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CORE

September 29, 2009

Honorable Senator Thomas A. Carper
Chairman, Senate Environmental and Public Works
Subcommittee on Clean Air and Nuclear Safety
United States Senate 513 Hart Building
Washington, DC 20510

Closing the RAP Gap for safety, cost and investment protection

Responding to Three Mile Island (TMI) twenty years ago, 10 CFR Part 52's 'Combined License' Quality Assurance Program (QAP) requires that certified nuclear plant designs have a 'Reliability Assurance Program' (RAP). Unfortunately, what constitutes an adequate RAP for a new plant remains unclear. For safety-related equipment, scheduled maintenance & operating monitoring plans provide effective reliability. Since Boeing introduced the 747, the FAA has only licensed new airplanes with certified scheduled maintenance plans. NRC should implement Part 52 by licensing new reactor designs with their RAP scheduled maintenance & operating monitoring plans specified, as U.S. airframe suppliers have done for the past 40 years.

Senator Carper:

Title 10 CFR Part 52, Combined Licenses,[1] requires new nuclear plants to have reliability assurance programs (RAP) covering safety-related equipment. The difference between new and operating plant reliability assurance programs – e.g., their scheduled maintenance plans, creates a gap – the RAP gap. Many nuclear plants started up under Part 50 with virtually no scheduled maintenance plans.[2] Three Mile Island (TMI) was one. Few of those plants that had plans scheduled their PMs; plans were incomplete. Surveillance test programs had major omissions, discovered only after industry-wide audits following TMI[3]. New plant owners of that era assumed their operators could patch together various safety-related equipment maintenance and monitoring plans after startup once they completed the immediate goal to establish operating income. They did not.

TMI demonstrated the huge risks placed on the plant's public, operators, and especially the nuclear industry and its financial backers by incomplete plans. Those charged to develop plans were often unprepared to do so, lacking formal training, qualification or effective tools. They deferred to operational needs. As a result, as late as 1995 many nuclear plants still ran with substantially incomplete reliability assurance plans. Some still do.

No financial lenders today should risk placing their $8 billion dollar asset into operation without scheduled maintenance assurance. Yet regardless of rules that require a nuclear equipment RAP, we are poised to repeat that omission again today – even on required, in-scope nuclear safety-related equipment. Although rules only formally cover a small

[1] "Licenses, certifications, and approvals for nuclear power plants;" see NUREG-0800, Standard Review Plan, Section 17.4, "Reliability Assurance Program"
[2] Part 50 licensed all of the nation's 104 operating nuclear plants, and 11 that no longer operate.
[3] The accident – a $2 billion loss.

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fraction of the total plant equipment – nuclear safety-related equipment – resistance to developing reliability programs *before start up* has emerged again. Regardless of what brokers or owners should expect to protect their investments[4] for economic reasons, addressing safety-related equipment's requirements for monitoring and scheduled maintenance before startup remains unresolved.

Commitment today to implement Part 52's NUREG-0800[5] and Regulatory Guide (RG) 1.206[6] RAP requirements remains unclear. Guidance remains confused by downplay of traditional deterministic design engineering requirements and judgment. Completing the scoping of safety-related equipment classification is the only pre-startup RAP requirement certain today. Thus, the same unprepared workers charged to develop Generation I plant plans, lacking formal training, qualification and tools, are poised to do so again post-startup. They will again defer to operational needs, and repeat the lessons of 1970's and 80's. Incomplete plans used to start up plants then posed substantial risks to nuclear operations. The cumulative result of thirty years of nuclear operations starting up and operating new plants was that incomplete operating "software"[7] caused confusion that posed unnecessary risk. Ignoring TMI, the past thirty years brought many rules like 50.49, Environmental Qualification of Class 1E Electrical Equipment for Nuclear Plants that specify nuclear maintenance requirements. Today, consensus guidance addresses how to develop complete effective scheduled maintenance and monitoring plans. For new nuclear construction, Part 52 requires a reliability plan that assures safety performance. Yet prospective licensees see providing the in-scope equipment covered by the rule, in the form of a safety-related master equipment list, as meeting that requirement. Few plan to provide scheduled maintenance plans the RAP requires at startup, even on safety-related equipment.[8]

Industry should emulate the Federal Aviation Administration (FAA) and airline industry. FAA certifies new airframes with a consensus-based preflight reliability assurance plan as crew operational checks and scheduled maintenance[9] – *before a licensed commercial plane ever leaves the ground!* There many are advantages. Aside from having a complete industry-based startup plan at the onset, this approach yields a systematic structured plan. That plan provides a foundation for the plant's entire life. Plants can realize design-based reliability, rather than let chance determine their maintenance. Engineering completeness, along with operating experience, justifies up-front reliability programs. Confusion on what should be in a reliability plan, then, would never arise.

Financial assurance requires consistent nuclear operations from the start. Not only is it imperative not to repeat TMI, new nuclear generation economics require high

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[4] in nonsafety balance-of-plant equipment, constituting 80% of overall plant cost
[5] Review of Safety Analysis Reports for Nuclear Power Plants
[6] Regulatory Guide for Combined License Applications for Nuclear Power Plants
[7] Procedures, plans, guidelines, equipment lists, scheduled maintenance, planned work orders, rounds…
[8] We are aware of none, although MHI may have plans strategically-developed to enter the U.S. market
[9] See ATA MSG-3 (2001), Operator/Manufacturer Scheduled Maintenance Development, which provides an FAA-approved method for developing aircraft inspection/maintenance programs. Aircraft providers must certify airframes and power plants for commercial service applications.

performance to repay construction loans. Cost-plus scenarios of Part 50 LWR licenses[10] are gone forever; now plants must meet public utility commission (PUC)-promised rate case projections. Predictable reliable nuclear operating costs benefit safety directly, as well as indirectly, over a plant's lifetime. Design-based reliability benefits nuclear power consumers by not funding repetitive, haphazard design basis and scheduled maintenance reconstitution programs, over and over, adding unnecessary or even detrimental requirements to nuclear maintenance processes. Plants certified with standardized licensed RAP operating plans will benefit everyone.

Conclusion

In the past, strategic initiatives challenged the nuclear industry. While the industry should legitimately concern itself with the intrusion of regulation, existing safety statutes and rules are mandatory. Extending those sensibly in nuclear plants to achieve financial success on nonsafety-related equipment should remain industry's prerogative. However, the tools, methods and programmatic understanding to develop, implement and maintain effective, automated reliability programs have never been more available. If loan guarantees make Congress effectively the nuclear industry's banker, it should require application of the very best methods and processes to protect its entire investments.

Given the substance, value and costs before us, as well as our safety interests, wisdom suggests that those who approve funds and provide guidance to build safe American nuclear energy resources thoughtfully consider the role of reliability as they license new nuclear facilities. Congress should deliberate reliability design as they continue the debate on nuclear energy.

Sincerely,

J.K. August, PE
J.J. Hunter SRO
CORE, Inc.
303-425-7408/970-330-1411

Attachment: Senate & House Energy & Nuclear Safety Committees
Re: EPW CA& NS Hearing Three Mile Island: Thirty years looking back
c/ Sen. Barbara Boxer (D-CA), Sen. Tom Coburn (R-OK), Sen. Bob Corker (R-TN), Sen. Jim DeMint (R-SC), Sen. Judd Gregg (R-NH), Sen. James Inhofe (R- OK), Sen. Paul G. Kirk, Jr. (D-MA), Sen. Jon Kyl (R-AZ), Sen. Joe Lieberman (D-CT), Sen. John McCain (R-AZ), Sen. Claire McCaskill (D-MO), Sen. Mitch McConnell (R- KY), Sen. Patty Murray (D-WA), Sen. Harry Reid (D-NV), Sen. Michael Bennett) (D-CO), Sen. Charles Schumer (D-NY), Sen. Mark Udall (D-CO), Sen. George Voinovich (R-OH), Sen. Jim Webb (D-VA), Sen. Sheldon Whitehouse (D-RI) Rep. Jason Altmire (D- PA), Rep. Roy Blunt (R-MO), Rep. John Boehner (R-OH), Rep. Mike Coffman (R-CO), Rep. Gabrielle Giffords (D-AZ), Rep. Kirsten Gillibrand (D-NY), Rep. Barney Frank (D-MA), Rep. Paul Hodes (D-NH), Rep. Steny Hoyer (D-MD), Rep. Betsy Markey C-(D-CO), Rep.

[10] Under Part 50, most rate-based plants were allowed to recover "reasonable" ongoing construction costs.

Kevin McCarthy (R- CA), Rep. Nancy Pelosi (D- CA), Rep Ed Perlmutter (D-CO), Charles B. Rangel (D-NY), Rep. Joe Sestak (D-PA), Rep. Edolphus Towns (D-NY)

Laura Haynes, Legislative Assistant, Senator Tom Carper's Office (pdf)
Matt Dempsey, Communications Director (EPW), Senator James Inhofe's Office (pdf)
Annie Caputo, Senior Technical Assistant (EPW), Minority Office (pdf)

*Attachments to Senators/Representatives listed in **red**; for email copies, please send contact address to:*

jkaugust@msn.com
J.K. August c/o
P.O. Box 606
Arvada, CO 80001

Attachment 1

Advantages Closing the RAP GAP

Following Three Mile Island, analyses like NUREG-0737[11] and the Kemeny Report[12] suggested fixing rules to restore the broken promise of safe nuclear operations. Part 52, the Combined License (COL)[13] required that new nuclear plants only start up with integrated reliability assurance plans – scheduled maintenance – as TMI-2 had not. Despite that promise and assurance, today the nuclear industry still struggles to develop requirements equivalent to those the FAA implemented forty years ago with the Boeing 747 in MSG-1: comprehensive scheduled maintenance plans licensed with every new [commercial airframe] design.

Closing the RAP gap offers distinct operational advantages. These include

- Common process standardization approach
  - Framework
  - Certified design applicant
  - COL
  - Methods and hardware
- Introducing innovation
  - automation
  - databases and
  - design integration philosophy
- Automated reviews removing explicit document RAI's and incorporating design reviews
  - design basis integral incorporation of RAI answers as they finish
  - safety design critical content links via libraries
- Downstream process content integration
  - procedures
  - technical specifications, and
  - degraded equipment failure risk analysis
- Solutions for industry effectiveness problems
  - response, custom responses, confusion over response to expected degradation mechanisms,
  - better diagnostics and monitoring on degradation discovery
  - better failures repairs on discovery response
  - better planning for predictable events
- Easier design revisions and modifications
  - correcting weaknesses
  - supporting better technology.
- More clearly-specified critical content in
  - Purchase requisitions
  - PO acceptance specifications
  - Installation specifications and startup testing
  - Operations monitoring and maintenance

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[11] Clarification of TMI Action Plan Requirements, and

[12] Report of the President's Commission on the Accident at Three Mile Island, Oct 30, 1979, John Kemeny, Chairman, 178 pages

[13] Licenses, certifications, and approvals for nuclear power plants

  - ITAACs, overall
- Component Purchases, acceptance tests, vender inspections and installation requirements are clearer and easier to set.
- Test
- Operations Technical Specifications & Surveillance
- No Surprises
  - All nuclear maintenance requirements are clear –
    - Before operations begin
    - Before equipment degrades and fails
    - While the opportunity for unbiased, unpressured, thoughtful risk-informed dialogue exists – before equipment failure occurs
- Commonality across equipment boundaries
  - Programs on nonsafety-related and safety-related equipment gets based on that equipment's actual functional support of the plant, rather than esoteric, arbitrary risk classification
  - Better, more accurately risk-categorized performance based equipment maintenance

Attachment 2

ITAACs: Inspections Tests Analyses and Acceptance Criteria

ITAACs verify objective design criteria and detailed design completion. ITAACs specify design review checks, procurement requirements, receipt and construction inspections and testing after completion and conformance with other specified requirements. ITAACs allow building new designs, starting them up to operate and controlling them after startup, based upon a controlled design. NRC specifies several thousand ITAACs (30,000 – AP-1000) during construction and startup testing. However, currently one (1) ITACC covers post-startup RAP design completion review.

- Objective Criteria for Construction
  - Specifications to procure by
  - Inspections to accept work
  - Tests (Acceptance, Startup)
  - Process identification
  - Qualifications
  - Other Criteria
    - Appendix A design
    - Appendix B quality
- Operations Criteria
  - Startup Test Acceptance Criteria
  - Technical Specifications
  - Tests (Surveillance)
  - Critical Instruments and controls
  - Procedures
  - Training
- Source documents requirements
  - Design Basis
- Construction requirements that carry forward into operations & maintenance
  - Design Basis
  - Modifications
  - Tests (Surveillance)
- Operating Experience
  - Onsite (unit)
  - Industry-wide
- Fleetwide operating information incorporation

Safety Benefits

- Quality
  - Accuracy
  - Clarity
  - Safety design basis
  - Conversion to useful parts
- Reliability

- Requirements operationalization
- responses to failures identified
- Operating monitoring and maintenance plans
- Knowledge of risks and systems structures and components (SSC) risk partition

Furthermore, ITAACs should help develop

- Innovation & competition
- Peer standard design reviews
- Industry cooperation
- Objective performance measures
- Assurance for nuclear plants owners
- Framework for new design evolution in operations

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William Borchardt
Executive Director Operations
U.S. NRC
11545 Rockville Pike M/S O-16 E15
Rockville, MD 20852