirements are currently being met (see the Applicable Regulatory Requirements, above [include GDC 14, GDC 31, and GDC 32]). This discussion should also explain your basis for concluding that the inspections discussed in response to Item 1.D will provide reasonable assurance that these regulatory requirements will continue to be met.*

Include the following specific information in this discussion:

(1) *If your evaluation does not support the conclusion that there is reasonable assurance that regulatory requirements are being met, discuss your plans for plant shutdown and inspection.*

(2) *If your evaluation supports the conclusion that there is reasonable assurance that regulatory requirements are being met, provide your basis for concluding that all regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.*

FPL Response to NRC Question 1.E: Based on the information provided in this letter, FPL concludes that there is reasonable assurance that both St. Lucie Units 1 and 2 are in compliance with applicable regulatory requirements and current licensing basis.

FPL completed a bare metal reactor vessel head inspection on Unit 2 in December of 2001. FPL routinely inspects the reactor pressure vessel head area during planned and unplanned outages of both St. Lucie Units 1 and 2. St. Lucie Unit 1 will receive a bare metal reactor vessel head inspection in the Fall 2002 refueling outage (SL1-18) as identified in the FPL response to NRC Bulletin 2001-01[3,4]. These inspections supply required information on the current condition. The cause of any leakage found will be repaired and any boric acid accumulation, if present, will be removed. St. Lucie has a robust Boric Acid Wastage Surveillance Program, which is based on a series of plant specific implementing procedures.

This program has effectively identified leakage in the past, and requires documentation and corrective action. St. Lucie, unlike Davis-Besse, does not have gasketed mechanical joints on the CEDMs and therefore, leakage from above the reactor vessel head would be an unexpected event.

The technical basis for concluding that the regulatory bases are met for St. Lucie Units 1 and 2 is provided in the Regulatory Requirements Section of MRP-48[10].

NRC Question 2: *Within 30 days after plant restart following the next inspection of the reactor pressure vessel head to identify any degradation, all PWR addressees are required to submit to the NRC the following information:*

A. the inspection scope (if different than that provided in response to Item 1.D.) and results, including the location, size, and nature of any degradation detected,

B. the corrective actions taken and the root cause of the degradation.

FPL Response to NRC Question 2: The requested information will be provided within 30 days following the St. Lucie Unit 1 Fall 2002 refueling outage (SL1-18). The information for the St. Lucie Unit 2 inspection that was completed in December of 2001 is summarized in the response to Question 1.A.

NRC Question 3: *Within 60 days of the date of this bulletin, all PWR addressees are required to submit to the NRC the following information related to the remainder of the reactor coolant pressure boundary:*

A. *the basis for concluding that your boric acid inspection program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this bulletin. If a documented basis does not exist, provide your plans, if any, for a review of your programs.*

FPL Response to NRC Question 3: The current Boric Acid Wastage Surveillance Program described above, already includes within its scope, the remainder of the reactor coolant pressure boundary components inside containment that could be affected by boric acid wastage degradation. FPL recently evaluated this program and concluded that there is reasonable assurance that the Boric Acid Wastage Surveillance Program will adequately manage the aging effects of various components, including the reactor vessel heads, susceptible to the corrosive element of boric acid in accordance with the current licensing basis. FPL has again reviewed the Boric Acid Wastage Surveillance Program along with the information from the Davis-Besse event and has determined that the above conclusions are still valid.

Accordingly, the St. Lucie Boric Acid Wastage Surveillance Program provides reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this Bulletin.

[1] NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," March 18, 2002.

[2] NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," August 3, 2001.

[3] FPL letter L-2001-198, "St. Lucie Units 1 and 2 and Turkey Point Units 3 and 4, Docket Nos. 50-335, 50-389, 50-250 and 50-251, Response to NRC Bulletin 2001-01, " R. S. Kundalkar to NRC, September 4, 2001.

[4] FPL letter L-2001-247, "St. Lucie Units 1 and 2, Docket Nos. 50-335 and 50-389, Supplemental Response to NRC Bulletin 2001-01, " R. S. Kundalkar to NRC, November 1, 2001.

[5] "Visual Examination for Leakage of PWR Reactor Head Penetrations," Electric Power Research Institute (EPRI) NDE Center, Charlotte, NC: 2001. 1006296, August 2001.

[6] NRC Letter, Project No. 689, "Issues to be Addressed in a Generic Justification for Continued Operation for PWRs," From Brian W. Sheron (NRC) to Alex Marion (Nuclear Energy Institute), April 17, 2001.

[7] NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," March 17, 1988.

[8] FPL Letter L-87-186, "Turkey Point Unit 4, Docket No. 50-251, Report on Instrument Port Column Assembly Leakage," C.O. Woody to NRC, April 27, 1987.

[9] NRC Information Notice 2002-11, "Recent Experience with Degradation of Reactor Pressure Vessel Head," March 12, 2002.

[10] "PWR Material Reliability Program Response to NRC Bulletin 2001-01 (MRP-48)," Electric Power Research Institute (EPRI) NDE Center, Palo Alto, CA: 2001. 1006284, August 2001.

[11] FPL letter PRN-LI-78-334, "Reportable Occurrence 335-78-41, St. Lucie Unit 1, Date of Occurrence: November 3, 1978, Technical Specification 3.4.1, Shutdown Cooling Flow/Containment Spray," A. D. Schmidt to NRC, November 17, 1978.

[12] FPL letter L-95-242, "St. Lucie Unit 1 Docket No. 50-335 Reportable Event: 95-007 Date of Event: August 17, 1995, Inadvertent Containment Spray via 1A Low Pressure Safety Injection Pump while Venting the Emergency Core Cooling System During Startup due to Inadequate Procedure," D. A. Sager to NRC, August 27, 1995.

ATTACHMENT 2

Bulletin 2002-01 Response for Turkey Point Units 3 and 4

On March 18, 2002, the NRC issued Bulletin 2002-01[1], "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity." The Bulletin requests licensees to provide (1) information related to the integrity of the reactor coolant pressure boundary including the reactor pressure vessel head and the extent to which inspection and maintenance programs have been undertaken to satisfy applicable regulatory requirements, and (2) the basis for concluding that plants satisfy applicable regulatory requirements related to the structural integrity of the reactor coolant pressure boundary and future inspections will ensure continued compliance with applicable regulatory requirements.

Florida Power and Light Company (FPL) hereby supplies the information requested within 15 days and 60 days of the Bulletin with respect to Turkey Point Units 3 and 4, and the 30 day response for Turkey Point Unit 4.

FPL committed to perform bare metal "qualified" visual inspections of Turkey Point Units 3 and 4 in the response to NRC Bulletin 2001-01[2, 3]. Those inspections are complete, and the results show that the reactor vessel heads are free of any leakage coming from the 66 reactor vessel head penetrations at each unit. The detailed scope and results of each inspection is provided in the response to Question 1.C.

NRC Question 1: *Within 15 days of the date of this bulletin, all PWR addressees are required to provide the following:*

A. *a summary of the reactor pressure vessel head inspection and maintenance programs that have been implemented at your plant,*

> **FPL Response to NRC Question 1.A:** A summary of the Boric Acid Wastage Surveillance Program for the Turkey Point Units 3 and 4 reactor pressure vessel heads and other components inside containment is as follows:
>
> Turkey Point Units 3 and 4 implemented a Boric Acid Wastage Surveillance Program following the discovery of boric acid leakage on the Unit 4 reactor vessel head in 1987[4]. This event was one of the precursors to the issuance of NRC Generic Letter 88-05[5], "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants." As a result, FPL has maintained a heightened awareness of the adverse effects of boric acid leakage on carbon steel surfaces and has taken significant steps to prevent the recurrence of this type of problem. Additional details of the Boric Acid Wastage Surveillance Program were provided in the FPL response[6] to NRC Generic Letter 88-05. FPL's program addressed the generic letter program requirements including: (1) the determination of principal locations where coolant leaks smaller than allowable specification limits could cause degradation of the pressure boundary by boric acid corrosion, (2) methods for conducting examinations that are integrated into VT-2 exams conducted during system pressure tests, and (3) corrective actions to prevent recurrences of this type of leakage.
>
> The Boric Acid Wastage Surveillance Program was implemented using the various plant procedures described below:

An operating procedure calls for visual inspection of the reactor head area whenever the plant is taken from Mode 2 to Mode 3 (prior to re-entry into Mode 2) if an inspection has not been performed in the last 30 days. Specifically, the area inside the reactor vessel head shroud and CRDMs is accessed through 3 panels that were cut into the shroud to allow more complete visual access. This procedure also provides for inspection of systems for boric acid leakage, and structural distress or corrosion ofsystems or components located inside containment, due to boric acid.

An operations surveillance procedure for Reactor Coolant System (RCS) overpressure leak testing is used to establish conditions and hold times required to perform testing (visual inspections) for verification of RCS integrity following each refueling outage. These inspections support technical specifications and ASME Section XI requirements, and are also used to meet post maintenance testing requirements.

An operations surveillance procedure for performing RCS leak rate calculations is performed by control room operators each day. This procedure is performed to monitor reactor coolant system leakage. Leakage in excess of 0.5 gpm requires investigation.

Supplemental procedures, which are also credited for this program include:

An administrative procedure for ASME Section XI pressure tests for Quality Group A, B, and C systems and components establishes the requirements for the performance of pressure tests under which VT-2 visual examinations are conducted per ASME Section XI, including acceptance criteria.

An operations surveillance procedure is used to conduct RCS visual leak inspection and leak evaluation of the reactor vessel, and RCS containment piping.

An administrative procedure for Condition Reports is used to document non-conformances and conditions adverse to quality, such as significant material loss due to boric acid corrosion resulting from system leakage. This procedure requires determination of probable cause, corrective actions and actions to prevent recurrence.

In addition, Turkey Point Units 3 and 4 have reactor vessel head leakage detection systems. The system monitors air samples drawn from the CRDM cooler discharge as well as containment atmosphere for reference. This system can be placed in service to assist in leakage detection by isolating or eliminating the potential sources of unidentified leakage originating inside the reactor vessel head shroud.

FPL also has a Nuclear Division Policy that requires the nuclear plant Site Vice President to personally review and approve any return to operation of a unit with known leakage from the reactor coolant system. The policy recognizes that plant technical specifications are bounding, and ensures that structures, systems and components important to safety are in proper working order for safe operation. The policy provides additional guidance to ensure maximum unit reliability by avoiding operation with plant problems that have a high likelihood of forcing a shutdown. This policy was implemented to ensure that the circumstances that occurred at Turkey Point Unit 4 in 1987 are not repeated.

NRC Question 1.B: *an evaluation of the ability of your inspection and maintenance programs to identify degradation of the reactor pressure vessel head including, thinning, pitting, or other forms of degradation such as the Degradation of the reactor pressure vessel head observed at Davis-Besse,*

FPL Response to NRC Question 1.B: The Boric Acid Wastage Surveillance Program, described above, is effective at identifying leakage that could cause degradation to the reactor vessel head surface due to boric acid corrosion. A comparison between the Davis-Besse and Turkey Point reactor vessel head designs and FPL's past experience provides reasonable assurance that the implementation of the inspection program at Turkey Point would have identified this type of leakage before the degradation observed at Davis-Besse could have occurred.

Davis-Besse design features and operating details:

- The B&W designed Davis-Besse unit uses a flanged and gasketed connection for all 69 of its CRDM nozzle penetrations. These connections have had recurring leaks, unlike the Turkey Point design.

- Davis-Besse reportedly identified leaks on top of their reactor vessel head during their 1998 and 2000 refueling outages as noted in NRC Information Notice IN 2002-11[7]. The leaks were determined to be coming from the gasket connection of multiple CRDMs. Davis-Besse performed a limited cleaning of the reactor vessel head at that time.

- IN 2002-11 indicated that a review of the Davis-Besse videotapes of the prior 1998 and 2000 inspections revealed "no evidence of leakage from RPV head nozzles, although many areas of the RPV head were not accessible because of persistent boric acid deposits that the licensee did not clean because of ALARA issues (including the region around nozzle 3)." This confirms that boric acid accumulation on the reactor vessel head surface was present at Davis-Besse for multiple cycles of operation.

Turkey Point design features and operating details:

- Turkey Point Units 3 and 4 each use a threaded and canopy seal welded connection for all the 45 CRDMs, 8 part length CRDMs (2 part length CRDMs modified for reactor vessel level instrumentation), 8 spare penetrations (6 for Unit 3, two spare penetrations were modified with full penetration welded caps), 4 instrument ports and 1 welded head vent. The active CRDMs and part length CRDMs have a vent assembly at the top, but these connections are essentially leak free; therefore any boric acid accumulation from these locations is an abnormal condition. The Conoseal assemblies for the 4 instrument ports, one of which was the source of leakage on Unit 4 in 1987, have been replaced on both units with a new leak resistant design that utilizes a grafoil seal. Due to these design features, leakage from these connections to the reactor vessel head surface is less likely. However, any leakage would be reported and dispositioned in accordance with the Turkey Point corrective action program.

- The Turkey Point staff has maintained a heightened awareness of the potential for degradation from boric acid leakage on the carbon steel components including the reactor vessel head. Three access doors were cut into the shroud at both units to gain more complete visibility to the CRDM region and top of the reactor vessel head following the Conoseal leak at Unit 4 in 1987.

- Turkey Point Units 3 and 4 have a reactor vessel head leakage detection system. This system can be periodically run to assist in leakage detection by isolating or eliminating the potential sources of unidentified leakage as coming from inside the head shroud.

- The original cemented insulation at Turkey Point Units 3 and 4 that was supplied with the reactor pressure vessel, was removed from both units in 1987 and the head surfaces were cleaned. The original insulation was replaced with a double layer of blanket insulation that rests on the reactor vessel head surface. As a result, any new leakage from above the head similar to the event at Davis-Besse would be visible on the insulation.

Based on the design of CRDM connections to the reactor vessel head penetrations at Turkey Point Units 3 and 4 the potential for leakage from above the reactor vessel head is greatly reduced as compared to Davis-Besse. Additionally, the FPL-administered Boric Acid Wastage Surveillance Program and FPL's heightened awareness of the adverse effects of boric acid leakage on carbon steel surfaces provide reasonable assurance that leakage would be detected on the reactor vessel head long before degradation would occur similar to that detected at Davis-Besse. The effectiveness of this program is further evidenced by the general good condition found and the lack of boric acid accumulation on the Turkey Point Units 3 and 4 heads, during the October 2001 and March 2002 bare head inspections, respectively.

NRC Question 1.C: *a description of any condition identified (chemical deposits, head degradation) through the inspection and maintenance programs described in 1.A. that could have led to degradation and the corrective actions taken to address such conditions,*

FPL Response to NRC Question 1.C: In October of 2001, Turkey Point Unit 3 completed the bare metal "qualified" visual inspection to which FPL committed in the response to NRC Bulletin 2001-01. The Turkey Point Unit 3 inspection included the top of the reactor vessel head surface around the 66 reactor vessel head penetrations. All insulation was removed to allow a direct visual or remote camera-aided examination, looking for any signs of boric acid leakage. There were no penetrations identified as having evidence of leakage as defined by the experience at Oconee and ANO as referenced by EPRI[8]. Analysis of particulate debris samples collected from 3 penetration nozzles (# 25, 43 and 45) were analyzed and determined not to contain any boric acid. None of the observed deposits originated from the intersection of the nozzle and head and no evidence of boric acid wastage was observed.

In March of 2002, Turkey Point Unit 4 completed the bare metal "qualified" visual inspection to which FPL committed in the response to NRC Bulletin 2001-01. The Turkey Point Unit 4 inspection included the top of the reactor vessel head surface around the 66 reactor vessel head penetrations. All insulation was removed to allow a direct visual or remote camera-aided examination, looking for any signs of boric acid leakage. There were no penetrations identified as having evidence of leakage as defined by the experience at Oconee and ANO as referenced by EPRI[8]. A sample of debris was taken from around nozzle 61 but testing confirmed the sample did not contain boric acid. The head was cleaned and vacuumed prior to reinstallation of insulation.

There was no evidence of boric acid wastage or degradation of either reactor vessel head surface other than that identified in 1987. The results of the reactor pressure vessel head bare metal inspections performed at Turkey Point Unit 3 and Turkey Point Unit 4 in October of 2001 and in March of 2002 (with the insulation removed) assure that wastage degradation such as that observed at Davis-Besse (identified in NRC Bulletin 2002-01 and NRC Information Notice 2002-11[7]) does not exist.

NRC Question 1.D: *Your schedule, plans, and basis for future inspections of the reactor pressure vessel head and penetration nozzles. This should include the inspection method(s), scope, frequency, qualification requirements, and acceptance criteria:*

FPL Response to NRC Question 1.D: FPL committed to perform inspections in response to NRC Bulletin 2001-01. Turkey Point Units 3 and 4 completed the remote "qualified" visual bare metal inspections (VT-2) of the reactor vessel head penetrations in October of 2001 and March of 2002, respectively. The findings showed no leakage or boric acid accumulations were present as identified in the response to question 1.C.

For subsequent inspections, FPL is planning to follow the guidance that will be supplied by the ASME Boiler and Pressure Vessel Code, Section XI. An ASME task group, on Alloy 600/182 cracking, is preparing recommendations for reactor vessel head examinations to the Main Section XI Committee for incorporation into the ASME Code. This work should be complete by the end of 2002. All aspects of inspection, such as methods, scope, frequency, qualification requirements, and acceptance criteria will be addressed. FPL has representation at these meetings and will continue to participate.

FPL is also a member of the EPRI Material Reliability Program (MRP) which is tasked with following this issue and providing recommendations to assure safe operation and integrity of the reactor coolant pressure boundary.

NRC Question 1.E: *your conclusion regarding whether there is reasonable assurance that regulatory requirements are currently being met (see the Applicable Regulatory Requirements, above [include GDC 14, GDC 31, and GDC 32]). This discussion should also explain your basis for concluding that the inspections discussed in response to Item 1.D will provide reasonable assurance that these regulatory requirements will continue to be met.*

Include the following specific information in this discussion:

(1) If your evaluation does not support the conclusion that there is reasonable assurance that regulatory requirements are being met, discuss your plans for plant shutdown and inspection.

(2) If your evaluation supports the conclusion that there is reasonable assurance that regulatory requirements are being met, provide your basis for concluding that all regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.

FPL Response to NRC Question 1.E: Based on the information provided in this response, FPL concludes that there is reasonable assurance that both Turkey Point Units 3 and 4 are in compliance with applicable regulatory requirements and current licensing basis. Both Units 3 and 4 have completed "qualified" bare metal visual inspections as identified in 1.C and the results identified no leakage from the reactor vessel head penetrations. These inspections supply required information on the current condition. Turkey Point has a robust Boric Acid Wastage Surveillance Program, which is based on a series of plant specific implementing procedures. This program has effectively identified leakage in the past and requires documentation and corrective action. Turkey Point, unlike Davis-Besse, does not have gasketed mechanical joints on the CRDMs and therefore, leakage from above the reactor vessel head would be an unexpected event.

The technical basis for concluding that the regulatory bases are met for Turkey Point Units 3 and 4 is provided in the Regulatory Requirements Section of MRP-48[9]. The following is a plant specific supplement to that response.

The "Applicable Regulatory Requirements" section of NRC Bulletin 2002-01 lists specific general design criteria of 10 CFR 50 Appendix A applicable to the vessel head penetration nozzle cracking issue. The GDC identified include GDC 14, GDC 31, and GDC 32. Due to the plant vintage, Turkey Point Units 3 and 4 are committed to the 1967 Proposed General Design Criteria as specifically addressed in various sections of the Turkey Point UFSAR. The 1967 Proposed General Design Criteria 9, 34, and 36 contain requirements for reactor coolant pressure boundary, reactor coolant pressure boundary rapid propagation failure prevention and reactor coolant pressure boundary surveillance requirements similar to the current requirements in GDC 14, 31, and 32. Regardless, the requirements established for design, fracture toughness, and inspectability were satisfied during Turkey Point Units 3 and 4 initial licensing review, and will continue to be satisfied during operation by performance of the visual inspections identified above.

NRC Question 2: *Within 30 days after plant restart following the next inspection of the reactor pressure vessel head to identify any degradation, all PWR addressees are required to submit to the NRC the following information:*

A. the inspection scope (if different than that provided in response to Item 1.D.) and results, including the location, size, and nature of any degradation detected,

B. the corrective actions taken and the root cause of the degradation.

FPL Response to NRC Question 2: The requested information for the Turkey Point Unit 4 inspection that was completed in March of 2002 is summarized in the response to Question 1.C and therefore, the 30 day requirement for Turkey Point Unit 4 is considered to be fulfilled by submittal of this response. The information for the Turkey Point Unit 3 inspection that was performed in October of 2001 is also summarized in the response to Question 1.C.

NRC Question 3: *Within 60 days of the date of this bulletin, all PWR addressees are required to submit to the NRC the following information related to the remainder of the reactor coolant pressure boundary:*

A. *the basis for concluding that your boric acid inspection program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this bulletin. If a documented basis does not exist, provide your plans, if any, for a review of your programs.*

FPL Response to NRC Question 3: The current Boric Acid Wastage Surveillance Program described above, already includes within its scope, the remainder of the reactor coolant pressure boundary components inside containment that could be affected by boric acid wastage degradation. FPL recently evaluated this program and concluded that there is reasonable assurance that the Boric Acid Wastage Surveillance Program will adequately manage the aging effects of various components, including the reactor vessel heads, susceptible to the corrosive element of boric acid in accordance with the current licensing basis. FPL has again reviewed the Boric Acid Wastage Surveillance Program along with

the information from the Davis-Besse event and has determined that the above conclusions are still valid.

Accordingly, the Turkey Point Boric Acid Wastage Surveillance Program provides reasonable assurance of compliance with the applicable regulatory requirements discussed in Generic Letter 88-05 and this bulletin.

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[1] NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," March 18, 2002.

[2] FPL letter L-2001-198, "St. Lucie Units 1 and 2 and Turkey Point Units 3 and 4, Docket Nos. 50-335, 50-389, 50-250 and 50-251, Response to NRC Bulletin 2001-01, " R. S. Kundalkar to NRC, September 4, 2001.

[3] NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," August 3, 2001.

[4] FPL letter L-87-186,"Turkey point Unit 4 Docket No. 50-251, Report on Instrument Port Column Assembly Leakage," C.O. Woody to NRC, April 27,1987.

[5] NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," March 17, 1988.

[6] FPL letter L-88-239, "Response to Generic Letter 88-05," W.F. Conway to NRC, May 31,1988.

[7] NRC Information Notice 2002-11, "Recent Experience with Degradation of Reactor Pressure Vessel Head," March 12, 2002.

[8] "Visual Examination for Leakage of PWR Reactor Head Penetrations," Electric Power Research Institute (EPRI) NDE Center, Charlotte, NC: 2001. 1006296, August 2001.

[9] "PWR Material Reliability Program Response to NRC Bulletin 2001-01 (MRP-48)," Electric Power Research Institute (EPRI) NDE Center, Palo Alto, CA. 2001. 1006284, August 2001.