



U.S. Nuclear Regulatory Commission Meeting with Nuclear Energy Institute and Material Reliability Program

*Wednesday, August 15, 2001
9:00 a.m. - 11:00 a.m.
Room: T-2B3*

Purpose: To discuss NRC expectations with regard to licensee responses to Bulletin 2001-01.

Success: NEI and MRP have a clear understanding of NRC's expectations with regard to what will constitute an acceptable bulletin response.

Introduction:	Jake Zimmerman/ Sam Collins	9:00 a.m. - 9:15 a.m.
Opening Remarks:	Jack Strosnider	9:15 a.m. - 9:35 a.m.
Discussion of Risk Assessment:	Mark Caruso	9:35 a.m. - 10:00 a.m.
Discussion of Technical Issues:	Allen Hiser	10:00 a.m. - 10:15 a.m.
Summary of Issues:	Jack Strosnider	10:15 a.m. - 10:25 a.m.
Closing Comments:	NRC/NEI/MRP	10:25 a.m. - 11:00 a.m.

Additional information on Generic Activities on PWR Alloy-600 Weld Cracking may be found on the NRC web site at <http://www.nrc.gov/NRC/REACTOR/ALLOY-600/index.html>.

The NRC staff will be available immediately following the meeting to speak with members of the public.

**NRC BULLETIN 2001-01:
CIRCUMFERENTIAL CRACKING OF RECTOR PRESSURE
VESSEL HEAD PENETRATION NOZZLES**

NRC PERSPECTIVES

August 15, 2001

**Jack Strosnider, Director
Division of Engineering
U.S. NRC**

MAINTAINING SAFETY

- C ADDITIONAL INFORMATION IS NECESSARY TO ASSESS THE POTENTIAL SAFETY SIGNIFICANCE OF THIS ISSUE AND PROPOSED LICENSEE ACTIONS**

- C PURPOSE OF THE BULLETIN IS TO COLLECT INFORMATION TO DETERMINE IF ADDITIONAL REGULATORY ACTION IS NECESSARY**

- C INFORMATION PROVIDED TO DATE DOES NOT PROVIDE A SUFFICIENT TECHNICAL BASIS TO SHOW THAT CONDITIONS ADVERSE TO QUALITY ARE BEING EFFECTIVELY MANAGED**

REDUCING UNNECESSARY REGULATORY BURDEN

- C INFORMATION REQUEST IN THE BULLETIN WAS MINIMIZED**

- C MANAGING THIS ISSUE WILL REQUIRE ADDITIONAL RESOURCES**

- C ADDITIONAL CRACKING SHOULD BE ANTICIPATED**

- C INSPECTION, ASSESSMENT, AND REPAIR METHODS MUST BE DEVELOPED TO MANAGE THIS ISSUE**

IMPROVING EFFICIENCY & EFFECTIVENESS

c WILL SUPPORT GENERIC APPROACHES

c COMMUNICATIONS IS THE KEY

INCREASING PUBLIC CONFIDENCE

C LICENSEE RESPONSES MUST PROVIDE CREDIBLE TECHNICAL BASES TO SUPPORT THEIR PROPOSED ACTIONS

C NRC WEB SITE

APPLICABLE REGULATORY REQUIREMENTS

! 10 CFR 50.55a - References Section XI of ASME B&PV Code

- <
- < **Code inspections are not adequate (insulation, VT-2) to satisfy Appendix B**
- <
- < **Code flaw disposition criteria are acceptable - need size and crack growth rate**

! Plant Technical Specifications

- <
- < **Do not permit reactor coolant pressure boundary leakage**
- <
- < **Because of no reasonable expectation - Exercise of Enforcement Discretion for Summer & Oconee**
- <
- < **2nd occurrence of leakage at same site - may be subject to enforcement action**
- <
- < **leakage at other sites - may be subject to enforcement action**

! Criterion XVI - Corrective Action (Appendix B to 10 CFR Part 50)

- <
- < **Conditions adverse to quality are promptly identified and corrected**
- <
- < **Determine cause of condition and corrective action to preclude repetition**

Mark A. Caruso
Probabilistic Safety Assessment Branch, NRR

! Apply principles of risk-informed regulation (Regulatory Guide 1.174)

S continue to meet current regulations

S maintain defense-in-depth philosophy

S maintain sufficient safety margins

S demonstrate that any increase in risk is small

S monitor the change

! Additional Guidance:

S Standard Review Plan Chapter 19

S staff reviews of previous risk-informed proposals (e.g., Farley, ANO-2 steam generator tube inspections)

! Key Technical Issues

- S potential for rupture**
- S accident sequence analysis (e.g., LOCA)**
- S availability of mitigating systems**
- S performance of equipment and operators**
- S containment performance**
- S treatment of uncertainties in data and methods**

**NRC BULLETIN 2001-01:
CIRCUMFERENTIAL CRACKING OF
REACTOR PRESSURE VESSEL HEAD PENETRATION NOZZLES:
TECHNICAL ISSUES**

Allen Hiser

**US Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Engineering
Materials and Chemical Engineering Branch**

Public Meeting with Industry

August 15, 2001

PROBABILISTIC FRACTURE MECHANICS EVALUATIONS

- ! Initial flaw distribution
 - < Multiple initiation sites
- ! Residual stresses as crack propagates
- ! Crack growth rate - what is the proper environment ??
- ! Through-wall or part through-wall ??

UNDERSTANDING CRACK PROGRESSION

- ! **Weld/HAZ/base metal cracking**
- !
- < **Initiation time**
- < **Controlling parameters (weld characteristics, microstructure, residual stresses, etc.)**
- < **Crack growth rate**
- <
- ! **Annulus conditions**
- Leak rate from weld/HAZ/base metal cracking**
- < **Chemistry in annulus**
- < **Temperature in annulus**
- < **Ability for leakage deposits to flow up the annulus**

- ! **Above-the-weld cracking**
- < **Initiation time**
- < **Multiple initiation sites**
- < **Residual stress levels as crack propagates**
- < **Crack growth rate (what is the proper environment ??)**
- < **Through-wall or part-through wall ??**

QUALIFICATION OF EXAMINATION METHODS

! VT-2 Visual Examination Qualification

- < Capable of detecting small amounts of boric acid deposits and discriminating deposits from VHP nozzle and other sources
- < Appropriate for Moderate Susceptibility Plants (33 total) - PWSCC of nozzles not likely in short term, but could occur

! Plant-Specific Visual Examination Qualification

- < Plant-specific demonstration that VHP nozzle cracks will lead to deposits on the RPV head (interference fit measurements, etc.)
- < Must be capable of reliable detection and source identification of leakage (insulation, pre-existing deposits, other impediments)
- < Appropriate for High Susceptibility Plants (7 total) - PWSCC of nozzles likely to occur in the near term

! Volumetric Examination Qualification

- < Demonstrated capability to reliably detect cracking on the OD of VHP nozzles
- < Appropriate for plants that have identified cracking (5 total) - PWSCC of nozzles is a documented occurrence
- < Default if Visual Examination cannot be Qualified
- < Applies for any plant finding leakage

QUALIFICATION OF OTHER EXAMINATION METHODS

- ! Eddy current testing**
 - < Scope of inspection (e.g., J-groove weld, nozzle OD below the weld, nozzle ID)**
 - < Detection of tight PWSCC cracks (European experience with pipe cracks)**

- ! Other surface methods**
 - < Penetrant testing**

- ! Qualification packages for head visual examinations**