

Radwaste Summit 2023

Nuclear Power Safety Initiatives

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Nuclear Safety from Three Mile Island Through Today

A Trip Down Memory Lane



→ The Accident at Three Mile Island, March 28, 1979

→ Shortly after the accident I wrote a paper comparing the safety records of coal fired power plants and nuclear power plants

→ As an undergraduate moving towards my first job as a chemist, I had no idea of what to expect when I began my research

→ Turns out the safety record for nuclear plants were far superior to coal plants! Therefore...

→ My 40+ years of nuclear safety were underway!

Nuclear Safety from Three Mile Island Through Today



- Nuclear safety includes:
 - ✓ The safe operation of the reactor(s)
 - ✓ Radiation safety, e.g., radiation protection or radiation control
- Nuclear safety starting with the Atomic Energy Commission (AEC)
- Continuing with the Nuclear Regulatory Commission (NRC) in 1974
- Consistent focus on reducing exposure, which eventually became termed “As Low as Reasonably Achievable” or ALARA

Nuclear Safety from Three Mile Island Through Today



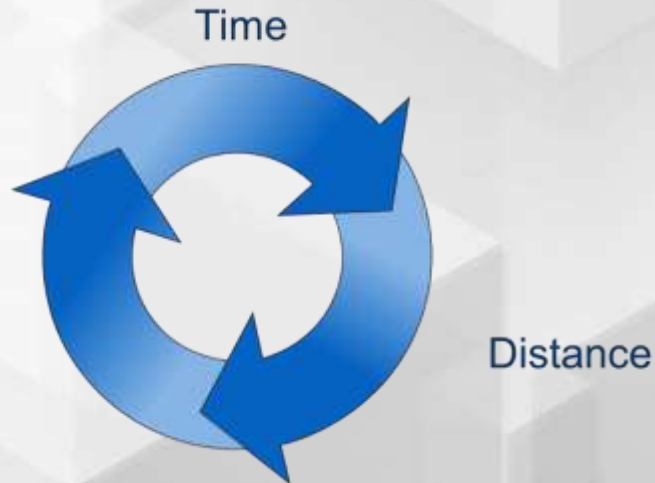
- Monumental 10CFR20, Standards for Protection Against Radiation, revision put in place on January 1, 1994
- The major changes/impacts of the revised 10CFR20 were:
 - ✓ A reduction in dose limits for both worker and members of the public
 - ✓ A summation of internal and external doses to determine compliance with new reduced limits
 - ✓ A re-emphasis and application of ALARA at power plants

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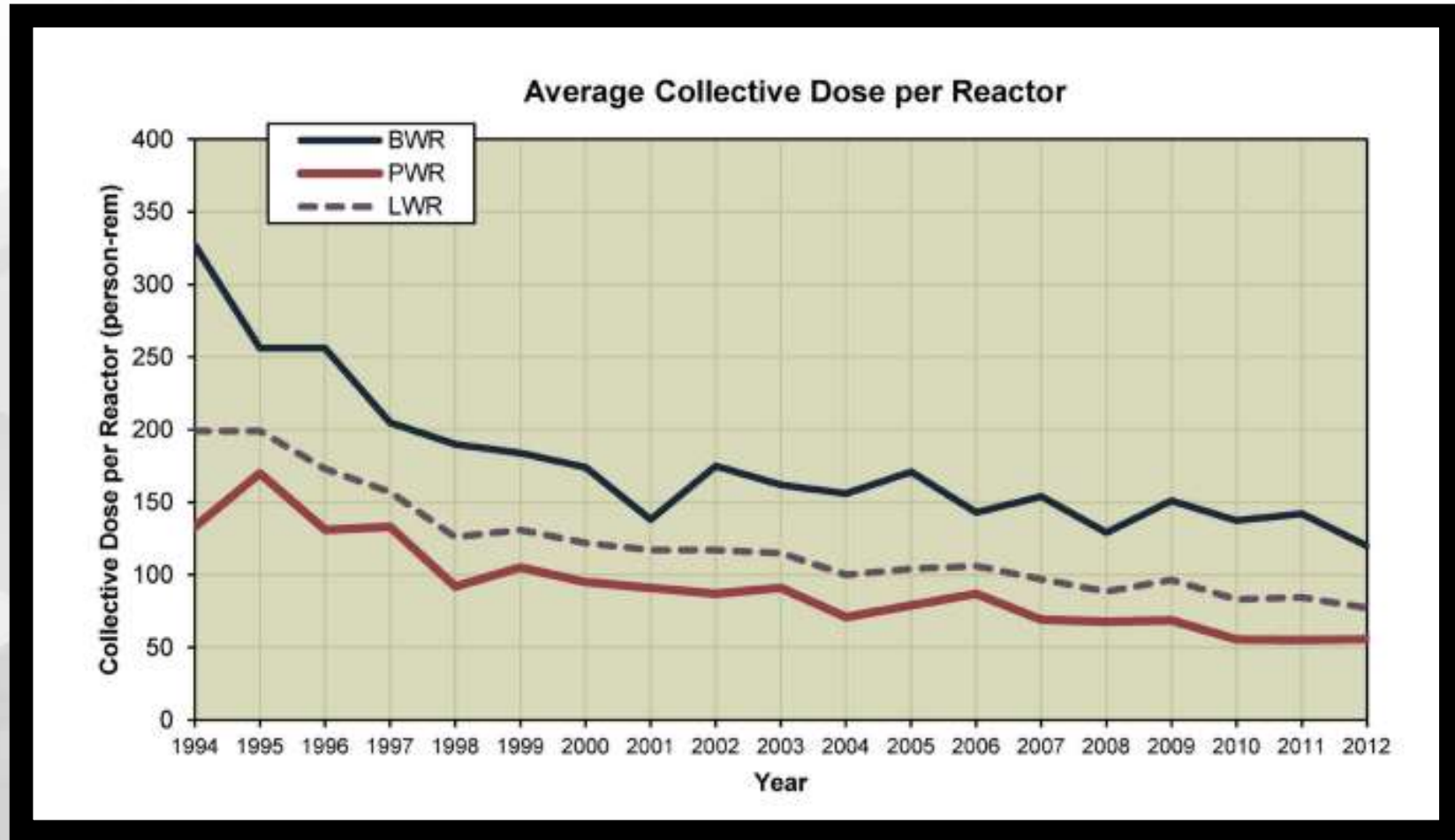
The implementation of the revision had a profound change on radiation safety thru a new focus on ALARA practice

- The summation of internal and external dose resulted in ALARA evaluations considering both types of exposure and BOOM, off came respirators
- The tried and true application of time distance and shielding resulted in significant reduction in individual and collective dose

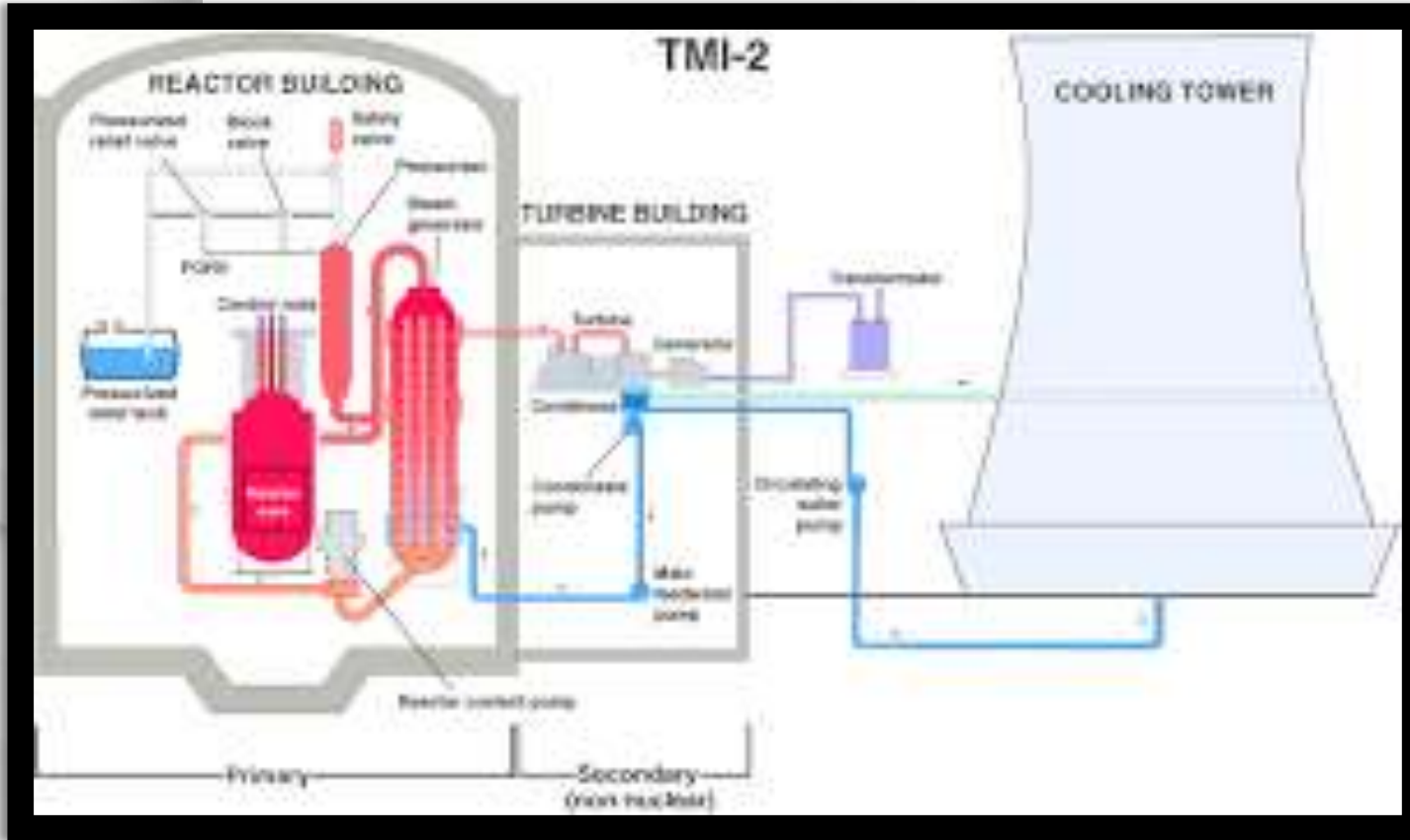


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These changes had a profound impact on reducing worker exposure in the ensuing years



Radiological Consequences of Design Basis Accidents (DBA) Analyses



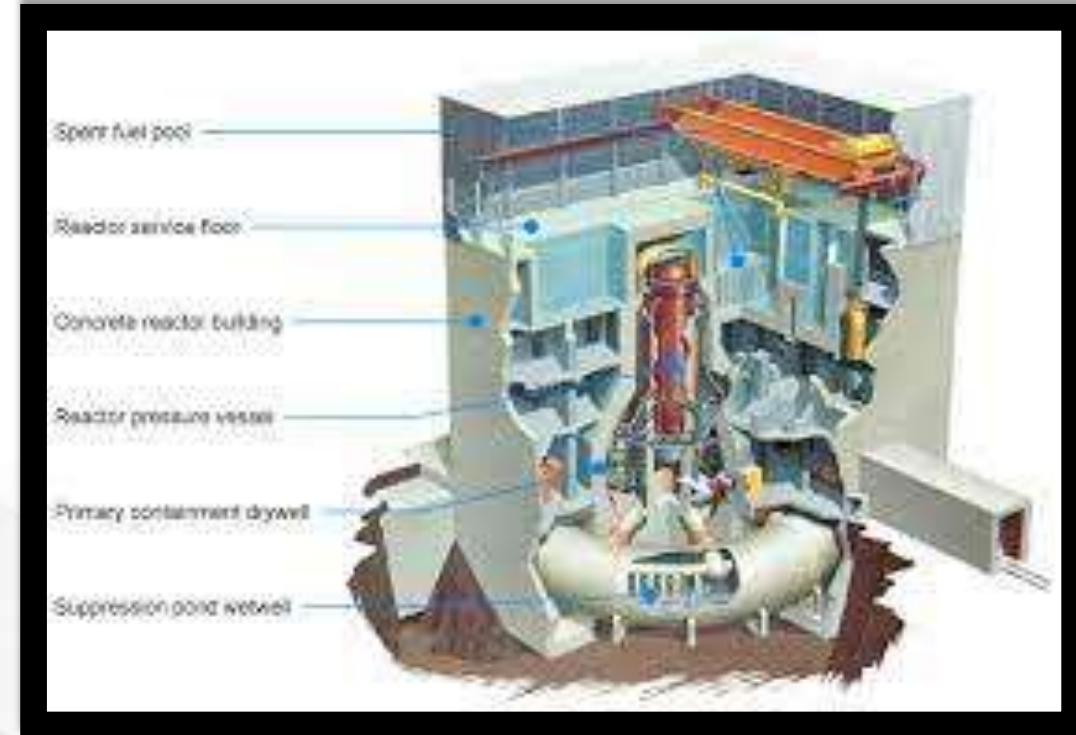
An analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site, with respect to the radiological consequence of NRC postulated design basis accidents (DBA's), radiological consequences for the exclusion area boundary (EAB), the low population zone (LPZ), and the control room (CR).

Radiological Consequences of Design Basis Accidents (DBA) Analyses

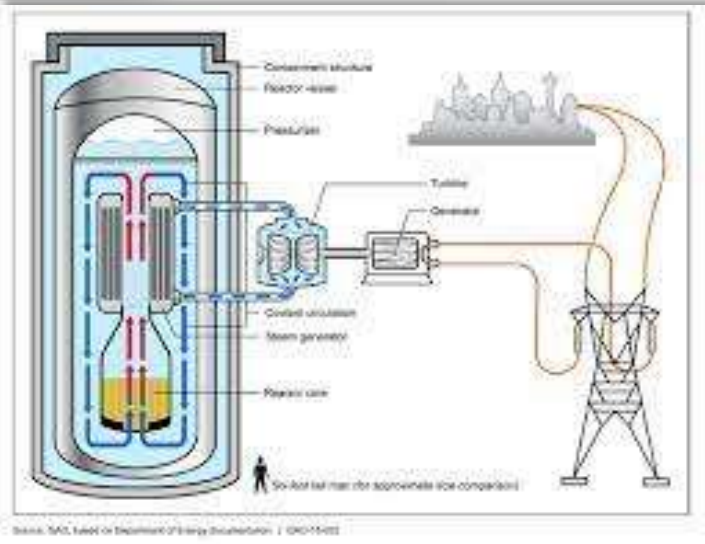
→ For two years I ran the analyses for two large commercial reactors to comply with NRC requirements to re-baseline the DBA components critical to operations and safety, help reduce projected doses, and increase the safety margin for operation of the plants

→ Being young (and likely stupid) I wondered why the assumptions and basis of each postulated accident were so “wildly” conservative

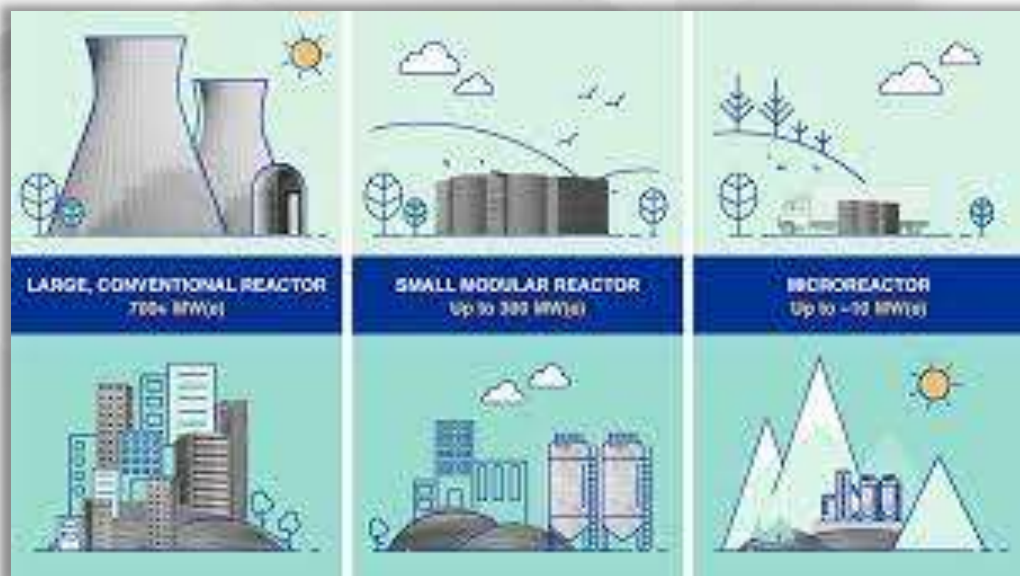
→ Years later, after the Fukushima Daiichi accident, I realized there is a distinct possibility (although low probability) of an event that results in the exceedance of a conservative design input or assumption



Nuclear Safety Today



- All the new “modular” reactor designs available today have incorporated nuclear safety lessons learned and further reduce the possibility of losing heat removal capacity during an event
- Many of the “old” power plants are undergoing decommissioning
- NUREG-1757, Consolidated Decommissioning Guidance, provides a whole new ALARA application specific to decommissioning and the resulting future exposure from released sites



Thank You for Your Time

Questions?