EDO Principal Correspondence Control

FROM: DUE: 07/10/03 EDO CONTROL: G20030298
DOC DT: 05/30/03
FINAL REPLY:

David Lochbaum
Union of Concerned Scientists

TO:

Travers, EDO

FOR SIGNATURE OF : ** GRN ** CRC NO:

Collins, NRR

DESC: ROUTING:

2.206 - Watts Bar Nuclear Plant - Reactor Coolant System Stainless Steel Cladding Defects Demand for Information

Travers
Paperiello
Kane
Norry
Dean
Burns
Congel, OE
Caputo, OI
Reyes, RII
Skay, NRR
Goldberg, OGC

DATE: 06/06/03

ASSIGNED TO: CONTACT:

NRR Collins

SPECIAL INSTRUCTIONS OR REMARKS:

Template: EDO-001

E-RIDS: EDO-01

Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

May 30, 2003

Dr. Willam D. Travers, Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Watts Bar Nuclear Plant – Petition Pursuant to 10 CFR 2.206 – Reactor Coolant System Stainless Steel Cladding Defects Demand for Information

Dear Dr. Travers:

Pursuant to §2.206 of Title 10 of the Code of Federal Regulations, the Union of Concerned Scientists (UCS) petitions the Nuclear Regulatory Commission (NRC) to take enforcement action against the Tennessee Valley Authority (TVA), the licensee for the Watts Bar Nuclear Plant. Specifically, UCS seeks enforcement action in the form of a Demand for Information (DFI) that would require TVA to provide the NRC with information about possible corrosion of the reactor coolant pressure boundary (RCPB) at the Watts Bar Nuclear Plant due to defects in the stainless steel cladding applied to the interior surface of the carbon steel reactor pressure vessel. It is necessary for the NRC to obtain and review this information to assure safe operation of the nuclear plant. In addition, this information will assist the NRC staff in making risk-informed decisions about RCPB problems at other nuclear power plants.

Section 5.2.3.2 of the Watts Bar Updated Final Safety Analysis Report begins with the following paragraph:

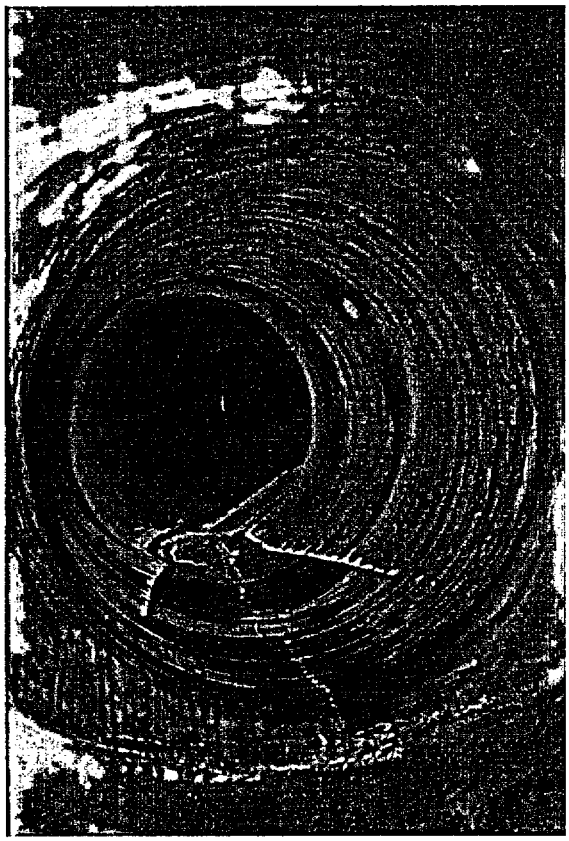
> 5.2.3.2 Compatibility With Reactor Coolant
>
> All of the ferritic low alloy and carbon steels which are used in pressure retaining applications are provided with corrosion resistant cladding on all surfaces that are exposed to the reactor coolant. This cladding material has a chemical analysis which is at least equivalent to the corrosion resistance of Types 304 and 316 austenitic stainless steel alloys or nickel-chromium-iron alloy, martensitic stainless steel and precipitation hardened stainless steel. Ferritic low alloy and carbon steel nozzles are safe ended with either stainless steel wrought materials, stainless steel weld metal analysis A-7, or nickel-chromium iron alloy weld metal F-Number 43. The latter buttering material requires further safe ending with austenitic stainless steel base material after completion of the post weld heat treatment when the nozzle is larger than a 4 inch nominal inside diameter and/or the wall thickness is greater than 0.531 inches.

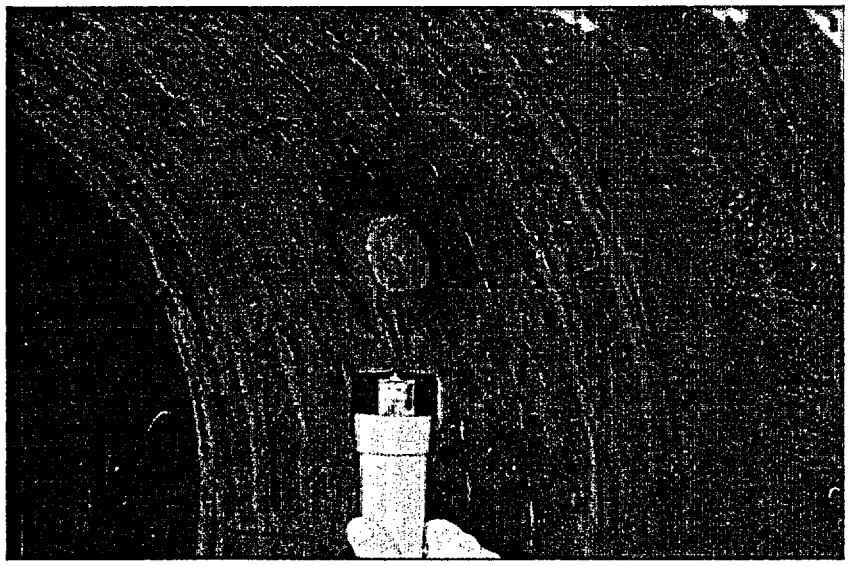
The carbon steel reactor pressure vessel at Watts Bar was coated with stainless steel to provide the corrosion resistance against the borated water used as reactor coolant. But as the photographs on the next two pages clearly illustrate, defects in the stainless steel coating for the cold leg nozzles permit direct and constant exposure of the carbon steel reactor pressure vessel to corrosive borated water.

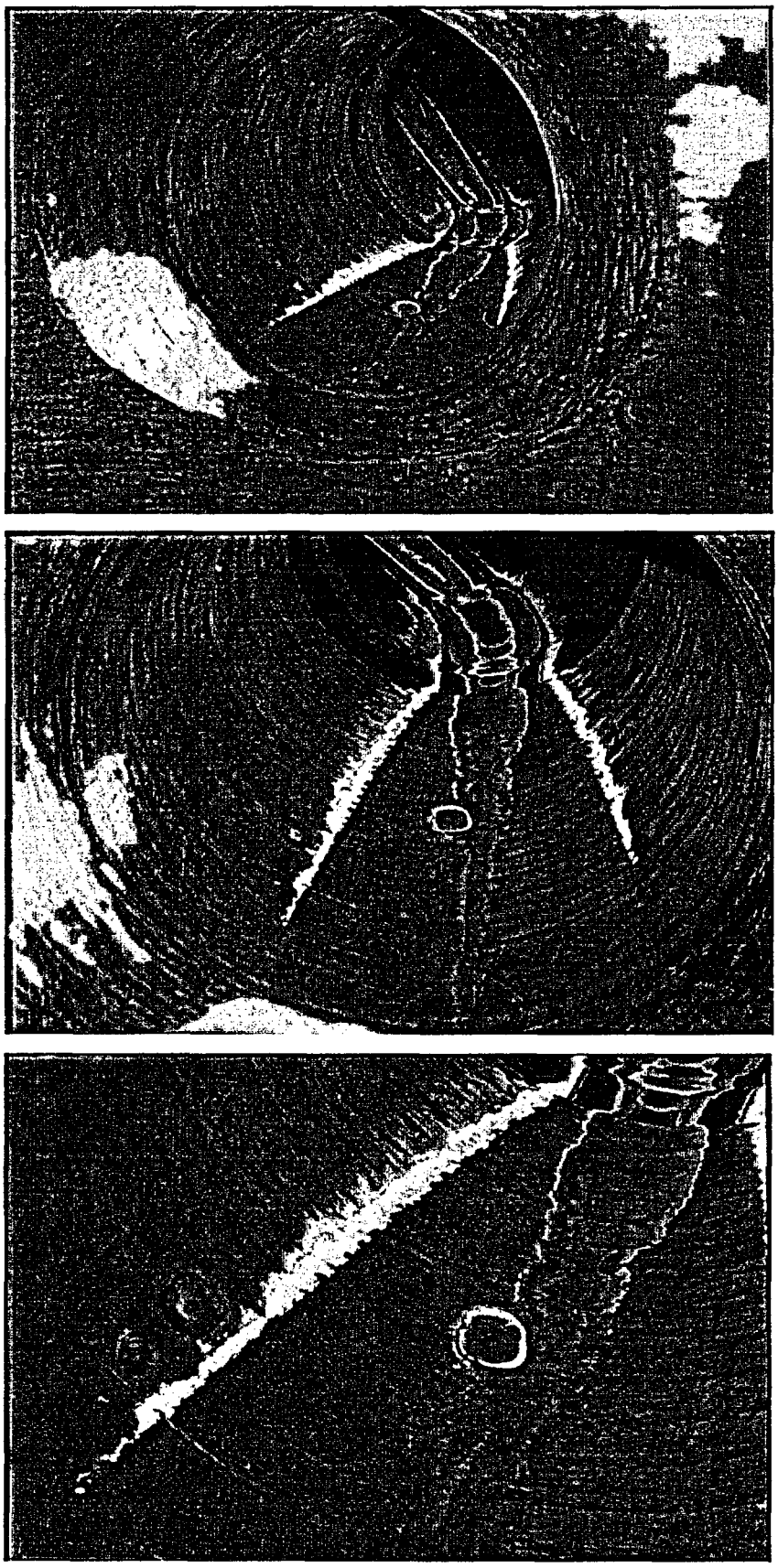
Washington Office: 1707 H Street NW Suite 600 • Washington DC 20006-3919 • 202-223-6133 • FAX: 202-223-6162
Cambridge Headquarters: Two Brattle Square • Cambridge MA 02238-9105 • 617-547-5552 • FAX: 617-864-9405
California Office: 2397 Shattuck Avenue Suite 203 • Berkeley CA 94704-1567 • 510-843-1872 • FAX: 510-843-3785

EDO --G20030298

Looking into the cold leg piping of reactor coolant loop #2 showing defect in the stainless steel cladding at the approximate one o'clock position.







Looking into the cold leg piping of reactor coolant loop #3 showing a defect in the cladding at the approximate six o'clock position.

The NRC is, or was, aware of these cladding defects. Page 5-4 of the NRC's original Safety Evaluation Report issued in June 1982 for the Watts Bar Nuclear Plant reported:

> General corrosion of all materials, except carbon and low alloy steel, is negligible. There are small unclad low alloy steel surfaces exposed to reactor coolant in the Watts Bar Unit 1 reactor vessel inlet nozzles. For this material in this environment, the corrosion rate data show the required use of reinforcements for nozzles has not been violated when considering the maximum cross sectional area of the grind outs, including the maximum depth of penetration as a result of corrosion. Inservice inspection is not required because experience, to date, shows the corrosion rates in this reactor coolant environment will not be of concern.

One might question why so much effort expense went to applying stainless steel cladding to the interior surface of the reactor pressure vessel if "corrosion rates in this reactor coolant environment will not be of concern." But whatever the answer to this apparently rhetorical question, operation of the plant with these cladding defects is within the Watts Bar licensing basis.

The NRC accepted the defects in the stainless steel cladding on the cold leg nozzles of the Watts Bar reactor pressure vessel and stated: "Inservice inspection is not required because experience, to date, shows the corrosion rates in this reactor coolant environment will not be of concern." That 'date' was 1982.

Curiously, when defects were later discovered in the stainless steel cladding of another carbon steel component within the reactor coolant pressure boundary at Watts Bar, it was <u>not</u> deemed permissible to leave them as-is. The component this time was the Safety Injection Accumulator Tank No. 3, with the problem found in the tank's stainless steel cladding next to a sample line nozzle. In its Safety Evaluation Report dated November 30, 1993, the NRC reported "TVA decided to finish the weld repair of the excavated areas by adding at least one layer of stainless steel weld material." So, the Watts Bar licensing basis nine years later required repair of defects in the stainless steel cladding for carbon steel components of the reactor coolant pressure boundary.

On August 3, 2001, the NRC issued Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Head Penetration Nozzles" to all pressurized water reactor licensees requiring them to supply information, in accordance with 10 CFR 50.54(f), on the condition of another reactor coolant pressure boundary component, the control rod drive mechanism (CRDM) nozzles. The NRC issued this bulletin following the discovery of CRDM nozzle cracking at the Oconee nuclear plant.

On August 9, 2002, the NRC issued Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs," to all pressurized water reactor licensees requiring them to undertake inspections of yet another reactor coolant pressure boundary component and provide the NRC with information on its condition. The NRC issued this bulletin following the discovery of significant corrosion of the carbon steel reactor pressure vessel head at the Davis-Besse by boric acid.

By these bulletins, the NRC required inspections and information above and beyond the current licensing basis. The NRC determined these requests were needed to protect public health and safety because of degradation in previously unexpected locations and/or at unexpectedly high rates. UCS believes the NRC should make a similar request of the Watts Bar licensee. Because the issue is confined to a single PWR instead of the entire PWR fleet, a Demand for Information as requested by UCS via this petition rather than a Bulletin is the appropriate means for the NRC to assure public health and safety. It might turn out that the defects in the stainless steel cladding on the reactor pressure vessel cold leg nozzles do not pose an undue challenge to reactor coolant pressure boundary integrity, but its prudent to revisit the issue in light of corrosion rate experience available today that was not available 21 years ago. If it turns out that the cladding defects do pose an undue challenge to reactor coolant pressure boundary integrity, now is the time to remedy the problem.

The Demand for Information sought by UCS via this petition:

1. The 1982 determination by TVA and NRC that the unprotected portions of the carbon steel reactor pressure vessel cold leg nozzles would not be exposed to excessive corrosion may not still be applicable in light of recent information about corrosion rates. **Has TVA updated the basis for its decision not to repair the cladding defects to verify that safety margins remain intact when recent experience and knowledge about corrosion causes and rate is considered? If so, what is that updated basis? If not, what is TVA's rationale for continuing to operate Watts Bar?**

2. The NRC's 1982 Safety Evaluation Report accepted the defects in the stainless steel cladding of the reactor pressure vessel cold leg nozzles without requiring inservice inspections. Although not required by the NRC, TVA may have voluntarily examined one or more of the defects. **Has TVA inspected any of the cold leg nozzle cladding defects? If so, when were the inspections conducted and what are the results from the inspections? If not, what are TVA's plans for future inspections of these known cladding defects?**

3. Watts Bar had its initial startup in the mid 1990s. Thus, the reactor never operated without portions of the carbon steel reactor pressure vessel cold leg nozzles being directly exposed to borated water. Consequently, reactor water chemistry information is unavailable for periods before and after the carbon steel became exposed. Nevertheless, reactor water chemistry data since startup may provide insight on potential corrosion of the carbon steel reactor pressure vessel. **What are the data for pertinent reactor water chemistry parameters (e.g., iron concentrations) since startup? Do the chemistry data indicate potential corrosion of the exposed carbon steel nozzle areas?**

4. The cladding defects are explicitly described in the NRC's 1982 Safety Evaluation Report, but are not mentioned at all in Section 5.0 of TVA's Updated Final Safety Analysis Report for Watts Bar. **Why are the defects mentioned in the SER but not in the UFSAR?**

UCS petitions the NRC to demand that TVA provide this information because recent experience challenges the validity of the 1982 determination to leave gaping holes in the stainless steel cladding on the cold leg nozzles of the carbon steel reactor pressure vessel. There are reasons why that 21-year-old decision may still be valid: the low oxygen levels of the reactor coolant, the high flow rate past the cladding defects, and the relatively lower boron concentration level of water in the reactor vessel compared to water in the safety injection accumulator tanks. But there are also reasons why that old decision may no longer be valid: Watts Bar's history prior to startup in the mid 1990s probably involved longer periods of non-operation with reactor water having higher than expected oxygen levels at lower than expected flow rates and corrosion rates in general have turned out to be faster than predicted.

By obtaining this information from TVA, the NRC can assure public health and safety as it did with the information requested via Bulletins 2001-01 and 2002-02. Not only will this information help the NRC assure appropriate safety levels at Watts Bar, but information on corrosion rates of unprotected carbon steel will aide the NRC in its decisions about the bottom head penetrations at South Texas Project. No doubt it will also help the NRC with decisions about degraded reactor coolant pressure boundary components at other plants in the future.

UCS requests that the NRC: (a) provide UCS with copies of all correspondence sent to TVA regarding this petition and the subject cladding defects at Watts Bar, (b) provide UCS with advance notice of all public meetings conducted by the agency with TVA regarding this petition and the subject cladding defects, (c) provide UCS with an opportunity to participate in all relevant phone calls[1] between NRC staff and TVA regarding this petition and the subject cladding defects at Watts Bar, and (d) provide UCS with copies of all correspondence sent to Members of Congress and/or industry organizations (e.g., the Nuclear Energy Institute, the Electric Power Research Institute, the Institute for Nuclear Power Operations, etc.).

Sincerely,

David A. Lochbaum

David Lochbaum
Nuclear Safety Engineer
Washington Office

[1] By 'relevant phone calls," UCS means phone calls between more than one member of the NRC staff and the licensee where this petition or the subject cladding defects are on the agenda. UCS does not mean phone calls where the matter comes up during another phone call off the scheduled agenda or phone calls where an NRC staffer discusses schedular/process matters regarding the petition with TVA. UCS's intent is to maintain awareness of technical discussions between the NRC staff and TVA on this matter.