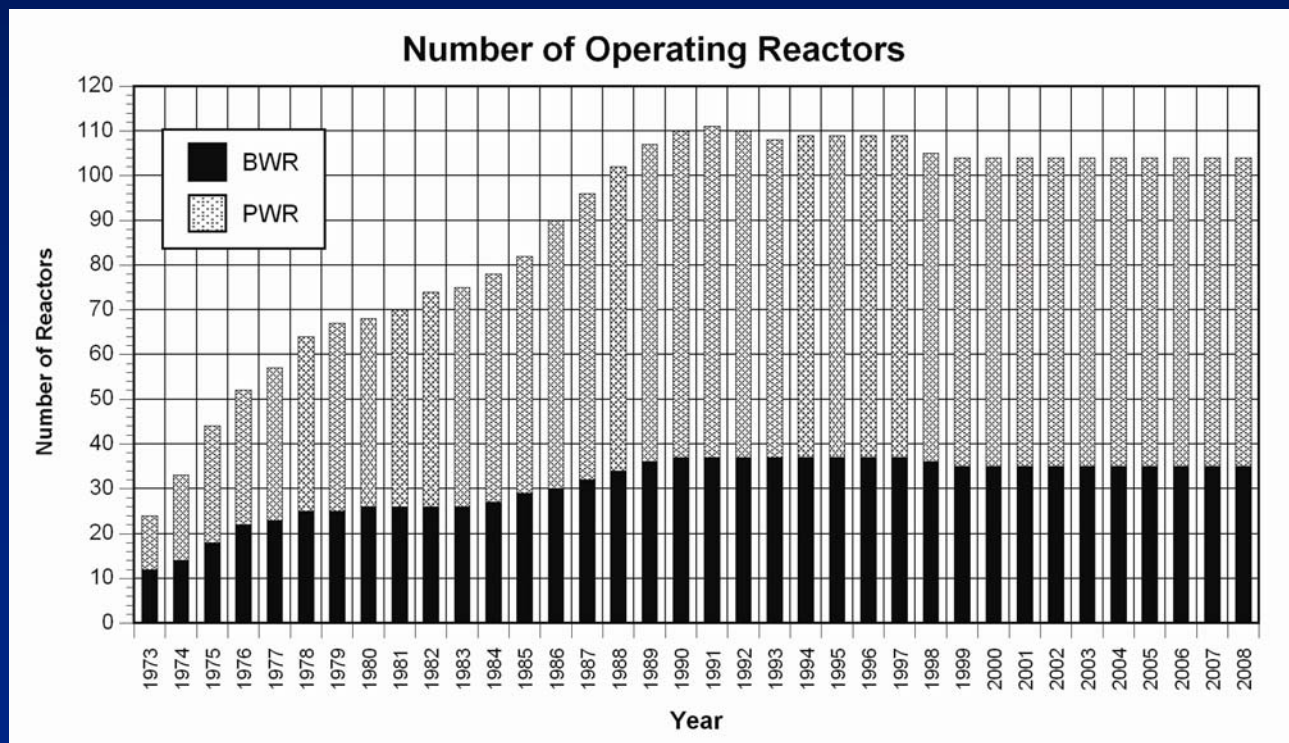


# **NRC Update on ALARA Regulatory Activities**

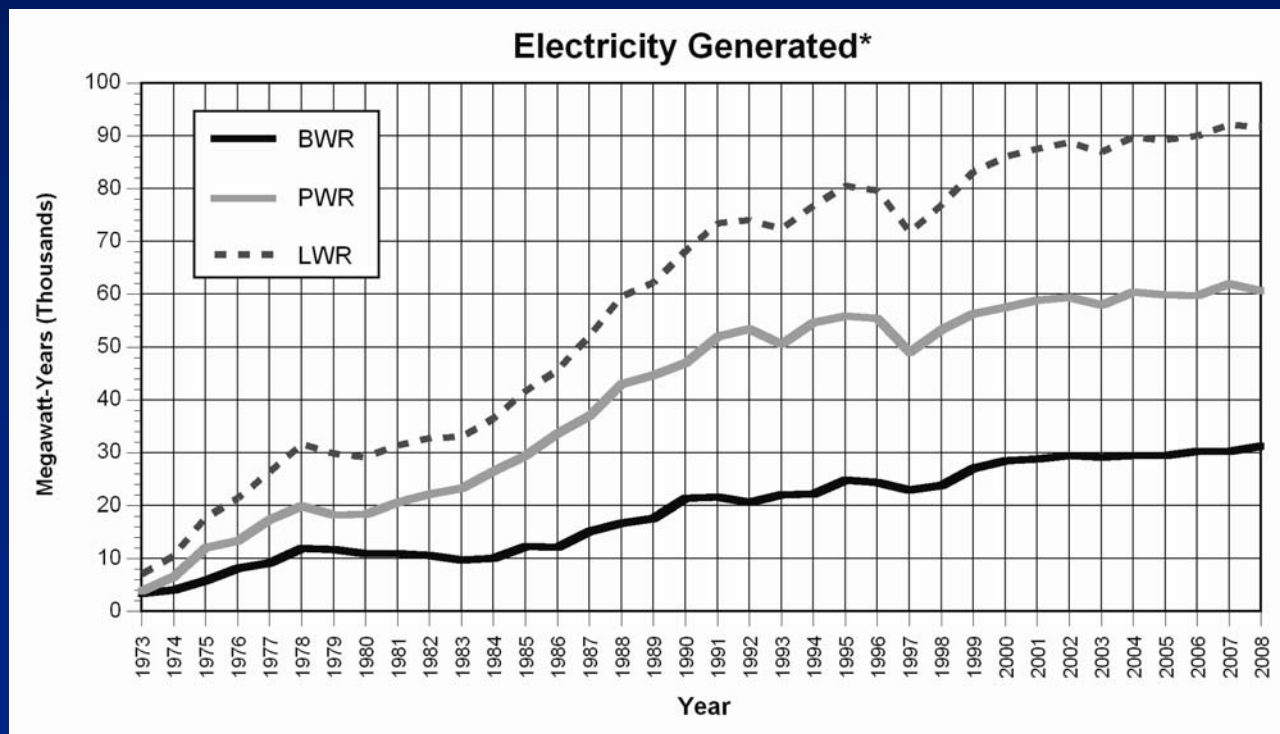
January 11-13, 2010

Steve Garry  
Sr. Health Physicist, NRR

## Number of Operating Reactors 1973 – 2008 (Preliminary NUREG-0713)

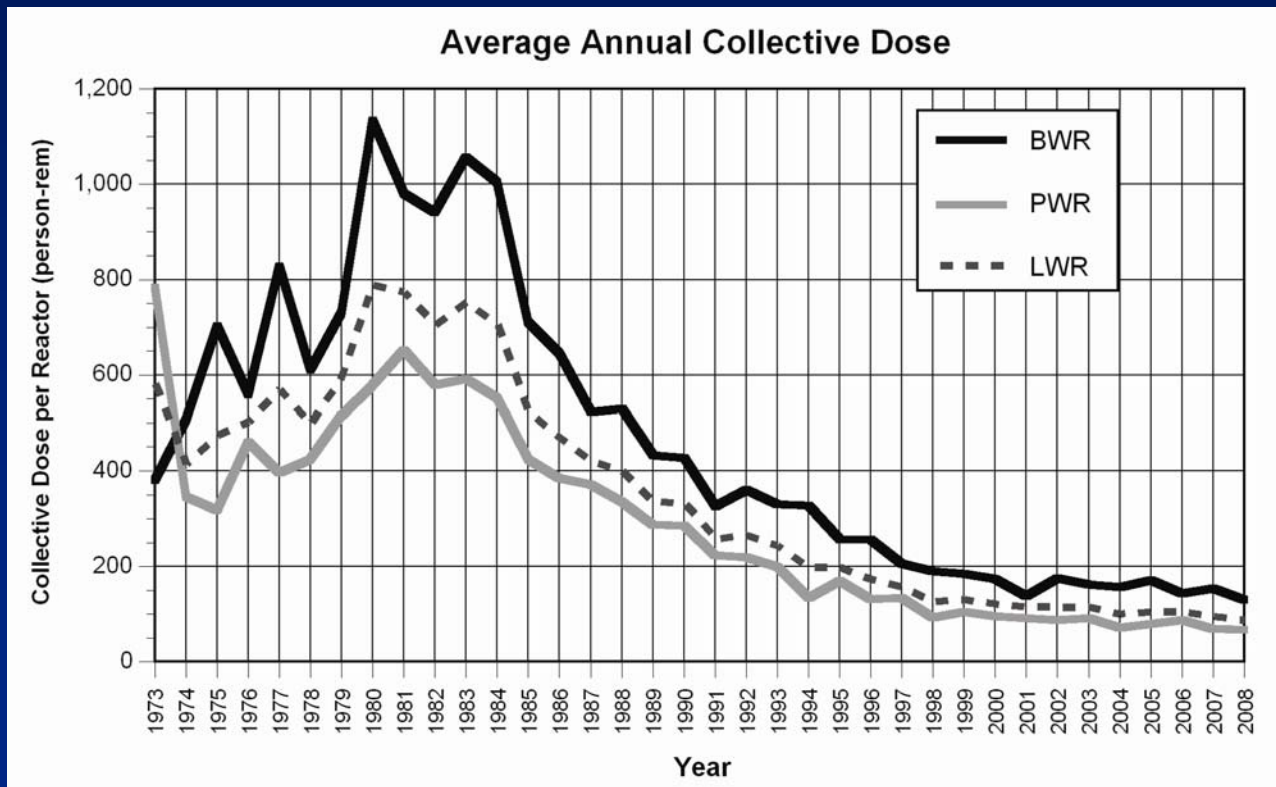


# Electricity Generated 1973 – 2008 *(Preliminary NUREG-0713)*

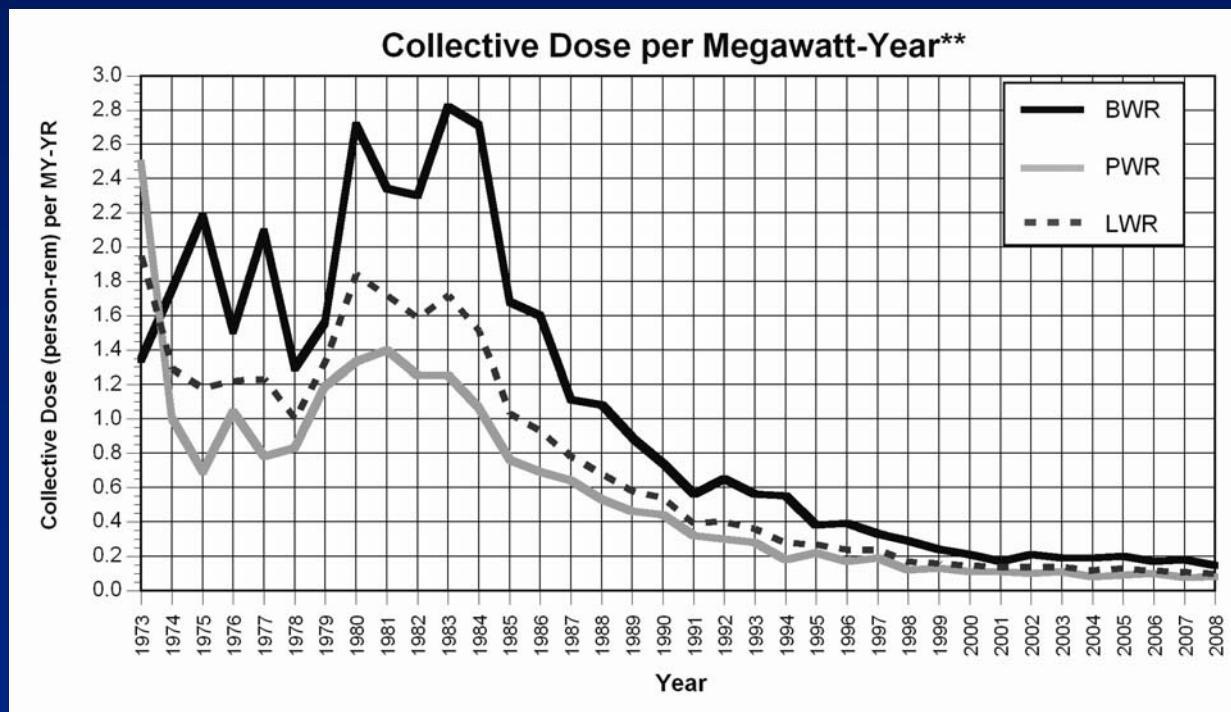


# Collective Dose 1973 – 2008

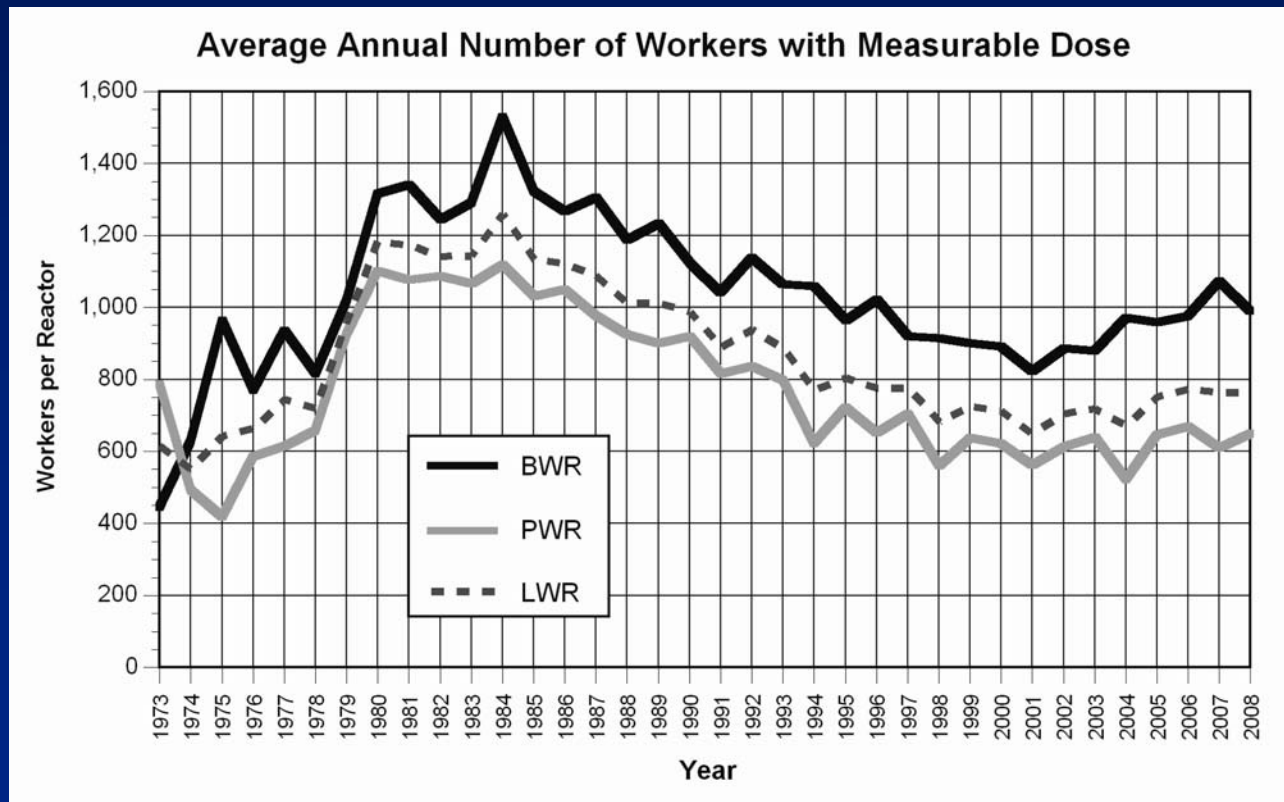
(Preliminary NUREG-0713)



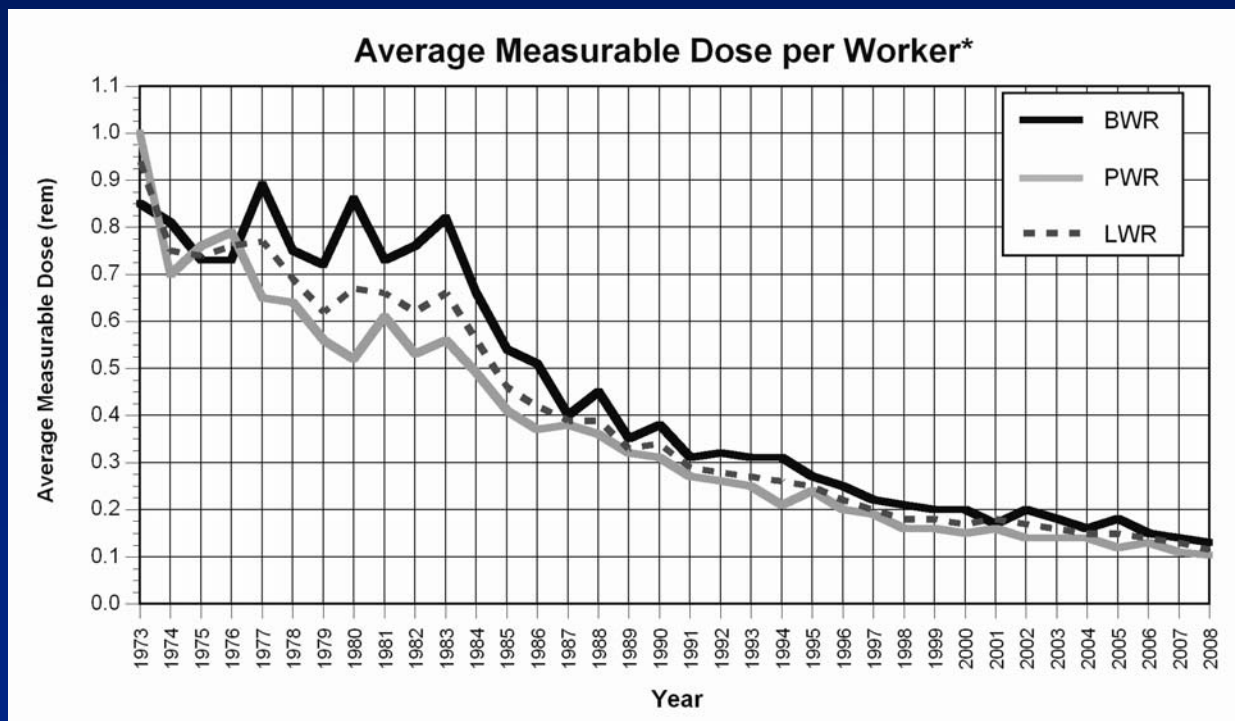
## Collective Dose per Megawatt-Year 1973 – 2008 (Preliminary NUREG-0713)



## Average Number of Workers per Rx 1973 – 2008 *(Preliminary NUREG-0713)*



## Average Measurable Dose / Worker 1973 – 2008 (Preliminary NUREG-0713)



# Revised Radiation Safety Inspection Module 71124

- 1: Hazard Assessment and Exp. Control
- 2: ALARA Planning and Controls
- 3: Airborne Radioactivity Control
- 4: Occupational Dose Assessment
- 5: Radiation Monitoring Instrumentation
- 6: Effluents
- 7: REMP
- 8: LLW, Transportation & RAM Control

## **ALARA Inspection Module 71124.02**

- Determine plant's quartile for 3 yr dose average
- Schedule inspection hours (biennial)
  - Top quartile                      – 44 inspection hours
  - Mid quartiles                      – 54 inspection hours
  - Lowest quartile                      – 64 inspection hours
- Adjust as appropriate based on the plant source term and overall ALARA effectiveness

## Inspection item - ALARA Plans

- Review ALARA work plans & RWPs
- Determine if work activities are reasonably grouped
- Review ALARA work plans and dose estimates
- Review dose reduction strategies

## Inspection item - Verify Dose Estimates

- Select three to five ALARA work packages
- Review planning assumptions, including dose rate and work-hour estimates
- Determine licensee's criteria
  - for performing additional ALARA reviews
  - for additional ALARA planning and controls

## Inspection Item - Adjusting Exposure Estimates

- Evaluate plant's method of adjusting exposure estimates or re-planning work
- Determine if adjustments:
  - are well founded and based on good reasoning, or
  - if they are just adjusted with failure to control the work

# Inspection Item - Source Term Reduction and Control

- Determine
  - dose rate trends
  - plant source terms
- Review planning for expected changes in source term
  - from changes in fuel performance issues or
  - changes in plant primary chemistry

## **Inspection item - Radiation Worker & HPT Performance**

- Concentrate on jobs with the greatest radiological risk
- Observe radworkers & HP Techs
  - overall performance
  - compliance with RWP and ALARA planned controls
  - training and skill level
  - awareness and use of the ALARA philosophy
  - use of low-dose waiting areas

## **Inspection item – Use of Corrective Action Program**

- Verify ALARA problems are being identified and entered into CAP programs
- Verify problems are being resolved by CAP program

## Performance Deficiencies (PD)

- First, inspector identifies an “Issue of Concern”
- Second, determine if it’s a PD
- Third, screen the PD
  - Is it “Minor”, or “More Than Minor”
  - If more than minor, then evaluate under Significance Determination Process
  - Determine if it’s a Green, White, Yellow, Red finding

## Minor or More Than Minor?

- IMC-612 Appendix B Screening
- IMC-612, Appendix E Minor Examples

# Philosophy of Screening Process

- Radiation Protection is a series of radiological barriers and protective measures
  - e.g., training, procedures, ALARA programs, surveys, worker briefings, postings, monitoring

## General Screening Criteria

- A PD in one barrier by itself is a minor reduction in overall adequacy of protection
- More than one barrier, or a loss of a significant barrier, is generally “More-Than-Minor”
- Screening depends on circumstances, and the NRC inspector’s evaluation of its significance

## ALARA “Violations” vs. “Findings”

- Violations are against regulations, e.g.; so ALARA “violations” are reserved for major/multiple performance deficiencies
- ALARA findings are normally based on COLLECTIVE dose exceeding dose goal

## **FR 56, May 21, 1991 (pg 23367)**

- Regulatory ALARA compliance is based on whether licensees have incorporated measures to track and reduce dose
- Regulatory ALARA compliance is not based on whether doses are the absolute minimum, or
- Whether all possible methods were used to reduce dose

## Individual Doses

- Normally, ALARA findings are NOT based on an individual unintended exposure
- Instead, the performance indicator (PI) program is applied:
- Example: A worker gets “unintended exposure” (e.g., alarming dosimeter alarm)
  - NRC expects licensees to use CAP program and fix problem
  - Evaluated under the performance indicator program

## **IMC 612, Appendix E**

### **- Minor Examples – Collective Dose**

- PD identified
  - Minor PD if:  $\leq 5$  rem collective dose, or
  - Minor PD if:  $\geq 5$  rem, but  $\leq 50\%$  above the planned, intended collective dose
  - More than Minor if:  $\geq 5$  rem dose AND  $\geq 50\%$  greater than planned, intended collective dose

## **Example: Expanded work scope**

- First step - identify a performance deficiency
- PD is “minor” if dose estimates are properly revised to account for actual work, and
- The actual dose  $> 5$  rem, but was less than 50% of revised, planned, intended dose



## Screening for Significance

- Does 3 yr rolling average exceed industry averages?
  - PWRs – 135 rem
  - BWRs – 240 rem
- If not exceeded, then it's a green finding

# Screening for Significance, Con't.

- If exceeded, then:
  - Did dose exceed 25 rem?
    - No, then it's a green finding
    - Yes, then it's a white finding
  - Were there more than 4 occurrences?
    - No, then it's a green finding
    - Yes, then it's a white finding

## Licensee-identified vs. self-revealing or NRC identified

- If the PD is licensee-identified and entered into CAP program, then the finding is not issued (not documented)
- If the PD was either:
  - 1) self revealing or
  - 2) NRC identified,then the finding is issued (documented)

## 12 ALARA Findings in 2 years

- Finding #1 – (2009)
- Inadequate work planning for in-vessel visual inspection
  - inexperienced workers and dose > 50%
- Finding #2 – (2009)
- Inadequate work planning for main steam line strain gauge modification
  - Interferences, scaffolding and insulation removal were not adequately planned and coordinated
  - 6.1 rem to 11.32 rem

## ALARA Findings

- Finding # 3 (2008)
  - failure in radiological and engineering controls - reactor recirculation sump strainer
    - Dose > 5 rem and > 50% above estimates
- Finding # 4 (2008)
  - did not effectively manage source term and work activities to prevent unnecessary dose > 5 rem and > 50%

## ALARA Findings

- Finding # 5 (2007)
  - Inadequate work instructions to isolate pressure transmitter prior to opening the drain valve
  - Resulted in unplanned and unintended dose
- Finding # 6 (2007)
  - Planned work hours were significantly increased
    - failed to include contractor work hours
    - design errors on bolting locations
    - 3.4 rem to 11.9 rem

## ALARA Findings

- Finding # 7 (2007)
  - Re-work for chemical decon, due to lack of planning and radworker errors
  - 5.8 rem to 9.1 rem (>50%)
- Finding # 8 (2007)
  - 3 different work activities exceeded planned dose by 50%

## ALARA Findings

- Finding # 9 (2009)
  - Failure to follow procedure and perform in-progress job reviews for jobs > 5 rem as required by procedure
- Finding # 10 (2008)
  - Failure to Perform Adequate TEDE ALARA Evaluation
    - respirators were specified to be used when not warranted based on use of engineering controls

## ALARA Findings

- Finding # 11 (2008)
  - Failure to properly pre-plan work for a RCP motor replacement
  - Estimated 3.5 rem, took 12 rem
- Finding # 12 (2007)
  - scaffolding dose exceeded 5 rem and 50%

# Revision of ALARA Regulatory Guides

- RG 8.10 ALARA Philosophy
  - DG-8033 Philosophy For Maintaining Occupational Exposures As Low As Is Reasonably Achievable
- RG 8.8 Occupational Exposure ALARA