

# Top Nozzle Screw Fracture Update

Meeting With USNRC

February 28, 2000

- Introduction
- TN Screw Status Update
- Conditional Acceptance Option
- WOG Perspective

D. Rowland

D. Rowland

J. Galembush

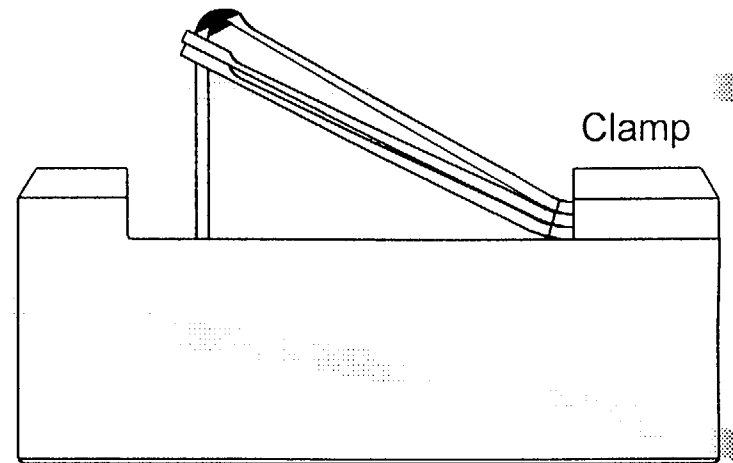
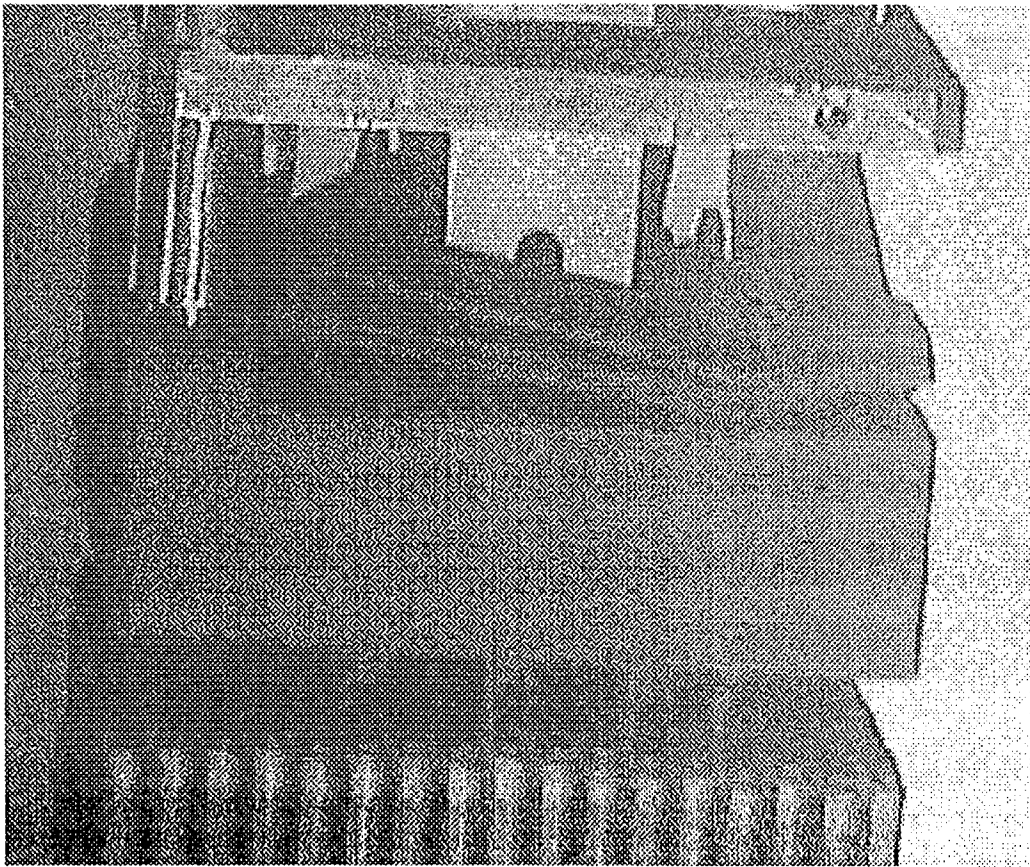
S. Ferguson

# Top Nozzle Screw Fracture Update Introduction

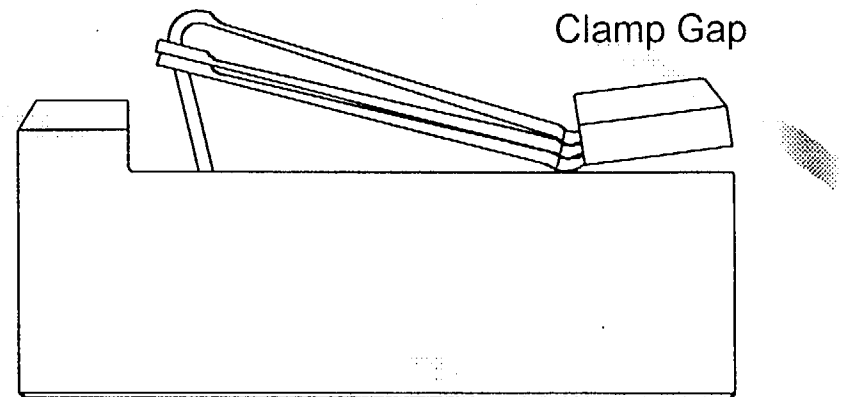
## Purpose:

- Follow-up to Dec 1999 update meeting on screw fractures.
- Closeout root cause analysis.
- Update on margin enhancements.
- Update on Spring 2000 outage preparation.
- Describe conditional acceptance option.

# Description

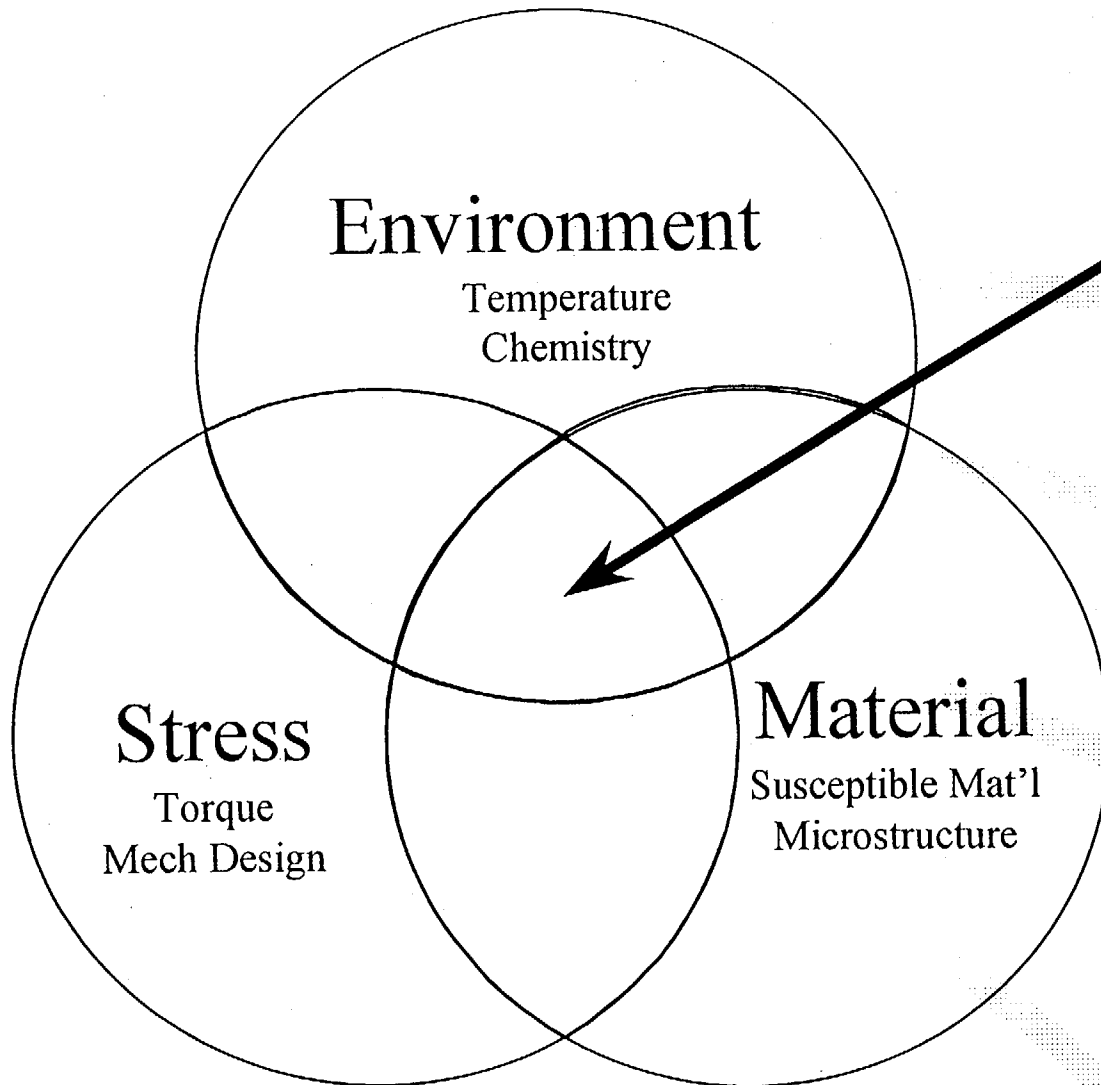


Normal Condition

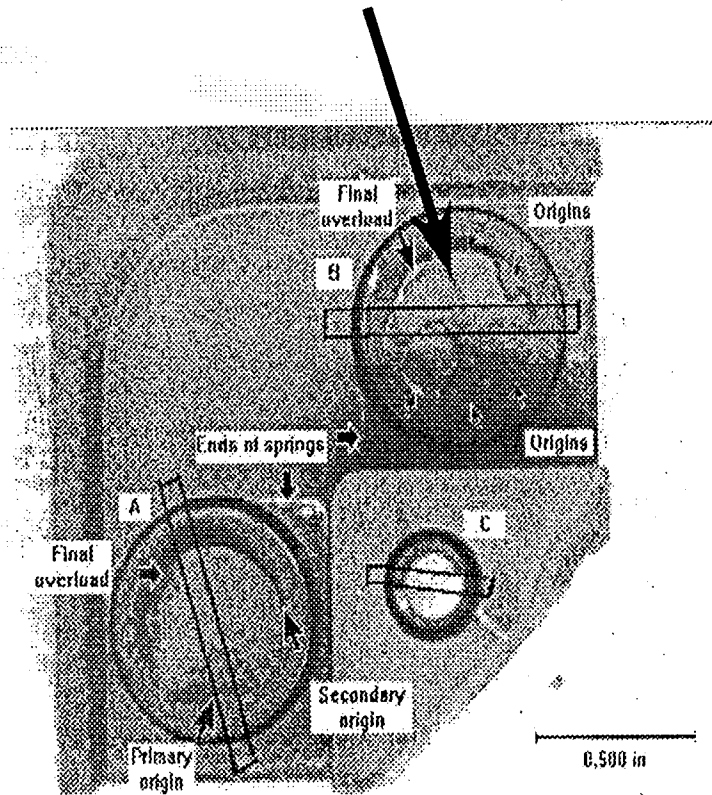


Abnormal Condition 3

# Fracture Mechanism: Primary Water Stress Corrosion Cracking



PWSCC requires combination of three conditions



# Root Cause Investigation

a, c



2/28/00

5

7/15/99

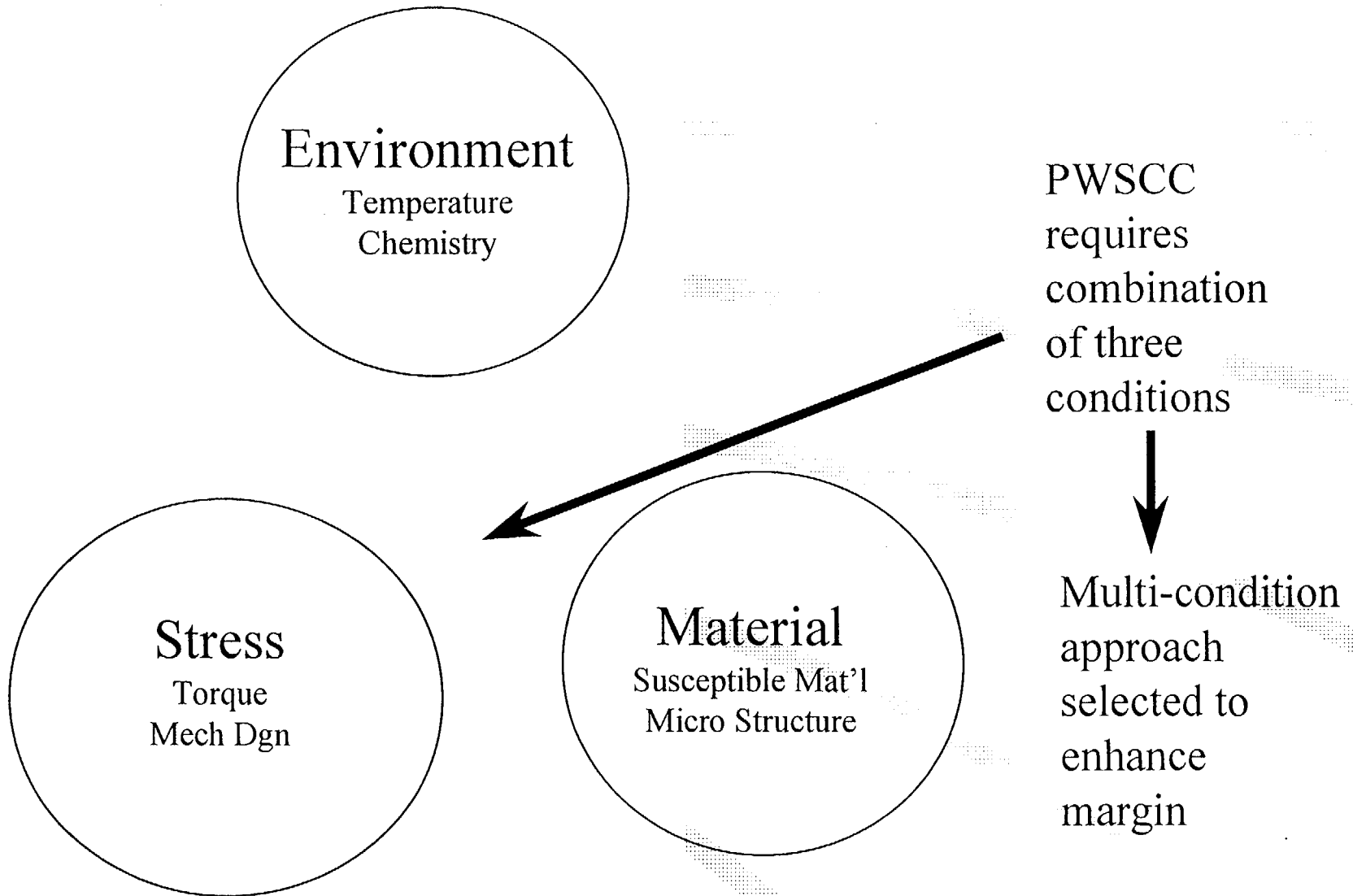
# Fall Inspection Results

- Repair activities have not affected critical path.
- Approximately 1200 fuel assemblies were inspected during the fall [ ] a, b, c.
- New spring screw inspection technique provided greater discrimination of fractures compared to visual exams.
- Key Fall inspection observations:
  - Fractures identified in fuel built prior to window
  - Fractures observed in a 14x14 region
  - No fractures detected in susceptible region at a 17x17 plant
  - No fractures observed in 1X fuel [ ] a, b, c
  - No fractures observed in 1X, 2X, or 3X fuel at a 14 foot design plant [ ] a, c

# Root Cause Results

- Material [ ] a, b, c identified as the key root cause:
  - [ ] a, b, c
  - [ ] a, b, c
- Variations in alloy 600 heat performance expected (and observed)
- Root Cause Report issued as WCAP-15356 (Proprietary), Dec. 1999.

# Margin Enhancements Implemented





# Top Nozzle Joint Margin Enhancement Strategy



# Safety Assessment: Low Safety Significance

- All parts remain captured on top nozzle
- FA remains engaged in alignment pins
  - Inspections of internals and assemblies show no unusual wear conditions
- RCCA movement unaffected
- Handling tools assessed
  - latching problems reported on 3 fuel assemblies
- Accident conditions acceptable
- Nuclear Safety Advisory Letter (NSAL-99-004, May 1999) documents low safety significance

# Alloy 600 Heat Performance



# Spring 2000 Outage Examinations Will Provide Key Information on Heat Performance



a, c

# Top Nozzle Screw Fractures: Actions

- Outage Plans:
  - Anticipate screw fractures in [ ] a, c.
  - Identify plant-by plant contingency plans in advance:
    - Repair.
    - Core redesign w/ acceptable replacement fuel.
    - Conditional acceptance.
  - Review and apply, as needed, available W documents on inspection, operation, & safety.
- New Fuel Deliveries:
  - [ ] a, c.
  - [ ] a, c.

# Top Nozzle Holddown Spring Screw Fractures Summary

- Root cause investigated & identified
- Corrective actions implemented
- Additional margin being pursued
- Options identified to minimize impact & manage the issue on older fuel

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# F/A Top Nozzle Holddown Spring Screw Fracture Safety Assessment Review

- Westinghouse 10 CFR Part 21 Evaluation
  - Completed on June 21, 1999.
  - No Substantial Safety Hazard.
  - Nuclear Safety Advisory Letter (NSAL) Published on May 11, 1999.
- Nuclear Safety Advisory Letter 99-004
  - Formal Licensee Notification of the Issue.
  - No Substantial Safety Hazard Determination.
  - Safety Assessment / JCO Provided.
  - NSAL 99-004 Remains Applicable Today.



# Fuel Reinsertion Licensing Option

- Two Options Previously Available for F/A's With Fractured Screws:
  - Discharge from the core.
  - Repair and reuse.
- With WOG support, Westinghouse developed another option for further flexibility:
  - Permits conditional acceptance of assemblies with fractured screws, provided design and safety criteria are met.
  - Expected to be applied on a plant specific basis depending on the situation.
  - WOG participated in review of safety evaluation.
  - Available for Spring 2000 outage plants.

# Key Design & Safety Criteria to Support Fuel Reinsertion Option

- Visual inspection of [ ]<sup>a, b, c</sup>.
  - No clamp gaps [ ]<sup>a, b, c</sup> permitted for re-inserted assemblies.
  - Ensures all parts are secured to the top nozzle.
  - Ensures no operation or handling concerns.
  - Conservatively bounds field observations and test results.
- A loose parts assessment will be performed as part of the safety evaluation to ensure that the specific nozzle design has been evaluated.
- Plant specific assessments are required to address potential effects on reactor internals holddown spring, Seismic, & LOCA forces.
- Licensee tracks non-conforming condition in its internal deficiency tracking system as per Generic Letter 91-18, Revision 1.

# F/A Top Nozzle Holddown Spring Screw Fracture Acceptance Option Safety Evaluation

- Westinghouse Generic Safety Evaluation
  - Meets 10 CFR 50.59 Criteria.
  - Uses Westinghouse Integrated Safety Evaluation (ISE) Process.
  - Primary Focus of the ISE is in the Following Areas:
    - › Potential for Loose Parts
    - › RCCA Insertion
    - › Reactor Internals & Fuel Assembly Holddown Forces
    - › Fuel Handling Accident

# F/A Top Nozzle Holddown Spring Screw Fracture Re-Use Option Safety Evaluation

- Plant Specific Safety Evaluation
  - Performed by Westinghouse on an “As-Requested” Basis.
  - Meets 10 CFR 50.59 Criteria.
  - Uses Plant Specific Design Parameters.
  - Uses the Generic Safety Evaluation as a Blueprint.

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# WOG Perspective

- Initial Potential Issue (PI) Core Team contact - 4/99.
- Fuel Working Group (FWG) included for technical support.
- PI Core Team/FWG reviewed NSAL 99-004 - 5/99.
- FWG was directly involved in the Root Cause Evaluation.
- Westinghouse requested WOG review of Safety Evaluation for use of fuel assemblies with fractured screws.

# WOG Perspective

- PI Core Team chairman formed task team for SECL review.
- Utilities included:
  - FP&L, UNICOM, Virginia Power, WCNOG
  - WEP, NEU, PSE&G
- Task team participation included:
  - Review/comment on SECL drafts
  - Review/comment on Operations Flow Chart

# WOG Perspective

- WOG views conditional acceptance of fuel assemblies with fractured spring screws as an acceptable option.
- WOG is providing consistent guidance for utility implementation of this option.



# Top Nozzle Screw Fracture Update Discussion Summary

- Follow-up to Dec 1999 update meeting on screw fractures.
- Closeout root cause analysis.
- Update on margin enhancements.
- Update on Spring 2000 outage preparation.
- Describe conditional acceptance option.