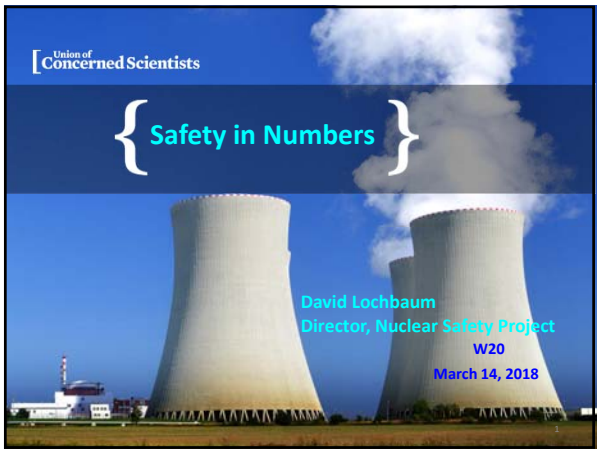


Benefits of Time Passage

> Accumulation of operating experience

> Significant expansion of computer modeling capabilities

These benefits combined could better inform decisions for removing unnecessary margin while still properly managing underlying risks.

2

Caution (a.k.a. Big BUT…)

Expanding risk-informed regulation increases subjectivity

Subjectivity is not inherently evil if it is handled properly

Davis-Besse in 2001 and Palo Verde last year reflect subjectivity being handled improperly

3

Caution: Davis-Besse (2001)

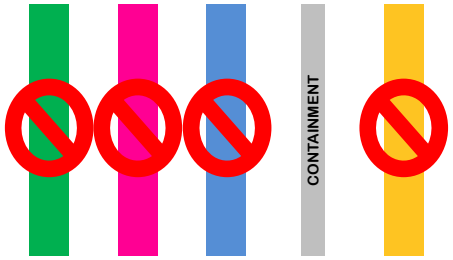
Source: Final slide from 11/29/2001 staff briefing of EDO on decision not to issue shut down order

RG 1.174 SAFETY PRINCIPLES

- Current Regulations are met
  - It is likely that current regulations are not met with respect to TS requirements and GDC
- Defense-in-depth philosophy maintained
  - It is likely that one of 3 barriers is lost
  - However, Davis-Besse has large dry containment
- Sufficient safety margins are maintained
  - It is likely that safety margins are reduced
- Only a small increase in CDF results
  - Incremental ΔCDF (no comp measures) is 1.1E-06/ry to 1.3E-04/ry
  - Baseline CDF is 6.6E- 05/ry
- The basis of risk measurement is monitored using performance measurement strategies
  - Will not occur until inspection is performed

4

Caution: Davis-Besse (2001)



NRC subjectively accepted known and suspected erosion of multiple defense-in-depth layers on its subjective notion that containment was 100% reliable

5

Caution: Davis-Besse (2001)

October 7, 2003

EA-03-131

Mr. Lew Myers
Chief Operating Officer
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: FINAL SIGNIFICANCE DETERMINATION FOR A YELLOW FINDING (NRC INSPECTION REPORT 50-346/03-15) - DAVIS-BESSE POTENTIAL CLOGGING OF THE EMERGENCY SUMP FOLLOWING A LOSS OF COOLANT ACCIDENT

NRC's notion about containment integrity proved fall from right as evidenced by this YELLOW finding for improper containment coatings that could clog sump.

6

Caution: EDG AOT LAR LOL

2015: NRC would not approve the 65-day EDG AOT LAR for Cook Unit 1 citing a 14-day limit in BTP 8-8

2017: NRC approved 62-day EDG AOT LAR for Palo Verde 3 also citing BTP 8-8 (but remaining silent about the whole fortnight thing)

7

Caution: EDG AOT LAR LOL

Final ASP Program Analysis - Precursor

Accident Sequence Precursor Program – Office of Nuclear Regulatory Research			
Palo Verde Nuclear Generating Station, Unit 3	Emergency Diesel Generator Failure Resulting in a Condition Prohibited by Technical Specifications		
Event Date: 12/15/2016	**LER:** 530-2016-002-01 **IR:** 05000530/2017008		ΔCDP= 2×10^{-5}
Plant Type: Combustion Engineering Pressurized-Water Reactor (PWR) with a Large Dry, Ambient Pressure Containment			
Plant Operating Mode (Reactor Power Level): Mode 1 (100% Reactor Power)			
Analyst: Keith Tetter	**Reviewer:** Chris Hunter	**Contributors:**	**BC Approved Date:** 11/15/2017

The alleged "low risk" of deliberately running a reactor for up to 62-days without an EDG qualified as an ASP event.

8

Caution: EDG AOT LAR LOL

Palo Verde: According to the NRC, the NRC-approved 57-day operation of Palo Verde Unit 3 with one of two EDGs broken resulted in **△CDF of $3.6\text{x}10^{-6}$**, exceeding the $1\text{x}10^{-6}$ ASP threshold.

DC Cook: By not approving a 65-day EDG AOT LAR, NRC avoided a positive **△CDF and may actually have made things safer.**

9

Caution: EDG AOT LAR LOL

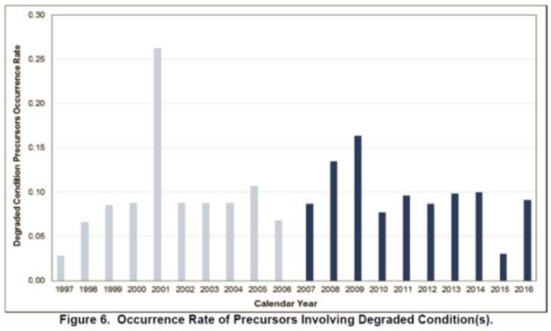


Figure 6. Occurrence Rate of Precursors Involving Degraded Condition(s).

Source: ASP Program Annual Report (ML17153A365)

10

Caution: EDG AOT LAR LOL

Note that when risk evaluations performed as part of the SDP are used for ASP program purposes, the SDP color representing the significance of the inspection finding is used as the official ASP Program result. The associated risk of the four SDP colors is as follows:

- *Red* (*High Safety Significance*), which corresponds to an event with a CCDP/ΔCDP greater than or equal to 10^{-4};
- *Yellow* (*Substantial Safety Significance*), which corresponds to an event with a CCDP/ΔCDP greater than or equal to 10^{-5}, but less than 10^{-4};
- *White* (*Low to Moderate Safety Significance*), which corresponds to an event with a CCDP/ΔCDP greater than or equal to 10^{-6}, but less than 10^{-5}; and
- *Green* (*Very Low Safety Significance*), which corresponds to an event with a CCDP/ΔCDP less than 10^{-6}.

△CDF of 3.6×10^{-6}

Source: ASP Program Annual Report (ML17153A365)

11

Caution: EDG AOT LAR LOL

Nuclear Safety 101:

Proper regulation, deterministic or risk-informed, should LESSEN the ASP rate, not INCREASE it

Nuclear Safety 102:

Don't deliberately take actions that result in ASP events & White findings

12

Another Caution (with Kudos)

More risk-informed regulation lessens importance of single-failure criterion

More risk-informed regulation increases importance of common-cause failures.

UCS acknowledges and applauds ongoing efforts by NRC and industry to better understand and factor CCFs into PRAs.

13

Still Another Caution

Delivering the Nuclear Promise and *Project Aim* initiatives each entail reductions in what is being done.

Care must be taken to avoid reducing data collection and analysis (i.e., macro OpE) that might impede populating the PRAs with necessary contemporary information.

14

Still Another Caution: ITP DOA

Project AIM killed the Industry Trends Program (ITP) which "was intended to provide a basis for assessing whether adoption of the ROP led to a degradation in overall operating reactor safety"

The absolute easiest and cheapest way to miss a warning sign of pending trouble is not to look.

Source: Project Aim Status Report (ML16362A191)

15

Still Another Caution: I&C DOA

Project Aim stopped research into incorporating digital I&C into PRA, eliminating the "development of new methods, models and tools in this area"

So, PRAs will model how I&C systems used to be, not how they currently are.

Ignorance is not only bliss, it's less costly. Swell!

Source: Project Aim Status Report (ML16362A191)

16

Still Another Caution: OpE DOA

Project Aim reduced "the number of operating experience based system and component studies" and reduced "the frequency in updating risk-informed regulatory guidance"

So, 21st century risk ciphering will use outdated OpE and obsolete guidance.

Source: Project Aim Status Report (ML16362A191)

17

Still Another Caution: SPAR OOD

Project AIM reduced "the updating of Standardized Plant Analysis Risk (SPAR) models" meaning that SPAR models will become more and more out of date (OOD) as time flies

Given the wide disparity between SPAR and PRA results, updating pace should be quickened, not slowed or stopped.

Source: Project Aim Status Report (ML16362A191)

18

Question (Rhetorical?)

Will hoping that express lanes for risk-informed regulation get constructed …

Source: https://www.flickr.com/photos/132926214@N07/

Source: https://www.flickr.com/photos/pquan/

… truly speed up the horse & buggy PRA pace?

19

Acronyms

AOT – Allowed Outage Time
ASP – Accident Sequence Precursor
BTP – Branch Technical Position
CCF – Common Cause Failure
CDF – Core Damage Frequency
EDG – Emergency Diesel Generator
I&C – Instrumentation and Controls
LAR – License Amendment Request
LOL – Laughing Out Loud
NRC – Nuclear Regulatory Commission
OpE – Operating Experience
PRA – Probabilistic Risk Assessment
ROP – Reactor Oversight Process

20