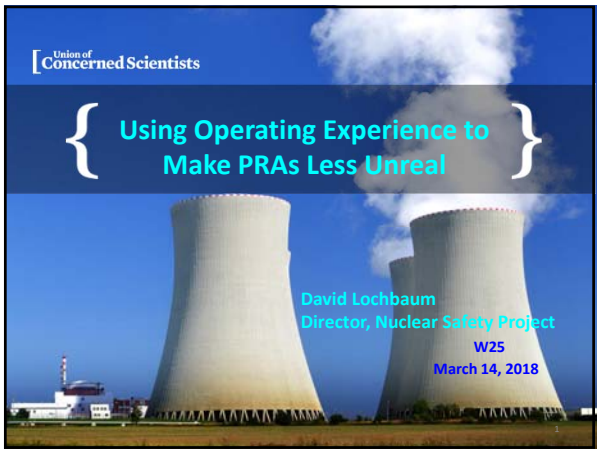


Two PRA Unrealisms

❶ PRAs assume there have been no and are no design errors that could prevent or impair a system, structure or component from fulfilling its safety role.

❷ PRAs neglect feedback from operator exams, especially simulator testing, when evaluating human performance.

2

PRA Unrealism ❶

NUREG-1275
Vol. 14

Causes and Significance of Design-Basis Issues at U.S. Nuclear Power Plants

Manuscript Completed: October 2000
Date Published: November 2000

Source: ML003770985

3

PRA Unrealism ❶

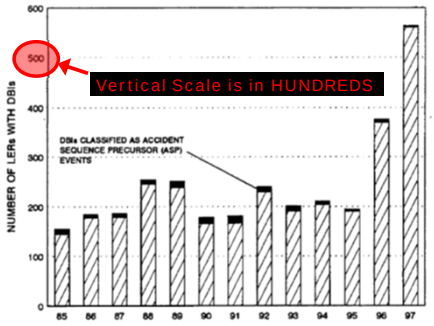
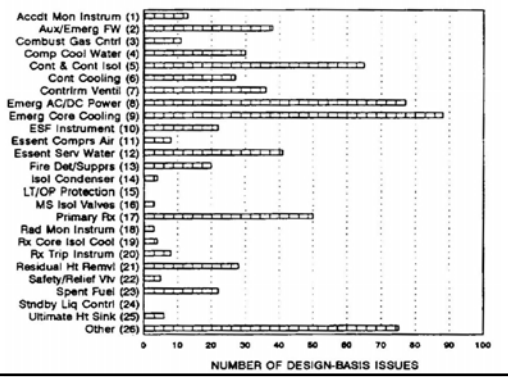


Figure 1 Trend of design basis issues reported for 1985–1997

4

PRA Unrealism ❶



5

PRA Unrealism ❶

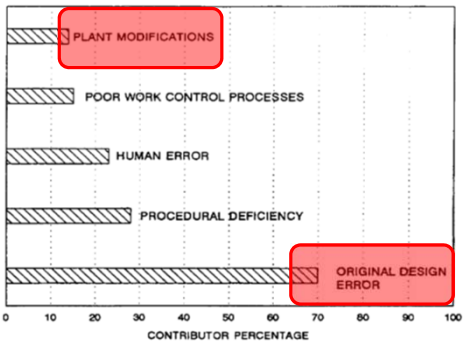


Figure 10 Causes of design-basis issues for 1997

6

PRA Unrealism ❶

This data (a.k.a. REALITY) shows that design errors have occurred.

This data shows which systems, structures, and components experienced design errors.

But this data is two decades old. Perhaps the design error problem has since been cured.

SPOILER ALERT! Nope

7

PRA Unrealism ❶

In 2013, NRC published a 68-page list of 137 violations of 10 CFR 50.59 between 2001 and 2012, an average of 11.4 violations per year or nearly one design bases violation per month for over a decade.

Source: ML13094A257

8

PRA Unrealism ❶

2007: "Specifically, the licensee's 10 CFR 50.59 screening failed to provide an evaluation as to why the installation of the HPCI suction piping, which did not meet USA Standard Code for Pressure Piping B31.1 Code requirements, did not present more than a minimal increase in the likelihood of occurrence of a malfunction of a SSC important to safety."

Source: ML13094A257

9

PRA Unrealism ❶

A system, structure or component may fail to fulfill its safety function because it is mis-operated, improperly maintained, or afflicted by a design error.

Operator mis-cues and maintenance faux pas are reflected in PRAs, but design errors are not.

10

PRA Unrealism ❶

CHAIRMAN JACKSON: Except that Mr. Lochbaum, if I am correct, is saying that in point of fact there isn't this updating.

MR. LOCHBAUM: There is no feedback for design failures, just active component failures.

CHAIRMAN JACKSON: There is no feedback for design failures, just for active components.

MR. THADANI: For design failures that is correct. That is an area that is not dealt with in the risk assessments. That's a recognized weakness.

CHAIRMAN JACKSON: So how do you handle that? What do you do about that?

MR. THADANI: Design failure is like -- pardon me for using this language -- a blunder in my view. It's not really a random issue. At a plant there is or is not a design problem. It is not the sort of thing you can deal with in a probabilistic manner.

Source: Transcript of Commission briefing 01/11/1999

11

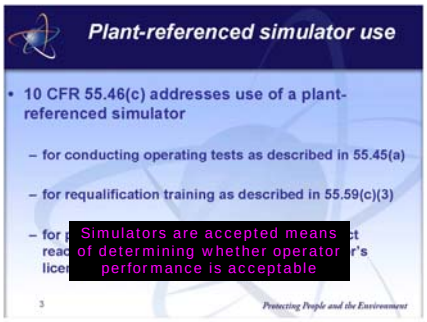
PRA Unrealism ❶

Data exists showing that design errors have afflicted systems, structures and components and continue to afflict them.

PRAs must account for potential impairments from design errors to properly reflect reality.

12

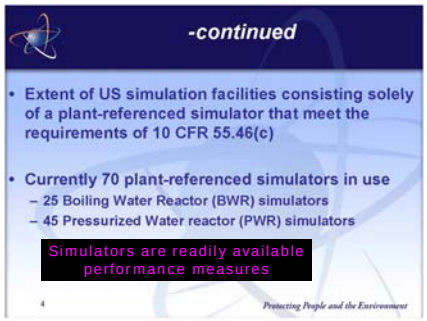
PRA Unrealism ❷



Source: ML15042A112

13

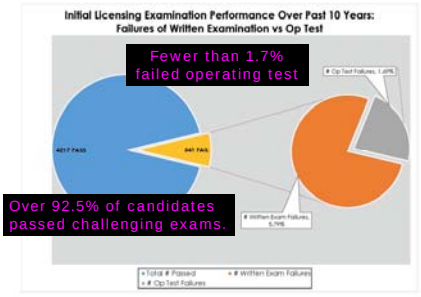
PRA Unrealism ❷



Source: ML15042A112

14

PRA Unrealism ❷



Source: ML13094A257

15

PRA Unrealism ❷

Callaway, 2015 – 6 of 7 candidates passed (ML15021A562)

Columbia Generating Station, 2015 – Majority of crews failed to notice that EDGs failed to start when drywell pressure exceeded actuation setpoint (ML15181A464)

Comanche Peak, 2015 – 7 of 8 candidates passed (ML15177A127)

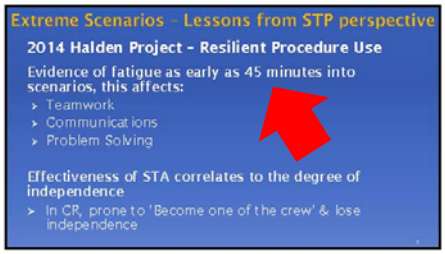
Cooper, 2015 – 6 of 6 candidates passed (ML15135A275)

Indian Point, 2015 – 6 of 6 crews passed the simulator test (ML15037A011)

Oconee, 2014 – All 3 RO and 5 SRO candidates passed (ML15041A533)

16

PRA Unrealism ❷



Source: March 2015 RIC Slides by South Texas Project (arrow provided by UCS at no additional cost)

17

PRA Unrealism ❷

Performance on simulators has long been used to determine whether candidates for initial operators are qualified and whether existing operators can be requalified.

Performance on simulators must also be used to assess operator performance in PRA space.

18

OpE PRA Realism ❶

NRC's Project Aim Items:

36) Killed the Industry Trends Program

52 & 59) Stopped research that would add realism to fire PRAs

61 & 64) Eliminated developed of new methods, models and tools for digital I&C in PRA

63) Scaled back SPAR model updates

65) Reduced number of operating experience based system and component studies

Source: Project Aim Status Report (ML16362A191)

19

AU

AU – Acronyms used
EDG – Emergency Diesel Generator
HPCI – High Pressure Coolant Injection
I&C – Instrumentation and Controls
PRA – Probabilistic Risk Assessment
RO – Reactor Operator
SPAR – Standardized Plant Assessment of Risk
SRO – Senior Reactor Operator
SSC – System, Structure, or Component
SSC – Structure, System, or Component
STA – Shift Technical Advisor
STP – South Texas Project

20