# Regulatory Information Conference 2003

# U.S. Nuclear Regulatory Commission

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# "Closing the Loop" or Falling Behind the Curve?

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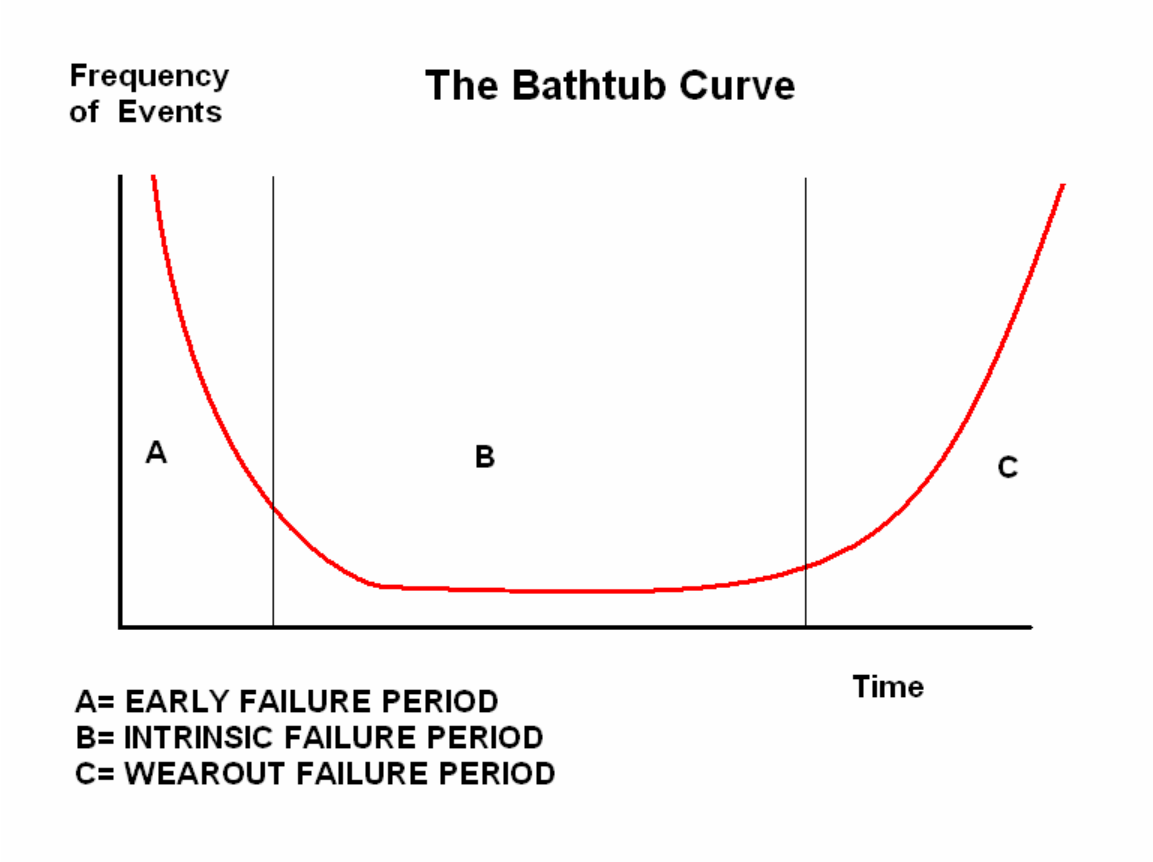
**My remarks regard public perceptions of industry management and NRC oversight of the primary coolant and pressure boundary system in nuclear power stations.**

**Is the loop being closed as NRC has thematically posed? Is the nuclear industry maintaining robust safety margins and managing age-related degradation with effective regulatory oversight of this primary production and safety system?**

**Or, is industry and its regulator falling behind an event-driven curve of unanticipated and significant safety issues emerging faster than are being recognized and effectively managed?**




**This simple bathtub curve serves to illustrate our concern.**

**The frequency of events for component breakdown and potentially safety system failure will increase as any appliance ages.**

**It is our contention that new areas of deterioration and surprises in established degradation mechanisms are**

**emerging faster than the NRC and the industry can recognize, resolve and manage. This becomes an increasingly risky and dangerous proposition.**

**As Commissioner Kenneth Rogers remarked, now approaching 15 years ago, steam generators are "a loaded gun, an accident waiting to happen."**

**NIRS is aware that one of those guns went off accidentally on February 15, 2000 at Indian Point alerting the public that both the industry and NRC had failed to stay ahead of the curve in safely managing material degradation on the primary pressure boundary.**

**We all are aware that more than 50% of the reactor pressure and coolant boundary is in those steam generator tubes and they are not backed-up by the additional barrier of the reactor containment to protect the public and the environment from harmful**

**accidental radiation releases.[1] The public understands that the techniques for looking for cracked steam generators are not reliable for determining the depth of the crack up to as much as 40% through-wall. And as the Advisory Committee on Reactor Safeguards further points out, NRC does not currently have a technically defensible analysis of how steam generator tubes, many of which are cracked and corroded, will behave under severe accident conditions.**

**Just over a year ago, at the prior Regulatory Information Conference, NIRS raised its concern for the potential failure of the primary coolant system at the reactor vessel head as the result of cracking in vessel head penetrations in pressurized water reactors.**

**Certainly, very few, if any could have accurately guessed, at that time, the severely corroded condition of Davis-Besse's vessel head, even though a majority in the conference room would have dismissed our concern for**

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[1] **U.S. NRC Advisory Committee on Reactor Safeguards, 02/2001**

**vessel head integrity as unfounded. But again, industry and NRC demonstrated a falling behind the curve to safely maintain the all important primary pressure boundary.**

**Newly emerging event-driven material issues, such as vessel head penetration cracking and pressure vessel corrosion, continue to significantly challenge the NRC and industry's base of knowledge, management capabilities and resources.**

**At the same time open and long-standing material safety issues continue to produce surprises that confound effective and confident management of material degradation. "Rust never sleeps" is an appropriate adage. And uncertainty still reigns in such significant areas as crack initiation in safety components, crack growth rate, a leak-before-break warning, confidence levels in early warning with crack detection technology and accident evolution.**

**Events are now driving and undermining confidence in many formerly safe assumptions drawn from previous industry material degradation experience and practice. Making safety assumptions drawn largely from where the industry has been may now prove as dangerous as driving a car through the rear view mirror.**

**Here are some illustrative examples of those surprises:**

**1. NRC Information Notice 2002-21 Supplement 1 issued April 1, 2003 reported early onset of stress corrosion cracking at Seabrook Station after only 10 Effective Full Power Years with "unexpected and unusual" Outer Diameter Stress Corrosion Cracking in thermally treated Alloy 600 material that has appeared in both the hot and cold leg steam generator tubes at unique locations in stress relieved materials that "may be difficult to screen for susceptibility" to cracking using eddy current testing.**

**2. Early in 2003, Diablo Canyon steam generator inspections revealed unanticipated crack growth rates in axial cracks at the tube-to-tube support plate intersection and "unexpected" circumferential cracking in outer row U-bend tubes. Generic Letter 95-05 regarded Diablo Canyon as exceeding the currently approved values for Probability of Detection and enforcement would not have been allowed restart. Despite these surprises and non-compliance with generic letter requirements, NRC instead handed Diablo Canyon operators a 120-day "conditional operating license" rather than enforce its guidance that could require a costly steam generator replacement.**

**3. A recent March 6, 2003 meeting before the Advisory Committee on Reactor Safeguards regarding primary coolant and pressure boundary issues at North Anna Unit 2 for Vessel Head Penetration Cracking and Vessel Head Degradation, yet another surprise revealed a circumferential crack at the root of one weld on a Control Rod Drive Mechanism Penetration Nozzle that**

**was in the process of growing into base material of the control rod drive mechanism nozzle. As the industry representative described it, this crack would "eventually have led to a circumferential flaw that would have been of great concern and that would not have necessarily been leaking." In other words, break before leak resulting in a control rod drive ejection accident without a "leak-before-break" warning.**

**4. The unexpected and dramatic surprise of vessel head corrosion at Davis-Besse has further led to inconclusive findings for potential cracking occurring in vessel bottom head penetrations. FirstEnergy is placing heavy reliance on visual inspections for stress corrosion cracking in this region to restart the reactor because there is no current non-destructive technology for inspecting the multi-base metal and weld material configurations that make up the pressure boundary at the bottom of this reactor vessel.**

**5. The most recent surprise came on April 12, 2003, when South Texas Unit 1 discovered potential reactor coolant leakage on two instrumentation penetrations through the bottom of the reactor pressure vessel.**

**Material degradation is unexpectedly growing in stress-relieved materials, at faster than anticipated growth rates, earlier than anticipated and in regions of the reactor coolant pressure boundary never before encountered or even considered. Effective detection technology still lags behind the myriad of configurations and mediums that fabricate the reactor pressure boundary.**

**But even with these significant challenges, nuclear power stations <u>with agency approval</u> still accelerate into power-uprates, record-seeking operational runs under expedited outages and still seek to strategically defer an occasional inspection, maintenance, repair or replacement contrary to current agency guidance and requirements.**

**All actions that would logically seem to increase uncertainty, risk and endanger public safety.**

**More than a decade ago, a NRC staffer named Joe Hopenfeld raised the concern that a single broken steam generator tube could trigger a domino effect of adjacent tube failures leading to a Loss of Coolant Accident with By-Pass of Containment.**

**Joe retired last year, but his concerns remain, though unresolved. Under the NRC plan, if it can be called an Action Plan, Hopenfeld's concerns are to be resolved by 2005. But with all the uncertainty and continued surprises it seems to us more like a roll of the dice than effective oversight and management will get us there without a nuclear accident.**