Control Room Habitability

CRH TF / NRC Meeting
March 19, 2002

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Overview

- NEI 99-03
- Outstanding Issues
- Test Summaries
- Licensing Basis
- Technical Specifications
- Industry Concerns
- Industry Recommendations

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Attachment 2

Chronology

- March 1998 -- Initial NRC/NEI interface
- **July 1998 -- NRC/industry workshop**
- September 1998 -- Formation CRH TF and initial CRH TF/NEC meeting
- August 1999 -- First draft of NEI 99-03 provided to NRC
  - NRC requests fundamental revision
- **November 1999 -- Initial series of NRC/TF meeting on NEI 99-03 revision**
- Jan - June 2000 -- Monthly NRC/TF meetings on revision to NEI 99-03
- October 2000 -- TF provided NRC new revision of NEI 99-03 to NRC for comment
- **October 25, 2000 -- NRC determined that it was unlikely that complete closure would be achieved**
  - Five issues
  - Letter issued November 13, 2000
  - NRC to develop four regulatory guides
  - Pursue closure via public comment process
- December 2000 -- ACRS letter
  - Recommendations and Observations
- **June 2001 -- NEI 99-03 issued for licensee use**
- August 2001 – Industry Workshop
- Dec 2001 to Jan 2002 – DG-1111 and DG-1113 issued for public comment

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July 1998 NRC/Industry Workshop

- Identified concerns
  - Control room inleakage greater than assumed
  - Licensing Basis differ from as-built or as-operated
  - Design basis accident analyzed not the most limiting
  - Excessive smoke might impair reactor shutdown
  - Challenges to toxic gas evaluation
- NEI 99-03 now addresses all these issues

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CRH Task Force

- Created following July 1998 workshop
- Purpose
  - Develop voluntary guideline (NEI 99-03) to address concerns
  - Identify approaches using current methodologies and insights
  - Interface with NRC to develop mutually acceptable guidance
- Three subgroups
  - Licensing
  - Systems
  - Analysis
- Membership
  - Utilities
  - EPRI
  - Vendors
  - NEI

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NEI 99-03 Key Elements

- CR in-leakage (baseline test and periodic assessment)
- Toxic gas (reassessment and periodic evaluation)
- Smoke infiltration -- qualitative assessment
- Uses existing licensing basis
- Uses all current design basis accidents to identify most limiting analysis results
- CR as-built configuration and operating procedures assessment
- Considers current radiological dose analysis methods (TID and AST)
- Program to maintain CRH

Assures licensees comply with licensing basis

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CRH Program

- Periodic assessment
  - System material condition
    - Post maintenance testing
  - In-leakage challenges
  - Toxic gas challenges
- Configuration control
  - CRE barrier control
  - Procedure control
  - Design change control
  - Analysis change control
- Training

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CRH Program (continued)

- Recommended assessment frequency
  - Plant specific
  - Examples of 10 year intervals and 18 month intervals are provided
  - Test as appropriate
- Factors affecting assessment and test frequency
  - Number of potential in-leakage sources
  - Differential pressure margins
  - Margin of measured to design in-leakage
  - Plant system modifications

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ACRS Letter

- NRC and CRH TF brief ACRS -- December 6, 2000
  - ACRS December 14 letter
- Recommendations and Observations
  - Staff continue with development of regulatory guides
    - **Make liberal and extensive use of NEI 99-03**
  - Results of component test be validated by comparison with tracer gas tests of several control room configurations
    - **If acceptable correlation permit use of component testing for baseline test**
  - Frequency of periodic testing should be based on performance basis
  - Specific limit for allowed inleakage should be made part of plants licensing basis
    - **Technical specifications not necessary**
  - Potential radiation dose from design basis accident from adjacent or nearby plant should be included in CRH evaluations
  - NEI 99-03 provides a sound basis for maintain safe shutdown capabilities from external smoke events

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Outstanding Issues

- Test Methodology
  - Acceptability of component testing versus integrated tracer gas testing
- Licensing Basis
  - Licensing basis approach
- Technical Specification
  - Licensee controlled program versus TS surveillance
- Smoke / Toxic Gas
  - In general agreement

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Test Methodologies

- Component Test
  - Only for positive pressure CRs with few in-leakage pathways:
  - Can be performed by plant staff
  - Measurement uncertainty <10% for individual components
  - Strengths of component test occur in CR designs where tracer gas testing limitations exist
- Tracer Gas Test
  - Valid for all CR designs
  - Recommended for non-pressurized CR
  - Large pressurization air flow can lead to significant uncertainties in tracer gas testing results
    - Neutral <10%
    - Pressurized 30% to 60%

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CR Inleakage Testing

- 19 of 66 plants have tested using tracer gas
  - Wide range of results dependent on CR design and boundary controls.
  - Test method should be flexible to allow for differences in CR boundary condition
- Three plants performed concurrent NEI 99-03 Component Test (CT) with Tracer Gas Tests (TGT)

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THE INTEGRATED COMPONENT TEST METHOD

Roger Walker, Director of Regulatory Affairs, Comanche Peak

Ken Taplett, Senior Licensing Staff Engineer, South Texas Project

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PURPOSE

To gain acceptance of a method for determining control room in-leakage that was developed by the Strategic Teaming and Resource Sharing (STARS) Alliance. This test method is the integrated Component Test Method.

STARS consists of the Callaway, Comanche Peak, Diablo Canyon, Palo Verde, South Texas Project and Wolf Creek plants

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STARS CRH HISTORY

- Sep 1999 - Recognized CRH as an industry issue and initiated a STARS project to address
- Nov 1999 - present: Member of NEI CRH Task Force
- Jan - June 2000: Formed STARS CRH Team and completed self-assessments at the 6 STARS stations
- Oct - Dec 2000: Presented the integrated Component Test Method to the NRC Staff and the ACRS
- **March 2001 - Submitted CRH self-assessment results and proposed testing methodology in a March 5th letter to the NRC**
- April 2001 - Conducted integrated tracer gas and component comparison testing at Palo Verde
- June 2001 - The integrated Component Test Method endorsed by the industry in NEI 99-03
- **August 2001 - Submitted the Palo Verde test results and concerns regarding testing uncertainty inherent in E741 testing for positive pressure control rooms in a August 31st letter to the NRC**
- December 2001 - Conducted integrated tracer gas and component comparison testing at Comanche Peak

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COMPONENT TEST METHOD

Tests control room envelope boundary in incremental parts to determine in-leakage. Total control room in-leakage is determined by summing the results of the incremental tests.

- Boundary differential pressure tested in sufficient number of areas to represent all areas credited (when sufficient positive pressure exists between the control room and adjacent spaces, the in-leakage is zero).
- Where it can not be determined that sufficient positive pressure exists between the control room and adjacent spaces, these components of the boundary are tested to quantify any in-leakage (this led to this integrated test method being named the Component Test Method)

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COMPONENT TEST METHOD APPLICABILITY

- Only for "positive pressure" designed control rooms
- Component leak tests can be conducted to reflect accident conditions (i.e. air pressures, air flows, etc.)
- Leak tests can be conducted using recognized test standards

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REASONS FOR THE COMPONENT TEST METHOD

- Accurate - as opposed to usually large measurement uncertainties inherent in E741 tracer test results for pressurized control room designs
- Test generally within capability of plant staff
- Identifies specific deficiencies in the boundary

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TEST VALIDATION EFFORT

Conducted comparison testing between Tracer Gas Test Method and Component Test Method at two plants

- Palo Verde plant in April 2001
- Comanche Peak plant in December 2001

Result: In-leakage determined by the Component Test Method validated by the Tracer Gas Test Method

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PALO VERDE TEST RESULTS

Test	Results
Train "A" control room unfiltered in-leakage tracer gas test	0 +/- 52 scfm
Train "B" control room unfiltered in-leakage tracer gas test	0 +/- 30 scfm
Duct leak component test	2.13 +/- 8.8 scfm out- leakage
Positive pressure test	~ 0.8 in. w.g.

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COMANCHE PEAK TEST RESULTS

COMPONENT TESTS	TRAIN A RESULTS	TRAIN A REVIEW CRITERIA	TRAIN B RESULTS	TRAIN B REVIEW CRITERIA
DAMPER LEAKAGE (FILTERED)	245±9.6 CFM	30 CFM	232±6.1 CFM	30 CFM
	NORTH DUCT		SOUTH DUCT	
DUCT LEAKAGE (UNFILTERED)	0 CFM *	2 CFM	0 CFM **	2 CFM

UNFILTERED INLEAKAGE FROM AIR SYSTEMS= 0.0 CFM

* Zero detected---Minimum detectable duct leakage was ≤ .075 (OSA) & ≤ .062 (UA) CFM

** Zero detected---Minimum detectable duct leakage was ≤ .18 (OSA) & ≤ .14 (UA) CFM

	TRAIN A OPERATING	TRAIN B OPERATING
MINIMUM PRESSURE TO ADJACENT AREA (SURV. TEST)	0.43 IN WG	0.43 IN WG

TRACER GAS TEST (ASTM E 741)	TRAIN A RESULTS	TRAIN A REVIEW CRITERIA	TRAIN B RESULTS	TRAIN B REVIEW CRITERIA
UNFILTERED INLEAKAGE	-44±34CFM	2 CFM	-18±27 CFM	2 CFM

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Catawba Test Results

Test	CT Result	TGT Result
Uncertainty	+/- 0.4 scfm	+/- 280 scfm
Train A Unfiltered In-leakage	13.0 scfm	-360 scfm
Train B Unfiltered In-leakage	15.5 scfm	-100 scfm
CR Area Duct	19.5 scfm	N/A
Total (1 train + duct)	**40 scfm**	—

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SUMMARY

- Control room in-leakage needs to be determined by testing to validate assumptions used in accident analyses
- The component test method has been validated by comparison testing with the integrated tracer gas method used previously in industry
- The component test method can determine control room in-leakage with reasonable assurance
- This work validated NEI 99-03 guidance

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Licensing Basis

- Limiting accident analysis
  - NEI - DBAs in current licensing basis
  - NRC – Current information (adjacent or nearby plants)
- Licensing basis approach
  - NEI - CLB with NEI 99-03 improvements
  - NRC - "Package" that can expand CLB (DGs)
- Differences do not apply to all plants and can be resolved on a plant-specific basis

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Technical Specifications

- NEI - CR in-leakage is a design basis input and should be controlled by Appendix B. CR in-leakage monitored by CRH program
- NRC – CR in-leakage requires a TS SR
- ACRS - commitment to a CRH program like in NEI 99-03 provides appropriate regulatory control
- Intent of in-leakage monitoring is the same. NEI 99-03 program goes further than a TS.

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Industry Concerns

- NRC is requesting licensees to establish new licensing basis that are not consistent with safety significance of issue
- NRC has not acknowledged that NEI 99-03 assures that licensees are meeting conditions of license
- NRC has not accepted demonstrations of component test methodology for baseline testing

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Industry Conclusions

- NEI 99-03 is the product of an extensive effort from the staff and industry. We are mostly in agreement with the content of this document
- Draft Guides 1111 and 1113 are beneficial and largely consistent with NEI 99-03
- Additional Regulatory Guides will cause confusion and are not warranted in light of the improvements recommended by NEI 99-03 and the relatively small differences between NRC and industry

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Industry Recommendations

- NRC should endorse NEI 99-03 by means of a RIS as an acceptable method of satisfying CRH regulatory requirements
  - Can be implemented through the NRC inspection process

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