

CONTROL ROOM HABITABILITY IN THE UNITED STATES



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Presentation Covers



- Control Room Habitability 1980 – Present
- NRC/Industry Efforts to Address Control Room Habitability (CRH)
- Issuance of Generic Letter (GL) 2003-01 and Associated Regulatory Guide
- Industry's Response to GL 2003-01
- Future Actions

Control Room Habitability In the 1980's



- Heighten Emphasis Due to TMI-2 Accident
- TMI Action Item III.D.3.4 issued in NUREG- 0737
- Licensee Responses to III.D.3.4
- ACRS Concerns About III.D.3.4 Responses
- NRC CRH Survey (NUREG/CONTROL ROOM-4960)
- De-emphasis Period

TMI Accident



- Radioactivity in the Control Room
- Operators on Self-contained Breathing Apparati

TMI Action Item III.D.3.4



- Position:
 - Control Room Operators Protected Against Radiation & Toxic Gases
 - Nuclear Reactor Operated Safely & Shutdown Under DBA Conditions

III.D.3.4 Requirements



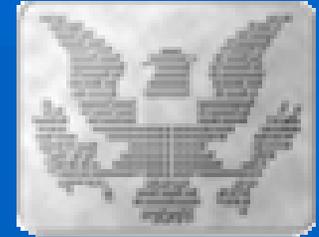
- Responses Required from All Licensees:
 - Analysis of Impact of Toxic Gas Accident (Onsite & Sources within 8 km)
 - Analysis of Control Room Operators' Doses from Radiological Accidents (LOCA & Other DBAs)

Advisory Committee on Reactor Safety (ACRS) Concerns



- Issues Were:
 - Licensee's Responses to III.D.3.4
 - Adequacy & Independence of Staff's Review of Control Rooms
 - Absence of Testing Protocol for Control Room HVAC Systems
 - Inability of Fire Dampers to Prevent Spread of Smoke & Other Combustion Byproducts

NRC Staff Response to ACRS Concerns



- CRH Working Group
- Initial 3 Plant Survey 1984 (NUREG/CONTROL ROOM-4191)
- Extensive 12 Plant Survey (NUREG/CONTROL ROOM-4960)
- Recommendations

Findings of NUREG/CONTROL ROOM-4960



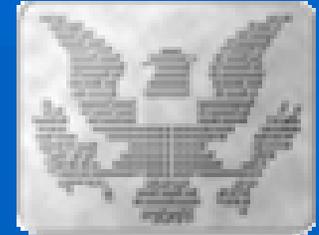
- CRH Systems Operated Inconsistently with Design Basis & Safety Evaluation
- Systems Not Constructed to Their Design Basis
- Systems Operating Outside Design Basis

CRH Systems Operated Inconsistently with Design Basis & Safety Evaluation



- Examples:
 - Toxic Gas Mode of Operation Involved Pressurization Rather Than Isolation of Control Room Envelope (CRE)
 - Emergency Operating Mode with Both Normal & Emergency Control Room HVAC Systems Operating (Increased CRE Inleakage with 2 Fans)

CRH Systems Operated Inconsistently with Design Basis & Safety Evaluation



- Examples:
 - Two Emergency Recirculation HVAC Systems Operated
 - Room with HVAC Systems More Negative
 - Potential Inleakage Greater Than Analysis
 - CRE Envelope Pressurized Due to Leaking Dampers with Dampers Actually Closed

Systems Not Constructed to Their Design Basis



- Examples:
 - Discrepancies in the Types and Number of Dampers
 - Different Quality
 - Not Redundant

Systems Operating Outside Design Basis



- Examples:
 - Systems Susceptible to Single Failures
 - Inadequate Control Room Cooling
 - Unrecognized Interactions Between Adjacent Areas & CRE
 - Inleakage Due to Integrity Issues of Ductwork, Fans or Dampers
 - Negation of Design Analysis Due to System Flow Rates Discrepancies
 - Absence of Toxic Gas Monitoring During Radiological Emergency Mode of Operation
 - Impact of Fire Suppressant Chemicals Within & In Areas Adjacent to CRE

Other NUREG/CONTROL ROOM- 4960



Findings

- Technical Specifications:
 - ΔP to Atmosphere Instead of to Adjacent Areas
 - Laboratory Tests of Charcoal
 - Conducted at Inappropriate Temperature and RH Conditions
 - Acceptance Criterion Lower Than Value Assumed in Accident Analysis or Based Upon No Safety Factor
 - Acceptance Criteria for In-place Tests of Charcoal & HEPA filters Inconsistent with Licensing Basis Assumptions

Other NUREG/CONTROL ROOM- 4960



Findings

- Procedures:
 - Inconsistent with Safety Evaluation
 - Flow Rates Not Verified
 - Pressurization Test Conducted with Outside Intake Damper Closed
 - No Isolation of Control Room Intake on High Radiation Alarm
 - No Requirement to Don SCBAs in the Event of a Cl₂ Release

Other NUREG/CONTROL ROOM- 4960



Findings

- Procedures: (cont.)
 - Inconsistent with Safety Technical Specifications
 - Control Room 10 Hour Test Conducted with Normal Ventilation System Operating & Providing Supplemental Cooling

NUREG/CONTROL ROOM-4960

Recommendations



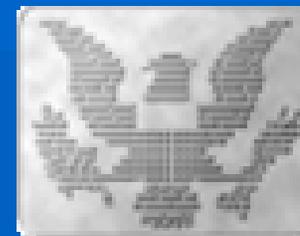
- Individual Plant Evaluations of System Design, Technical Specifications & Procedures
- Clarification & Updating of Regulatory Guides, SRPs, STS & ANSI N509 & N510 Standards

Generic Letter



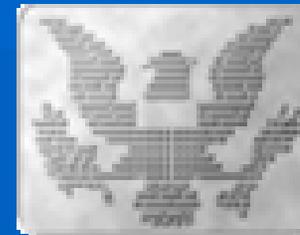
- 1998 – 1992 Y De-emphasis period on CRH and first ASTM E741 Testing of CRE – Zion (339 cfm)
- 1992 – 1998 Y 8% of CRE's tested with largest Inleakage (4300 cfm)
- July 1998 Y Joint NRC & Industry Workshop
 - CRH Issues
 - Regulatory Requirements
 - Accident Dose Assessment
 - ASTM E741 Testing
 - Industry Experiences

Generic Letter



- August 1998 – December 2000
 - Joint meetings Y unable to reach consensus
 - NRC plans to release a Generic Letter (GL)
- January 2001 – August 2002
 - NEI 99-03. Rev. 0 (industry guidance)
 - Draft GL & 4 Regulatory Guides Issued for Comment (i.e., Atmospheric Dispersion, Dose Assessment, Control Room Habitability and Demonstrating CRE Integrity)
 - 5 NRC Workshops on GL and Draft Regulatory Guidance

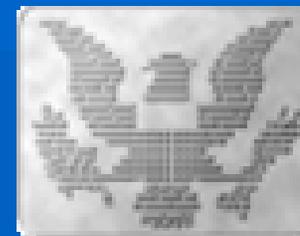
Generic Letter



- September 2002 – June 2003
 - Public Comments on Draft GL & Regulatory Guides Received
 - Rev 1 to NEI 99-03 Issued
 - GL 2003-01* & Regulatory Guides 1.192 – 1.195 Issued

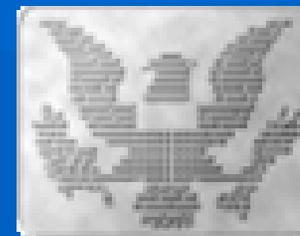
*At time GL issued, 30% of CREs tested, one met design basis value for inleakage

Generic Letter



- Generic Letter 2003-01 Requested Confirmation of:
 - Licensing Basis Consistent With System Design, Operation, Construction, and Performance
 - Facility's Control Room's Adherence to Regulatory Requirements
 - CRE's Inleakage Characteristics for Radiological, Hazardous Chemical & Fire Challenges Consistent with Licensing Basis

Generic Letter



- Generic Letter 2003-01 Requested Confirmation of:
 - Technical Specifications Verify CRE Integrity & Assumed Inleakage Rates of Potentially Contaminated Air
 - Use of Compensatory Actions & Schedule for Their Retirement
 - Confirmation of CRE Design to General Design Criteria (GDCs) draft GDCs or Principal Design Criteria

Generic Letter



- Generic Letter 2003-01 Required:
 - Response within 180 days unless ????
 - 60 Day Response Required
 - Alternative Course of Action
 - Schedule for the Alternative Course of Action
 - Basis for Acceptability of Alternative Course of Action

Current Status



- 85% of Reactors Have Tested Their CRE
- 84% Have Provided Complete Responses to GL

CRH Technical Specifications



- Existing Options
 - Appendix B, Regulatory Guide 1.196
 - TST-448
 - NRC Technical Specification in January 24, 2005 Letter to TSTF
- Problems
 - Formulation Inconsistent with Improved Standard Technical Specification
 - Linkage of Inoperability of Control Room Envelope to Control Room Emergency Ventilation System (CREVS) Inoperability

CRH Technical Specifications



- Appendix B, Regulatory Guide 1.196 Problems
 - Formulation Inconsistent with Improved Standard Technical Specification
 - Linkage of Inoperability of Control Room Envelope to Control Room Emergency Ventilation System (CREVS) Inoperability
 - Inconsistent Treatment of Allowable Outage Time (AOT) with Other Risk-Informed Technical Specification
 - Ambiguity between Inoperable CRE and 2 CREVS Trains Inoperable Due to Inoperable CRE Boundary
 - Disparity of Treatment of CREVs & CRE If Either is Inoperable

CRH Technical Specifications



- TSTF-448
 - Problems
 - Issues Similar to Appendix B, Regulatory Guide 1.196

CRH Technical Specifications



- TSTF-448
 - Fixes in January 24, 2005 Letter to TSTF
 - Limiting Condition for Operation (LCO) Defined as Control Room and not CREVS
 - Control Room OPERABLE Defined as 2 CREVS Trains & CRE OPERABLE
 - Recognition Inoperable CRE Does Not Render CREVS Inoperable
 - 30 Day AOT for Inoperable CRE
 - ΔP Surveillance Linked to System Design & E741 Test

Future Actions



- Resolve Control Room Habitability TECHNICAL SPECIFICATION Issues (e.g., Appendix B, Regulatory Guide 1.196 & TSTF-448)
- Assessment of GL Responses
- Request Additional Information Clarifying GL Responses
- Development of Temporary Instructions for Inspections
- Inspections
- Assessment of Overall Response to GL