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July 27, 2004

U.S. Nuclear Regulatory Commission
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Subject: Duke Energy Corporation
McGuire Nuclear Station Units 1 & 2
Docket Nos. 50-369, 370
Catawba Nuclear Station Units 1 & 2
Docket Nos. 50-413, 414
Oconee Nuclear Stations Units 1, 2 & 3
Docket Nos. 50-269, 270, 287
Response to NRC BULLETIN 2004-01: INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS

Pursuant to 10 CFR 50.54(f), this letter and the associated attached Enclosures provide Duke Energy Corporation's (Duke) response to NRC Bulletin 2004-01 for the McGuire, Catawba and Oconee Nuclear Stations. This bulletin requested plant-specific information as a result of NRC staff concerns related to the inspection of ALLOY 82/182/600 materials used in the fabrication of the pressurizer penetrations and steam space piping connections at PWRs.

Responses are provided for the Bulletin in Attachments 1, 2 and 3 for Catawba, McGuire, and Oconee respectively.

The regulatory commitments made by Duke in response to this bulletin are provided in Attachment 4.

If you have questions or need additional information, please contact Gregory S. Kent at (704) 373-6032.

Very truly yours,

Henry B Barron

Henry B. Barron

A110

Henry B. Barron affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Henry B Barron

Group Vice President
Nuclear Generation and
Chief Nuclear Officer

Subscribed and sworn to me: July 27, 2004
Date

Betty Sharpe Gregory
Notary Public

My Commission Expires: 3/9/09
Date

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Catawba RGC Data File
Catawba Master File 801.01
McGuire Master File 801.01
Oconee Master File 801.01
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CATAWBA RESPONSE TO BL 2004-01

(1) All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.

(a) A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

Catawba Nuclear Station has compiled a list and descriptions of pressurizer connections, including those that utilize Alloy 600 wrought or Alloy 82/182 welded materials. The lists for Catawba Units 1 and 2 are provided as Tables 1 and 2 of this response, respectively. The information contained in the tables was compiled from plant and manufacturers' drawings, plant stress reports, and installation weld process control data.

Table 1: Catawba Unit 1 Pressurizer Penetrations and Steam Space Piping Connections *

Location / Item	Qty.	Description
6" Safety Nozzles *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	3	The carbon steel nozzles (SA508 Class 2 or 2A) are buttered with Alloy 82 / 182 material and the safe ends, fabricated from SA 182 Gr. F-316L stainless steel, are attached by full penetration Alloy 82 / 182 V-groove welds. The safe ends attach to the stainless plant piping by stainless steel weld metal.
Instrument Nozzles *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	8	These connections consist of SA213 Gr. TP316 piping inserted through the vessel wall. Partial penetration with fillet cap welds attach the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, SA 182 Gr. F-316 couplings are welded to the stainless steel piping. The couplings then attach to the stainless plant piping. All weld filler material is presumed stainless steel.
4" Spray Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.

Heater Penetrations *Incl. heater well tubing, immersion heater end plugs, heater sheath tubing, heater well adaptor*	78	The heater well tubing (SA 213 TP 316) is roll expanded and welded to the stainless steel cladding on the inner surface of the pressurizer. There are four pressure boundary welds a) end plug (SA479 TP316) to heater sheath tubing (SA 213 TP 316), b) heater well tubing to stainless steel cladded surface of the pressurizer, c) heater well tubing to heater well adaptor (SA 182 GR. F-316) and d) heater well adaptor to heater sheath tubing. All base materials are stainless steel and all welds consist of stainless steel filler material.
6" Relief Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
3/4" Sample Nozzle *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping. The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
Manway Diaphragm *incl. manway forging, manway studs, nuts, diaphragm plate, seal weld and manway cover*	1	The manway is a bolted closure consisting of a manway forging (SA508 Class 2 or 2A) welded into the carbon steel Pzr shell, SA193 Gr B7 studs, SA194, Gr 7 nuts, SB-168 diaphragm plate, and a manway cover (SA533 Gr A, Class 1). Alloy 52 / 152 is used to seal weld the diaphragm to the manway cladding.
14" Surge Line Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.

Table 2: Catawba Unit 2 Pressurizer Penetrations and Steam Space Piping Connections *

Location / Item	Qty.	Description
6" Safety Nozzles *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	3	The carbon steel nozzles (SA508 Class 2 or 2A) are buttered with Alloy 82 / 182 material and the safe ends, fabricated from SA 182 Gr. F-316L stainless steel, are attached by full penetration Alloy 82 / 182 V-groove welds. The safe ends attach to the stainless plant piping by stainless steel weld metal.

Instrument Nozzles *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	8	These connections consist of SA213 Gr. TP316 piping inserted through the vessel wall. Partial penetration with fillet cap welds attach the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, SA 182 Gr. F-316 couplings are welded to the stainless steel piping. The couplings then attach to the stainless plant piping. All weld filler material is presumed stainless steel.
4" Spray Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
Heater Penetrations *Incl. heater well tubing, immersion heater end plugs, heater sheath tubing, heater well adaptor*	78	The heater well tubing (SA 213 TP 316) is roll expanded and welded to the stainless steel cladding on the inner surface of the pressurizer. There are four pressure boundary welds a) end plug (SA479 TP316) to heater sheath tubing (SA 213 TP 316), b) heater well tubing to stainless steel cladded surface of the pressurizer, c) heater well tubing to heater well adaptor (SA 182 GR. F-316) and d) heater well adaptor to heater sheath tubing. All base materials are stainless steel and all welds consist of stainless steel filler material.
6" Relief Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
3/4" Sample Nozzle *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping. The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
Manway Diaphragm *incl. manway forging, manway studs, nuts, diaphragm plate, seal weld and manway cover*	1	The manway is a bolted closure consisting of a manway forging (SA508 Class 2 or 2A) welded into the carbon steel Pzr shell, SA193 Gr B7 studs, SA194, Gr 7 nuts, SB-168 diaphragm plate, and a manway cover (SA533 Gr A, Class 1). Alloy 82 / 182 is used to seal weld the diaphragm to the manway cladding.

14" Surge Line Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.

* Presumptions have been made as to the most probable filler material of small diameter factory welds and as to the likelihood of post weld heat treatment (PWHT) of connections. If a factory weld of a small diameter instrumentation connection or sample tap was made for the purpose of attaching stainless piping to a stainless fitting, the filler metal is presumed to be stainless steel. This condition would be consistent with accepted welding practice. Presumptions were also made about the typical PWHT practice for welded connections to carbon steel. For welded piping connections utilizing a stainless steel safe end without butter, PWHT of the nozzle, weld and safe end is presumed. For welded piping connections consisting of both a butter layer and a subsequent weld attaching the safe end to the carbon steel nozzle, PWHT of only the butter layer and nozzle is presumed. Applying the premise of typical PWHT practices when butter layers are applied, the safe end and weld are not considered post weld heat treated. Research of manufacturing records is necessary to provide details of PWHT history.

(b) A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup NDE was performed to characterize flaws in the leaking penetrations.

Catawba Nuclear Station conducts Inservice Inspections according to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The inspections include volumetric and surface examinations that are performed in accordance with Duke Energy Corporation's (Duke's) Section XI program to ensure compliance with applicable codes, standards, and procedures.

In response to industry experience with Alloy 600 degradation, Catawba Nuclear Station has implemented an increasing number of visual inspections of the pressurizer penetrations. These bare metal visual inspections (BMV's) were conducted in addition to the normal ISI required by Section XI of the ASME Code. The BMV's were conducted by a VT-2 qualified Quality Assurance inspector and the results recorded according to the Duke's work control processes. When an unacceptable condition was identified, it was resolved according to the Catawba Nuclear Station corrective action program.

Tables 3 and 4 provide the locations and outages of the inspections that have been completed on Units 1 and 2, respectively. The BMV's listed for Unit 1 were completed at its last RFO. These BMVs were conducted due to an awareness of the relationship between temperature and PWSCC susceptibility which caused Catawba to begin incorporating BMVs of selected pressurizer locations into outage plans. These inspections were completed prior to the publication of industry guidance contained in EPRI MRP 2003-039, issued January 20, 2004, and EPRI MRP 2004-05, issued April 2, 2004. The BMV's for Unit 2 will be conducted per the commitments to 1(c) of this bulletin response during the next RFO scheduled for fall of 2004.

While performing the ISI VT-2 inspection during the Catawba Unit 1 Spring 2002 RFO, boron deposits were discovered on the pressurizer manway flange surface. Engineering evaluation, including penetrant testing revealed cracking attributed to PWSCC in the seating surface of the diaphragm in the vicinity of the seal weld area. Corrective actions, including additional inspections, investigative activities, and plans for replacement of both units' diaphragms with more corrosion resistant material, were administered through Catawba's corrective action program to ensure that all ASME Code and other applicable requirements were satisfied.

Table 3: Inspection History of Alloy 600 Pressurizer Locations for Catawba Unit 1

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
4" Spray Nozzle	(Note 4)	Fall 1997	Fall 1997
6" Relief Nozzle	Fall 2003 (Note 2)	Fall 1997	Fall 1997
6" Safety Nozzle (1NC001)	Fall 2003 (Note 1)	Spring 2002	Spring 2002
6" Safety Nozzle (1NC002)	Fall 2003 (Note 1)	Spring 2002	Spring 2002
6" Safety Nozzle (1NC003)	Fall 2003 (Note 1)	Spring 2002	Spring 2002
Manway Diaphragm	(Note 3)	Not Applicable	Not Applicable

Note 1: The adjacent safe-end to pipe stainless welds were subjected to ASME code surface and volumetric examination during the Fall 2003 refueling outage. Performance of the Code exam would have provided ample opportunity for visualization of evidence of leakage on the adjacent area.

Note 2: These locations were inspected visually by VT-2 qualified personnel as part of the Alloy 600 program.

Note 3: The pressurizer manway receives a VT-2 inspection every RFO using ASME Code case N-533 (Reactor Coolant system is unpressurized and at ambient temperature.)

Note 4: This nozzle was omitted from the previous BMV inspections due to its estimated operating temperature being less that 590 F and the previous susceptibility criteria suggesting a reduced probability of PWSCC.

Table 4: Inspection History of Alloy 600 Pressurizer Locations for Catawba Unit 2

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
4" Spray Nozzle	(Note 2)	Fall 1998	Fall 1998
6" Relief Nozzle	(Note 2)	Fall 1998	Fall 1998
6" Safety Nozzle (2NC001)	(Note 2)	Spring 1994	Spring 1994
6" Safety Nozzle (2NC002)	(Note 2)	Spring 1994	Spring 1994
6" Safety Nozzle (2NC003)	(Note 2)	Spring 1994	Spring 1994
Manway Diaphragm	(Note 1)	Not Applicable	Not Applicable

Note 1: The pressurizer manway receives a VT-2 inspection every RFO using ASME Code case N-533 (Reactor Coolant system is unpressurized and at ambient temperature.)

Note 2: The BMV's will be conducted during the next RFO in the fall of 2004.

(c) A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what followup NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

Duke will implement the following inspection program for the Catawba Alloy 82/182/600 pressurizer penetrations and steam space piping connections addressed in NRC Bulletin 2004-01 at the next and each subsequent refueling outage.

- Bare metal visual inspection around 100% of each Alloy 600 penetration and each Alloy 82/182 weld, except those penetrations subject to volumetric or surface ISI during that RFO;
- Bare metal visual inspection of the gap between the manway cover and pressurizer manway for evidence of manway diaphragm plate seal weld leakage;
- Inservice Inspections in accordance with Section XI of the applicable ASME Code.

This program will remain in effect until revised by Duke as a result of further guidance provided by the industry or the component is modified to mitigate PWSCC susceptibility or replaced.

The bare metal visual inspections will be conducted by personnel qualified to perform VT-2 inspections according to ASME code. Inspection results will be documented according to applicable procedures. Evidence of leakage will be addressed in accordance with the Boric Acid Corrosion program, including evaluation by engineering to determine extent of condition, applicability to other locations, and establishing the basis for concluding that the plant satisfies applicable regulatory requirements.

The Inservice Inspections (ISI) will be performed in accordance with Section XI of the applicable ASME Code, and will be performed using qualified personnel and procedures. Any indications found during ISI will be addressed in accordance with Code requirements and the ISI program.

Engineering will evaluate evidence of leakage to determine cause and extent of condition. Catawba's corrective action program will be utilized to evaluate the need for additional

NDE methods and increased inspection scopes, including like locations and other Duke units. These actions will ensure detection of unsafe conditions and the appropriate response to the discovery of circumferential cracking.

(d) In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

Duke performs Inservice Inspection, including system leakage testing, of its nuclear power plants in accordance with Section XI of the applicable ASME Code. Duke's Section XI program utilizes qualified personnel and procedures, and includes activities to identify evidence of through wall leakage and initiate corrective action for unacceptable conditions, which may include supplemental examination, analytical evaluation, repair, and replacement.

As a result of industry experience with the degradation of Alloy 600 and welding Alloys 82 / 182, and the associated occurrences of degradation of the reactor coolant boundaries due to borated water leakage, Duke has created an Alloy 600 program and Boric Acid Corrosion program. These programs, in association with Catawba's corrective action program, prescribe activities for the detection, investigation, and mitigation of reactor coolant pressure boundary leakage due to PWSCC of Alloy 600.

Industry experience indicates that leakage attributed to degradation of Alloy 600 due to PWSCC has been detected prior to the occurrence of gross leakage from the reactor coolant pressure boundary. Implementation of the rigorous visual inspection program described in Duke's response to 1c, including continued ISI required by ASME Section XI should be adequate to detect leakage through the reactor coolant pressure boundary prior to the occurrence of extensive degradation. Aggressive investigative and evaluation practices as dictated by the previously mentioned programs should ensure appropriate response to the discovery of circumferential cracking, including expansion of NDE scope to include "like locations," and should provide adequate protection against the occurrence of rupture of and/or gross reactor coolant pressure boundary leakage, thus satisfying applicable regulatory requirements.

MCGUIRE RESPONSE TO BL 2004-01

(1) All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.

(a) A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

McGuire Nuclear Station has compiled a list and descriptions of pressurizer connections, including those that utilize Alloy 600 wrought or Alloy 82/182 welded materiàls. The lists for McGuire Units 1 and 2 are provided as Tables 1 and 2 of this response, respectively. The information contained in the tables was compiled from plant and manufacturers' drawings, plant stress reports, and installation weld process control data.

Table 1: McGuire Unit 1 Pressurizer Penetrations and Steam Space Piping Connections*

Location / Item	Qty.	Description
6" Safety Nozzles *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	3	The carbon steel nozzles (SA508 Class 2 or 2A) are buttered with Alloy 82 / 182 material and the safe ends, fabricated from SA 182 Gr. F-316L stainless steel, are attached by full penetration Alloy 82 / 182 V-groove welds. The safe ends attach to the stainless plant piping by stainless steel weld metal.
Instrument Nozzles *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	7	These connections consist of SA213 Gr. TP316 piping inserted through the vessel wall. Partial penetration with fillet cap welds attach the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, SA 182 Gr. F-316 couplings are welded to the stainless steel piping. The couplings then attach to the stainless plant piping. All weld filler material is presumed stainless steel.
3/4" Code Safety Drain *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping.

		The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
4" Spray Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
Heater Penetrations *Incl. heater well tubing, immersion heater end plugs, heater sheath tubing, heater well adaptor*	78	The heater well tubing (SA 213 TP 316) is roll expanded and welded to the stainless steel cladding on the inner surface of the pressurizer. There are four pressure boundary welds a) end plug (SA479 TP316) to heater sheath tubing (SA 213 TP 316), b) heater well tubing to stainless steel cladded surface of the pressurizer, c) heater well tubing to heater well adaptor (SA 182 GR. F-316) and d) heater well adaptor to heater sheath tubing. All base materials are stainless steel and all welds consist of stainless steel filler material.
6" Relief Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
3/4" Sample Nozzle *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping. The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
Manway Diaphragm *incl. manway forging, manway studs, nuts, diaphragm plate, seal weld and manway cover*	1	The manway is a bolted closure consisting of a manway forging (SA508 Class 2 or 2A) welded into the carbon steel Pzr shell, SA193 Gr B7 studs, SA194, Gr 7 nuts, SB-168 diaphragm plate, and a manway cover (SA533 Gr A, Class 1). Alloy 82 / 182 is used to seal weld the diaphragm to the manway cladding.
14" Surge Line Nozzle *Incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.

Table 2: McGuire Unit 2 Pressurizer Penetrations and Steam Space Piping Connections*

Location / Item	Qty.	Description
6" Safety Nozzles *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	3	The carbon steel nozzles (SA508 Class 2 or 2A) are buttered with Alloy 82 / 182 material and the safe ends, fabricated from SA 182 Gr. F-316L stainless steel, are attached by full penetration Alloy 82 / 182 V-groove welds. The safe ends attach to the stainless plant piping by stainless steel weld metal.
Instrument Nozzles *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	7	These connections consist of SA213 Gr. TP316 piping inserted through the vessel wall. Partial penetration with fillet cap welds attach the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, SA 182 Gr. F-316 couplings are welded to the stainless steel piping. The couplings then attach to the stainless plant piping. All weld filler material is presumed stainless steel.
3/4" Code Safety Drain *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping. The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
4" Spray Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.
Heater Penetrations *incl. heater well tubing, immersion heater end plugs, heater sheath tubing, heater well adaptor*	78	The heater well tubing (SA 213 TP 316) is roll expanded and welded to the stainless steel cladding on the inner surface of the pressurizer. There are four pressure boundary welds a) end plug (SA479 TP316) to heater sheath tubing (SA 213 TP 316), b) heater well tubing to stainless steel cladded surface of the pressurizer, c) heater well tubing to heater well adaptor (SA 182 GR. F-316) and d) heater well adaptor to heater sheath tubing. All base materials are stainless steel and all welds consist of stainless steel filler material.
6" Relief Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	The carbon steel nozzle (SA508 Class 2 or 2A) is buttered with Alloy 82 / 182 material and the safe end, fabricated from SA 182 Gr. F-316L stainless steel, is attached by a full penetration Alloy 82 / 182 V-groove weld. The safe end attaches to the stainless plant piping by stainless steel weld metal.

3/4" Sample Nozzle *incl. partial penetration plus fillet weld, piping. piping to coupling weld, coupling, coupling to plant piping weld*	1	This connection consists of SA213 Gr. TP316 piping inserted through the vessel wall. A partial penetration with fillet cap weld attaches the piping to the inside, built up, stainless steel cladded surface of the pressurizer. The piping is roll expanded through the vessel. Outside the vessel, a SA 182 Gr. F-316 coupling is welded to the stainless steel piping. The coupling then attaches to the stainless plant piping. All weld filler material is presumed stainless steel.
Manway Diaphragm *incl. manway forging, manway studs, nuts, diaphragm plate, seal weld and manway cover*	1	The manway is a bolted closure consisting of a manway forging (SA508 Class 2 or 2A) welded into the carbon steel Pzr shell, SA193 Gr B7 studs, SA194, Gr 7 nuts, SB-168 diaphragm plate, and a manway cover (SA533 Gr A, Class 1). Alloy 82 / 182 is used to seal weld the diaphragm to the manway cladding.
14" Surge Line Nozzle *incl. Pzr nozzle to safe end weld, safe end and safe end to pipe weld*	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.

* Presumptions have been made as to the most probable filler material of small diameter factory welds and as to the likelihood of post weld heat treatment (PWHT) of connections. If a factory weld of a small diameter instrumentation connection or sample tap was made for the purpose of attaching stainless piping to a stainless fitting, the filler metal is presumed to be stainless steel. This condition would be consistent with accepted welding practice. Presumptions were also made about the typical PWHT practice for welded connections to carbon steel. For welded piping connections utilizing a stainless steel safe end without butter, PWHT of the nozzle, weld and safe end is presumed. For welded piping connections consisting of both a butter layer and a subsequent weld attaching the safe end to the carbon steel nozzle, PWHT of only the butter layer and nozzle is presumed. Applying the premise of typical PWHT practices when butter layers are applied, the safe end and weld are not considered post weld heat treated. Research of manufacturing records is necessary to provide details of PWHT history.

(b) A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup NDE was performed to characterize flaws in the leaking penetrations.

McGuire Nuclear Station conducts Inservice Inspections according to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Code case N-577 addressing Risk Informed Inspection for Piping Inservice Inspection, and the associated Westinghouse Owners' Group topical report on risk informed inspection. The inspections include volumetric, surface, and visual examinations that are performed in accordance with Duke Energy Corporation's (Duke's) Section XI program and associated procedures to ensure compliance with applicable codes and standards.

In response to the industry experience with Alloy 600 degradation, McGuire Nuclear Station has conducted bare metal visual inspections of some pressurizer penetrations. These bare metal visual inspections (BMV's) were conducted in addition to the normal ISI required by Section XI of the ASME Code. The BMV's were conducted by a VT-2 qualified Quality Assurance inspector and the results recorded according to Duke's work control processes. No leaking penetrations or other unacceptable conditions were detected. If unacceptable conditions had been detected, they would have been resolved according to procedural guidance and the McGuire corrective action program.

Tables 3 and 4 provide the locations and outages of the inspections that have been completed on Units 1 and 2, respectively. The BMV's listed were completed during the last RFO for each unit. These BMVs were conducted due to an awareness of the relationship between temperature and PWSCC susceptibility which caused McGuire to begin incorporating BMVs of selected pressurizer locations into outage plans. These inspections were completed prior to or shortly after the publication of industry guidance contained in EPRI MRP 2003-039, issued January 20, 2004, and EPRI MRP 2004-05, issued April 2, 2004.

Table 3: Inspection History of Alloy 600 Pressurizer Locations for McGuire Unit 1

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
4" Spray Nozzle	(Note 3)	Fall 1995	Fall 1995
6" Relief Nozzle	Spring 2004 (Note 1)	Fall 1995	Fall 1995
6" Safety Nozzle	Spring 2004 (Note 1)	Fall 1995	Fall 1995
6" Safety Nozzle	Spring 2004 (Note 1)	Fall 1999	Fall 1999
6" Safety Nozzle	Spring 2004 (Note 1)	Fall 1999	Fall 1999
Manway Diaphragm	(Note 2)	Not Applicable	Not Applicable

Note 1: These locations were inspected visually by VT-2 qualified personnel as part of the Alloy 600 program.

Note 2: The pressurizer manway receives a VT-2 inspection every RFO using ASME Code case N-533 (Reactor Coolant system is unpressurized and at ambient temperature.)

Note 3: This location will receive a BMV inspection during the next scheduled RFO.

Table 4: Inspection History of Alloy 600 Pressurizer Locations for McGuire Unit 2

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
4" Spray Nozzle	(Note 3)	Spring 1996	Spring 1996
6" Relief Nozzle	Fall 2003 (Note 1)	Spring 1999	Spring 1999
6" Safety Nozzle	Fall 2003 (Note 1)	Spring 1999	Spring 1999
6" Safety Nozzle	(Note 3)	Fall 2003	Fall 2003
6" Safety Nozzle	(Note 3)	Fall 2003	Fall 2003
Manway Diaphragm	(Note 2)	Not Applicable	Not Applicable

Note 1: These locations were inspected visually by VT-2 qualified personnel as part of the Alloy 600 program.

Note 2: The pressurizer manway receives a VT-2 inspection every RFO using ASME Code case N-533 (Reactor Coolant system is unpressurized and at ambient temperature.)

Note 3: These locations will receive a BMV inspection during the next scheduled RFO.

(c) A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what followup NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

Duke will implement the following inspection program for the McGuire Alloy 82/182/600 pressurizer penetrations and steam space piping connections addressed in NRC Bulletin 2004-01 at the next and each subsequent refueling outage.

- Bare metal visual inspection around 100% of each Alloy 600 penetration and each Alloy 82/182 weld, except those penetrations subject to volumetric or surface ISI during that RFO;
- Bare metal visual inspection of the gap between the manway cover and pressurizer manway for evidence of manway diaphragm plate seal weld leakage;
- Inservice Inspections in accordance with Section XI of the applicable ASME Code.

This program will remain in effect until revised by Duke as a result of further guidance provided by the industry or the component is modified to mitigate PWSCC susceptibility or replaced.

The bare metal visual inspections will be conducted by personnel qualified to perform VT-2 inspections according to ASME code. Inspection results will be documented according to applicable procedures. Evidence of leakage will be addressed in accordance with the Boric Acid Corrosion program, including evaluation by engineering to determine extent of condition, applicability to other locations, and establishing the basis for concluding that the plant satisfies applicable regulatory requirements.

The Inservice Inspections (ISI) will be performed in accordance with Section XI of the applicable ASME Code, and will be performed using qualified personnel and procedures. Any indications found during ISI will be addressed in accordance with Code requirements and the ISI program.

Engineering will evaluate evidence of leakage to determine cause and extent of condition. McGuire's corrective action program will be utilized to evaluate the need for additional NDE methods and increased inspection scopes, including like locations and other Duke units. These actions will ensure detection of unsafe conditions and the appropriate response to the discovery of circumferential cracking.

(d) In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

Duke performs Inservice Inspection, including system leakage testing, of its nuclear power plants in accordance with Section XI of the applicable ASME Code. Duke's Section XI program utilizes qualified personnel and procedures, and includes activities to identify evidence of through wall leakage and initiate corrective action for unacceptable conditions, which may include supplemental examination, analytical evaluation, repair, and replacement.

As a result of industry experience with the degradation of Alloy 600 and welding Alloys 82 / 182, and the associated occurrences of degradation of the reactor coolant boundaries due to borated water leakage, Duke has created an Alloy 600 program and Boric Acid Corrosion program. These programs, in association with McGuire's corrective action program, prescribe activities for the detection, investigation, and mitigation of reactor coolant pressure boundary leakage due to PWSCC of Alloy 600.

Industry experience indicates that leakage attributed to degradation of Alloy 600 due to PWSCC has been detected prior to the occurrence of gross leakage from the reactor coolant pressure boundary. Implementation of the rigorous visual inspection program described in Duke's response to 1c, including continued ISI required by ASME Section XI should be adequate to detect leakage through the reactor coolant pressure boundary prior to the occurrence of extensive degradation. Aggressive investigative and evaluation practices as dictated by the previously mentioned programs should ensure appropriate response to the discovery of circumferential cracking, including expansion of NDE scope to include "like locations," and should provide adequate protection against the occurrence of rupture of and/or gross reactor coolant pressure boundary leakage, thus satisfying applicable regulatory requirements.

OCONEE RESPONSE TO BL 2004-01

(1) All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.

(a) A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

Oconee Nuclear Station has compiled a list and descriptions of pressurizer connections, including those that utilize Alloy 600 wrought or welded materials. The lists for Oconee Units 1, 2, and 3 are provided as Tables 1, 2, and 3 of this response, respectively. The information contained in the tables was compiled from plant and manufacturers' drawings, vendor supplied information, plant stress reports, and installation weld process control data.

Table 1: Oconee Unit 1 Pressurizer Penetrations and Steam Space Piping Connections*

Location / Item	Qty.	Description
1.5" Thermowell *incl. J-groove weld*	1	The 1.5" Thermowell is fabricated from SB-166 bar stock. The thermowell extends through the carbon steel pressurizer wall and is welded to the inner surface of the vessel wall by an Alloy 182 J-groove weld and butter. Butter is most probably post weld heat treated.
1" Level Taps *incl. safe end, safe end to pzr nozzle weld and safe end to pipe weld*	6	The 1" Level Tap safe ends are fabricated from SB-166 bar stock. The safe ends attach to the carbon steel PZR nozzles by Alloy 82 full penetration V-groove welds that are most probably post weld heat treated. The safe ends attach to stainless steel piping by Alloy 182 or 82 full penetration V-groove welds that were not post weld heat treated.
1" Sample Tap *incl. safe end, safe end to PZR nozzle weld, and safe end to pipe weld.*	1	The 1" Sample Tap safe end is fabricated from SB-166 bar stock. The safe end attaches to the carbon steel PZR nozzle by an Alloy 82 full penetration V-groove weld that is most probably post weld heat treated. The safe end attaches to stainless steel piping by an Alloy 182 or 82 full penetration V-groove weld that was not post weld heat treated.

1" Vent *incl. vent nozzle, vent nozzle safe end, J-groove weld, vent nozzle to safe end weld, and safe end to pipe weld*	1	The 1" Vent Nozzle and Vent Nozzle safe end are fabricated from SB-166 bar stock. The vent nozzle penetrates the carbon steel PZR shell and is attached to the inner surface of the shell and cladding with a partial penetration Alloy 182 J-groove weld using Alloy 182 butter. The butter and J-groove weld are most probably post weld heat treated. The vent nozzle attaches to the safe end with a full penetration Alloy 82 weld. The J-groove and full penetration welds are most probably post weld heat treated. The safe end is welded to the stainless piping using Alloy 82 or 182 and not post weld heat treated.
4" Spray Nozzle *incl. safe end, safe end to PZR nozzle weld, safe end to pipe weld, internal safe end weld buttons,*	1	The 4" PZR Spray nozzle safe end is fabricated from SB-166 bar stock. The Spray nozzle safe end attaches to the carbon steel spray nozzle by an Alloy 82 full penetration V-groove weld with Alloy 82 butter. The butter and J-groove weld are most probably post weld heat treated. The safe end attaches to the stainless steel pipe by a full penetration Alloy 182 or 82 V-groove weld that was not post weld heat treated. Four weld buttons on the inner surface of the safe end are fabricated from Alloy 182 or 82 weld metal.
4" Spray Nozzle Extension Pin *incl. extension pin to cladding weld, extension pin to pipe weld, and internal weld buttons*	1	The 4" PZR Spray nozzle extension pin is a pipe fabricated from SB-166 bar stock. The extension pin attaches to the stainless steel weld build-up on the inside of the carbon steel shell and the stainless steel pipe inside the PZR by Alloy 82 full penetration V-groove welds. The weld attaching the pin to the carbon steel shell is most probably post weld heat treated. Four weld buttons on the inside surface of the extension pin are fabricated from Alloy 182 or 82 weld metal.
2.5" Relief Nozzles *incl. stainless steel flange*	3	The 2.5" carbon steel relief nozzles are welded to the stainless steel flanges with a full penetration Alloy 82/182 V-groove weld using Alloy 182 buttering. The buttering is most probably post weld heat treated.
Heater Diaphragm Plates *incl. diaphragm plate to PZR cladding welds.*	3	The heater diaphragm plates are fabricated from SB-168 Alloy 600 plate. An Alloy 82 or 182 partial penetration seal weld is between the diaphragm plate and the PZR cladding. This non-structural seal weld was not post weld heat treated.
Heater Sleeves *incl. heater sleeve to diaphragm weld and heater sleeve to sheath weld.*	117	The heater sleeves are fabricated from SB-166 Alloy 600 bar. Alloy 82 partial penetration J-groove welds attach the individual heater sleeves to the diaphragm plate. An Alloy 82 fillet weld attaches the Type 316L stainless steel heater sheath to each heater sleeve. None of the welds are considered to be post weld heat treated.
10" Surge Nozzle	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.

Manway *Incl. boss, cladding, diaphragm plate, and cover*	1	The Manway boss is fabricated from the weld build-up of carbon steel, clad with stainless steel. The diaphragm plate is stainless steel, and the manway cover is carbon steel.

Table 2: Oconee Unit 2 Pressurizer Penetrations and Steam Space Piping Connections*

Location / Item	Qty.	Description
1.5" Thermowell *incl. J-groove weld*	1	The 1.5" Thermowell is fabricated from SB-166 bar stock. The thermowell extends through the carbon steel pressurizer wall and is welded to the inner surface of the vessel wall by an Alloy 182 J-groove weld. The J-groove weld is most probably post weld heat treated.
1" Level Taps *incl. safe end, safe end to pzr nozzle weld and safe end to pipe weld*	6	The 1" Level Tap safe ends are fabricated from SB-166 bar stock. The safe ends attach to the carbon steel PZR nozzles by Alloy 82 full penetration V-groove welds that are most probably post weld heat treated. The safe ends attach to stainless steel piping by Alloy 182 or 82 full penetration V-groove welds that were not post weld heat treated.
1" Sample Tap *incl. safe end, safe end to PZR nozzle weld, and safe end to pipe weld.*	1	The 1" Sample Tap safe end is fabricated from SB-166 bar stock. The safe end attaches to the carbon steel PZR nozzle by an Alloy 82 full penetration V-groove weld that is most probably post weld heat treated. The safe end attaches to stainless steel piping by an Alloy 182 or 82 full penetration V-groove weld that was not post weld heat treated.
1" Vent *incl. vent nozzle, J-groove weld, vent nozzle to pipe weld*	1	The 1" Vent nozzle is fabricated from SB-166 bar stock. The vent nozzle penetrates the carbon steel PZR shell and is attached to the inner surface of the shell and cladding with a partial penetration Alloy 182 J-groove weld. The J-groove weld is most probably post weld heat treated. The vent nozzle attaches to the stainless piping using Alloy 82 or 182 that was not post weld heat treated.
4" Spray Nozzle *incl. safe end, safe end to PZR nozzle weld, safe end to pipe weld, internal safe end weld buttons,*	1	The 4" PZR Spray nozzle safe end is fabricated from SB-166 bar stock. The Spray nozzle safe end attaches to the carbon steel spray nozzle by an Alloy 82 full penetration V-groove weld with no buttering. The V-groove weld is most probably post weld heat treated. The safe end attaches to the stainless steel pipe by a full penetration Alloy 182 or 82 V-groove weld that was not post weld heat treated. Four weld buttons on the inner surface of the safe end are fabricated from Alloy 182 or 82 weld metal.

4" Spray Nozzle Extension Pin *Incl. extension pin to cladding weld, extension pin to pipe weld, and internal weld buttons*	1	The 4" PZR Spray nozzle extension pin is a pipe fabricated from SB-166 bar stock. The extension pin attaches to the stainless steel weld build-up on the inside of the carbon steel shell and the stainless steel pipe inside the PZR by Alloy 82 full penetration V-groove welds. The weld attaching the pin to the carbon steel shell is most probably post weld heat treated. Four weld buttons on the inside surface of the extension pin are fabricated from Alloy 182 or 82 weld metal.
2.5" Relief Nozzles *incl. stainless steel flange*	3	The 2.5" carbon steel relief nozzles are welded to the stainless steel flanges with a full penetration Alloy 82/182 V-groove weld using Alloy 182 buttering. The butter is most probably post weld heat treated.
Heater Diaphragm Plates *Incl. diaphragm plate to Pzr clad weld*	3	The Heater diaphragm plates are fabricated from Type 304 stainless steel plate. A stainless steel partial penetration seal weld is between the diaphragm plate and the Pzr cladding. This non-structural weld is not considered to be post weld heat treated.
10" Surge Nozzle	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.
Manway *Incl. boss, cladding, diaphragm plate, and cover*	1	The Manway boss is fabricated from the weld build-up of carbon steel, clad with stainless steel. The diaphragm plate is stainless steel, and the manway cover is carbon steel.

Table 3: Oconee Unit 3 Pressurizer Penetrations and Steam Space Piping Connections*

Location / Item	Qty.	Description
1.5" Thermowell *incl. J-groove weld*	1	The 1.5" Thermowell is fabricated from SB-166 bar stock. The thermowell extends through the carbon steel pressurizer wall and is welded to the inner surface of the vessel wall by an Alloy 182 J-groove weld. The J-groove weld is most probably post weld heat treated.
1" Level Taps *incl. safe end, safe end to pzr nozzle weld and safe end to pipe weld*	6	The 1" Level Tap safe ends are fabricated from SB-166 bar stock. The safe ends attach to the carbon steel PZR nozzles by Alloy 82 full penetration V-groove welds that are most probably post weld heat treated. The safe ends attach to stainless steel piping by Alloy 182 or 82 full penetration V-groove welds that were not post weld heat treated.

1" Sample Tap *incl. safe end, safe end to PZR nozzle weld, and safe end to pipe weld.*	1	The 1" Sample Tap safe end is fabricated from SB-166 bar stock. The safe end attaches to the carbon steel PZR nozzle by an Alloy 82 full penetration V-groove weld that is most probably post weld heat treated. The safe end attaches to stainless steel piping by an Alloy 182 or 82 full penetration V-groove weld that was not post weld heat treated.
1" Vent *incl. vent nozzle, J-groove weld, vent nozzle to pipe weld*	1	The 1" Vent nozzle is fabricated from SB-166 bar stock. The vent nozzle penetrates the carbon steel PZR shell and is attached to the inner surface of the shell and cladding with a partial penetration Alloy 182 J-groove weld. The J-groove weld is most probably post weld heat treated. The vent nozzle attaches to the stainless piping using Alloy 82 or 182. that was not post weld heat treated.
4" Spray Nozzle *incl. safe end, safe end to PZR nozzle weld, safe end to pipe weld, internal safe end weld buttons,*	1	The 4" PZR Spray nozzle safe end is fabricated from SB-166 bar stock. The Spray nozzle safe end attaches to the carbon steel spray nozzle by an Alloy 82 full penetration V-groove weld with no buttering. The V-groove weld is most probably post weld heat treated. The safe end attaches to the stainless steel pipe by a full penetration Alloy 182 or 82 V-groove weld that was not post weld heat treated. Four weld buttons on the inner surface of the safe end are fabricated from Alloy 182 or 82 weld metal.
4" Spray Nozzle Extension Pin *incl. extension pin to cladding weld, extension pin to pipe weld, and internal weld buttons*	1	The 4" PZR Spray nozzle extension pin is a pipe fabricated from SB-166 bar stock. The extension pin attaches to the stainless steel weld build-up on the inside of the carbon steel shell and the stainless steel pipe inside the PZR by Alloy 82 full penetration V-groove welds. The weld attaching the pin to the carbon steel shell is most probably post weld heat treated. Four weld buttons on the inside surface of the extension pin are fabricated from Alloy 182 or 82 weld metal.
2.5" Relief Nozzles *incl. stainless steel flange*	3	The 2.5" carbon steel relief nozzles are welded to the stainless steel flanges with a full penetration Alloy 82/182 V-groove weld using Alloy 182 buttering. The butter is most probably post weld heat treated.
Heater Diaphragm Plates *incl. diaphragm plate to Pzr clad weld*	3	The Heater diaphragm plates are fabricated from Type 304 stainless steel plate. A stainless steel partial penetration seal weld is between the diaphragm plate and the Pzr cladding. This non-structural weld is not considered to be post weld heat treated.
10" Surge Nozzle	1	Per the bulletin instructions, the surge nozzle is not addressed by this bulletin. Therefore, the fabrication details are not included in this bulletin response. This penetration is included for completeness of the list.
Manway *incl. boss, cladding, diaphragm*	1	The Manway boss is forged from carbon steel, welded to the vessel with carbon steel, and clad with stainless steel. The

plate, and cover	diaphragm plate is stainless steel, and the manway cover is carbon steel.

* Information on post weld heat treatment was assimilated from an owner's group document providing the design and configuration information of the Alloy 600/82/182 in the pressurizers. Some presumptions were required. Where vendor information indicated that a weld was "most probably" post weld heat treated, that information is included. These presumptions are based on the premise of accepted manufacturing techniques and vendor information provided by the Babcock and Wilcox Owner's Group project document. Research of manufacturing records is necessary to provide detailed PWHT histories.

(b) A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup NDE was performed to characterize flaws in the leaking penetrations.

Oconee Nuclear Station conducts Inservice Inspections according to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The inspections include volumetric and surface examinations that are performed in accordance with Duke Energy Corporation's (Duke's) Section XI program to ensure compliance with applicable codes, standards, and procedures.

In response to industry experience with Alloy 600 degradation, Oconee Nuclear Station has implemented an increasing number of visual inspections of the pressurizer penetrations. These bare metal visual inspections (BMV's) were conducted in addition to the normal ISI required by Section XI of the ASME Code. The BMV's were conducted by a VT-2 qualified Quality Assurance inspector, a VT-1 qualified Quality Assurance inspector or an experienced boric acid corrosion evaluation engineer and the results recorded according to Duke's work control processes. When a unacceptable condition was identified, it was resolved according to the Oconee Nuclear Station corrective action program.

Tables 4, 5, and 6 provide the locations and outages of the inspections that have been completed on Units 1, 2, and 3, respectively. The BMV's listed for Units 1, 2, and 3 were completed at the last RFO of each unit. These BMVs were conducted due to an awareness of the relationship between temperature and PWSCC susceptibility which caused Oconee to begin incorporating BMVs of selected pressurizer locations into outage plans. These inspections were completed prior to the publication of industry guidance contained in EPRI MRP 2003-039, issued January 20, 2004, and EPRI MRP 2004-05, issued April 2, 2004.

In the fall of 1989, a leaking seal weld was discovered between the heater bundle diaphragm plate and the heater bundle access port cladding on Oconee Unit 1. The flaw location was identified by the leakage. Liquid penetrant (PT) NDE was used, but did not identify the flaw location. The portion of the seal weld containing the leak was replaced. No leakage has occurred at this location since this repair.

Table 4: Inspection History of Alloy 600 Pressurizer Locations for Oconee Unit 1

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
1.5" Thermowell	Fall 2003	Not Applicable	Not Applicable
1" Level (qty 6)	Fall 2003 (qty 6)	Fall 2003 (qty 6)	Not Applicable
1" Sample	Fall 2003	Fall 2003	Not Applicable
1" Vent	Fall 2003	Not Applicable	Not Applicable
4" Spray (Noz to SE)	Fall 2003	Fall 1997	Fall 1997
4" Spray (SE to pipe)	Fall 2003	Spring 2002	Spring 2002
2.5" Relief (qty 3)	Fall 2003 (qty 3)	Fall 2000 (qty 1) Fall 1995 (qty 2)	Not Applicable
Heater Bundle Diaphragm (qty 3)	Fall 2003 (qty 3)	Not Applicable	Not Applicable

Table 5: Inspection History of Alloy 600 Pressurizer Locations for Oconee Unit 2

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
1.5" Thermowell	Spring 2004	Not Applicable	Not Applicable
1" Level (qty 6)	Spring 2004 (qty 6)	Fall 2002 (qty 6)	Not Applicable
1" Sample	Spring 2004	Fall 2002	Not Applicable
1" Vent	Spring 2004	Not Applicable	Not Applicable
4" Spray (Noz to SE)	Spring 2004	Fall 2002	Fall 2002
4" Spray (SE to pipe)	Fall 2002	Fall 2002	Fall 2002
2.5" Relief (qty 3)	Spring 2004 (qty 3)	Spring 2001 (qty 3)	Not Applicable

Table 6: Inspection History of Alloy 600 Pressurizer Locations for Oconee Unit 3.

Nozzle Description	Bare Metal Visual Inspection	Surface Inspection (ISI)	Volumetric Inspection (ISI)
1.5" Thermowell	Spring 2003	Not Applicable	Not Applicable
1" Level (qty 6)	Spring 2003 (qty 6)	Spring 2003 (qty 6)	Not Applicable
1" Sample	Spring 2003	Spring 2003	Not Applicable
1" Vent	Spring 2003	Not Applicable	Not Applicable
4" Spray (Noz to SE)	Spring 2003	Fall 1996	Fall 1996
4" Spray (SE to pipe)	Spring 2003	Fall 1992	Fall 1992
2.5" Relief (qty 3)	Spring 2003 (qty 3)	Fall 1998 (qty 3)	Not Applicable

(c) A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what followup NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

Duke will implement the following inspection program for the Oconee Alloy 82/182/600 pressurizer penetrations and steam space piping connections addressed in NRC Bulletin 2004-01 at the next and each subsequent refueling outage.

- Bare metal visual inspection around 100% of each Alloy 600 penetration and each Alloy 82/182 weld, except those penetrations subject to volumetric or surface ISI during that RFO;
- Inservice Inspections in accordance with Section XI of the applicable ASME Code.

This program will remain in effect until revised by Duke as a result of further guidance provided by the industry or the component is modified to mitigate PWSCC susceptibility or replaced.

The bare metal visual inspections will be conducted by personnel qualified to perform VT-2 inspections according to ASME code. Inspection results will be documented according to applicable procedures. Evidence of leakage will be addressed in accordance with the Boric Acid Corrosion program, including evaluation by engineering to determine extent of condition, applicability to other locations, and establishing the basis for concluding that the plant satisfies applicable regulatory requirements.

The Inservice Inspections (ISI) will be performed in accordance with Section XI of the applicable ASME Code, and will be performed using qualified personnel and procedures. Any indications found during ISI will be addressed in accordance with Code requirements and the ISI program.

Engineering will evaluate evidence of leakage to determine cause and extent of condition. Oconee's corrective action program will be utilized to evaluate the need for additional NDE methods and increased inspection scopes, including like locations and other Duke units. These actions will ensure detection of unsafe conditions and the appropriate response to the discovery of circumferential cracking.

(d) In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

Duke performs Inservice Inspection, including system leakage testing, of its nuclear power plants in accordance with Section XI of the applicable ASME Code. Duke's Section XI program utilizes qualified personnel and procedures, and includes activities to identify evidence of through wall leakage and initiate corrective action for unacceptable conditions, which may include supplemental examination, analytical evaluation, repair, and replacement.

As a result of industry experience with the degradation of Alloy 600 and welding Alloys 82 / 182, and the associated occurrences of degradation of the reactor coolant boundaries due to borated water leakage, Duke has created an Alloy 600 program and Boric Acid Corrosion program. These programs, in association with Oconee's corrective action program, prescribe activities for the detection, investigation, and mitigation of reactor coolant pressure boundary leakage due to PWSCC of Alloy 600.

Industry experience indicates that leakage attributed to degradation of Alloy 600 due to PWSCC has been detected prior to the occurrence of gross leakage from the reactor coolant pressure boundary. Implementation of the rigorous visual inspection program described in Duke's response to 1c, including continued ISI required by ASME Section XI should be adequate to detect leakage through the reactor coolant pressure boundary prior to the occurrence of extensive degradation. Aggressive investigative and evaluation practices as dictated by the previously mentioned programs should ensure appropriate response to the discovery of circumferential cracking, including expansion of NDE scope to include "like locations," and should provide adequate protection against the occurrence of rupture of and/or gross reactor coolant pressure boundary leakage, thus satisfying applicable regulatory requirements.

Duke Energy's Regulatory Commitments Made in Response to NRC BL 2004-01

Duke Energy will implement the following inspection program for the Catawba, McGuire, and Oconee Alloy 82/182/600 pressurizer penetrations and steam space piping connections addressed by NRC Bulletin 2004-01 at the next and each subsequent refueling outage.

- Bare metal visual inspection around 100% of each Alloy 600 penetration and each Alloy 82/182 weld, except those penetrations subject to volumetric or surface ISI during that RFO;
- Bare metal visual inspection of the gap between the manway cover and pressurizer manway for evidence of manway diaphragm plate seal weld leakage (for Catawba and McGuire only); and

The bare metal visual inspections will be conducted by personnel qualified to perform VT-2 inspections according to ASME code

- Inspection results will be documented according to applicable procedures;
- Evidence of leakage will be addressed in accordance with the Boric Acid Corrosion program, including evaluation by engineering to determine extent of condition, applicability to other locations.

Engineering will evaluate evidence of leakage to determine cause and extent of condition. The station corrective action program will be utilized to evaluate the need for additional NDE methods and increased inspection scopes, including like locations and other Duke units.