

NRC Update on ALARA Regulatory Activities

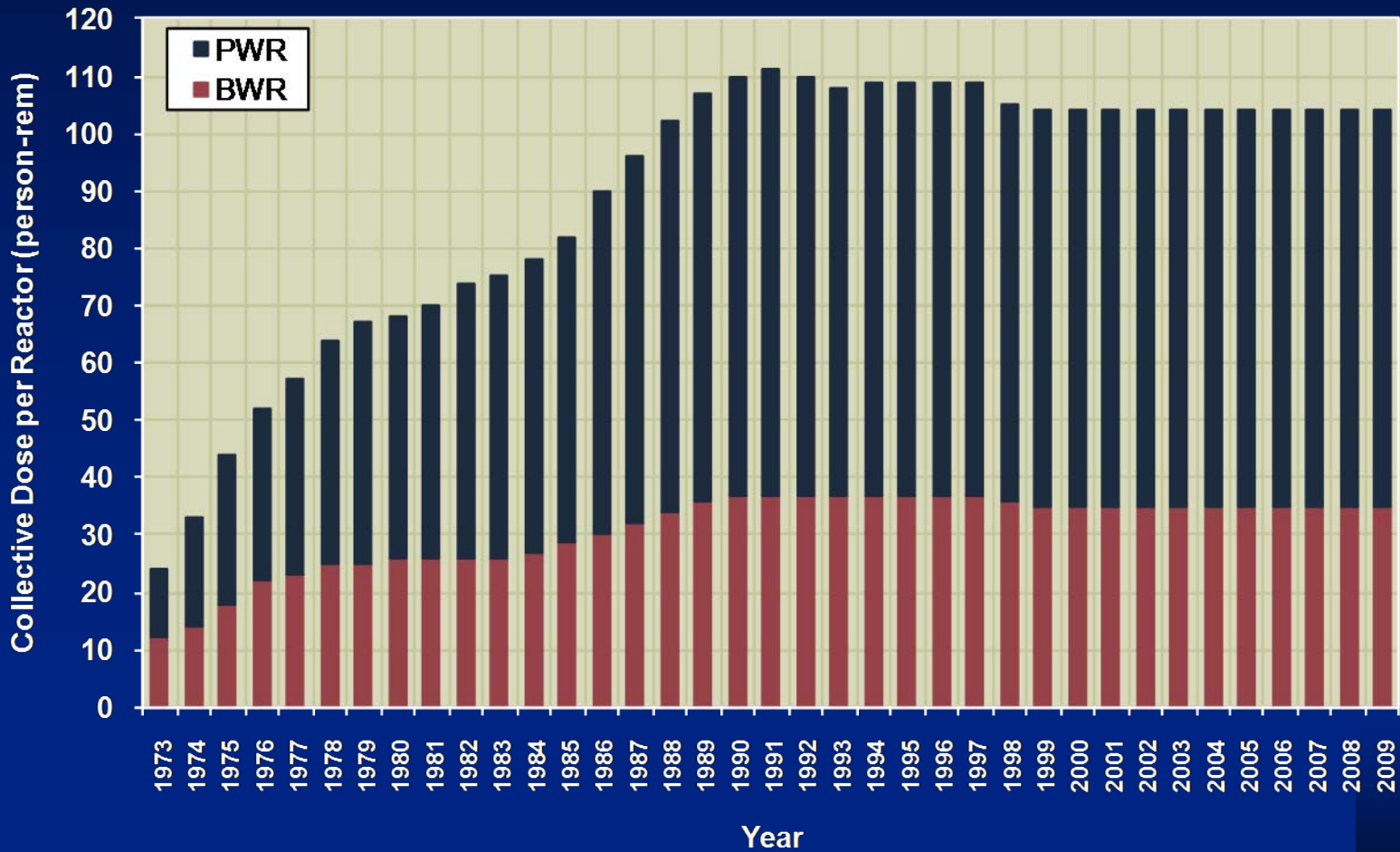
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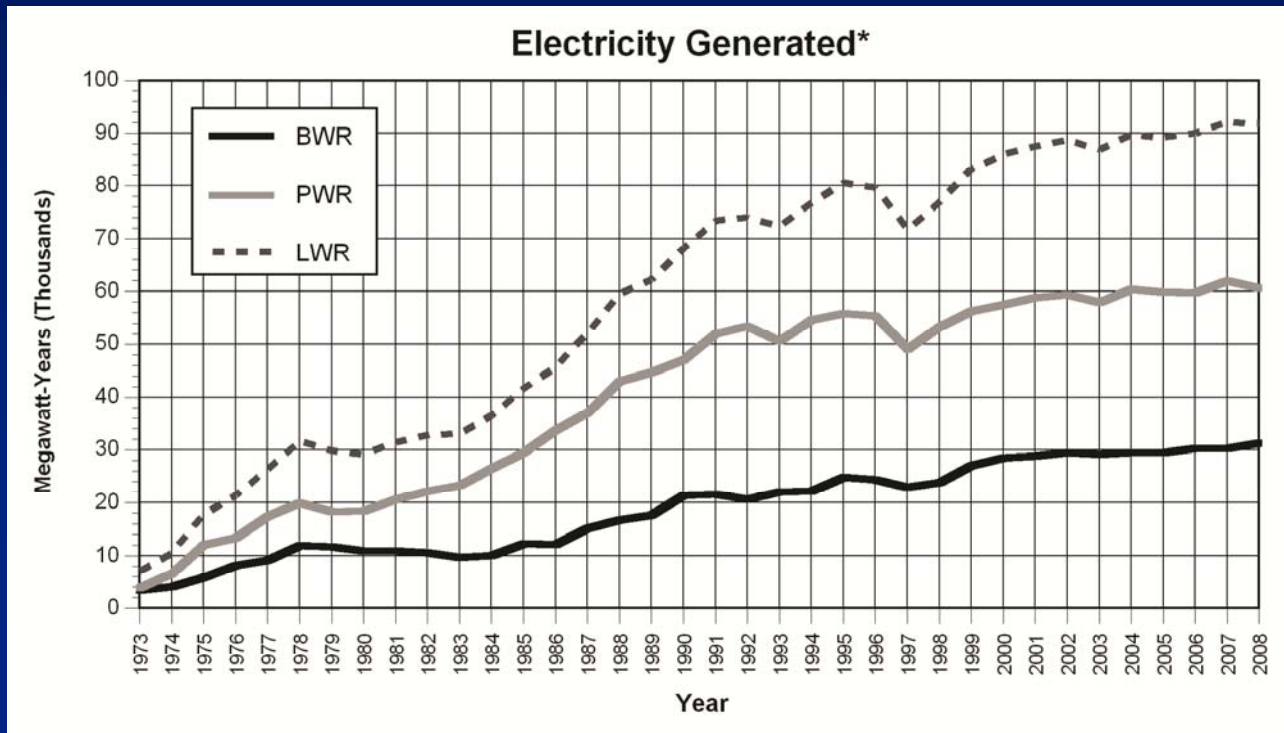
Number of Operating Reactors

1973 – 2009 *(Preliminary NUREG-0713)*



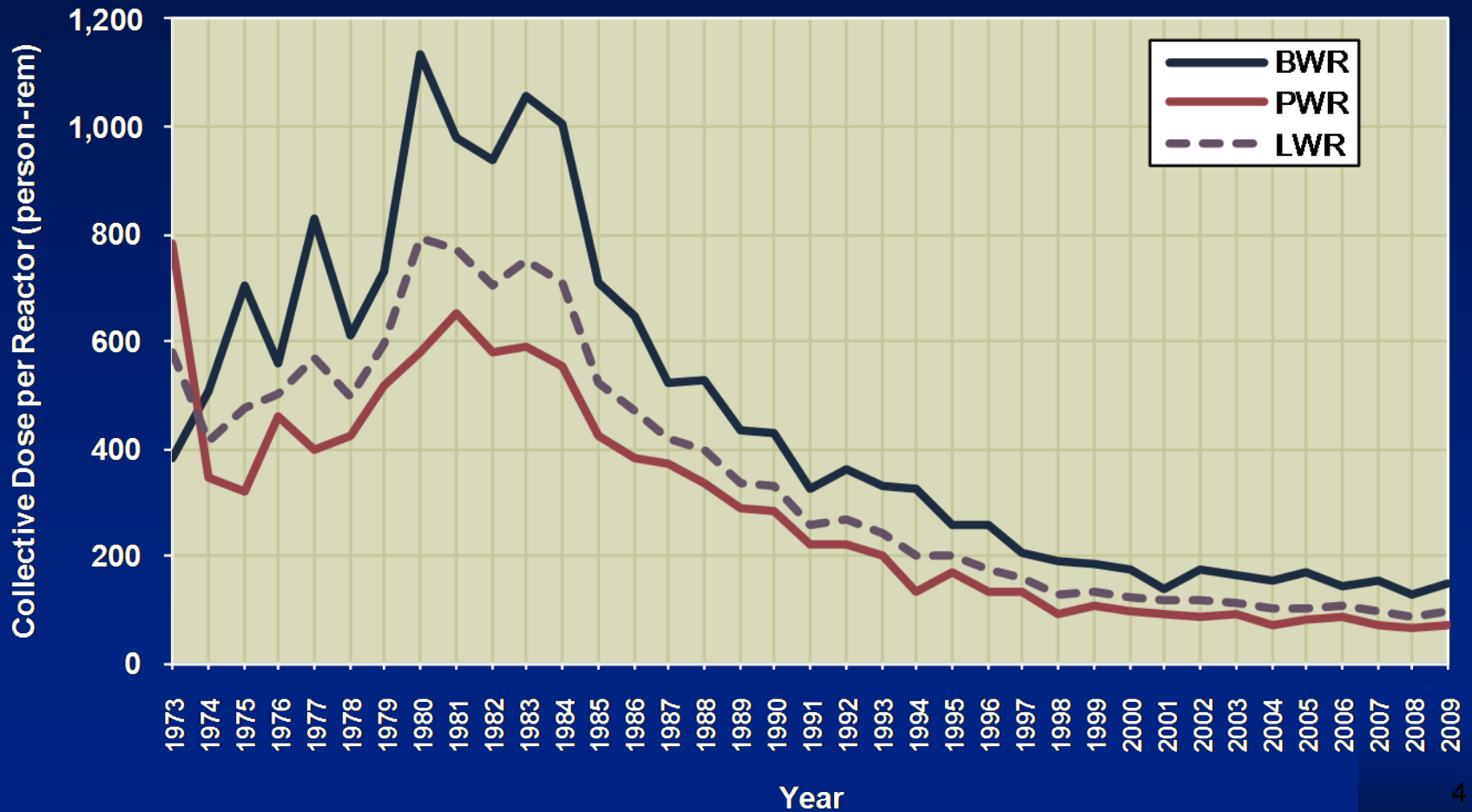
Electricity Generated

1973 – 2008 *(Preliminary NUREG-0713)*



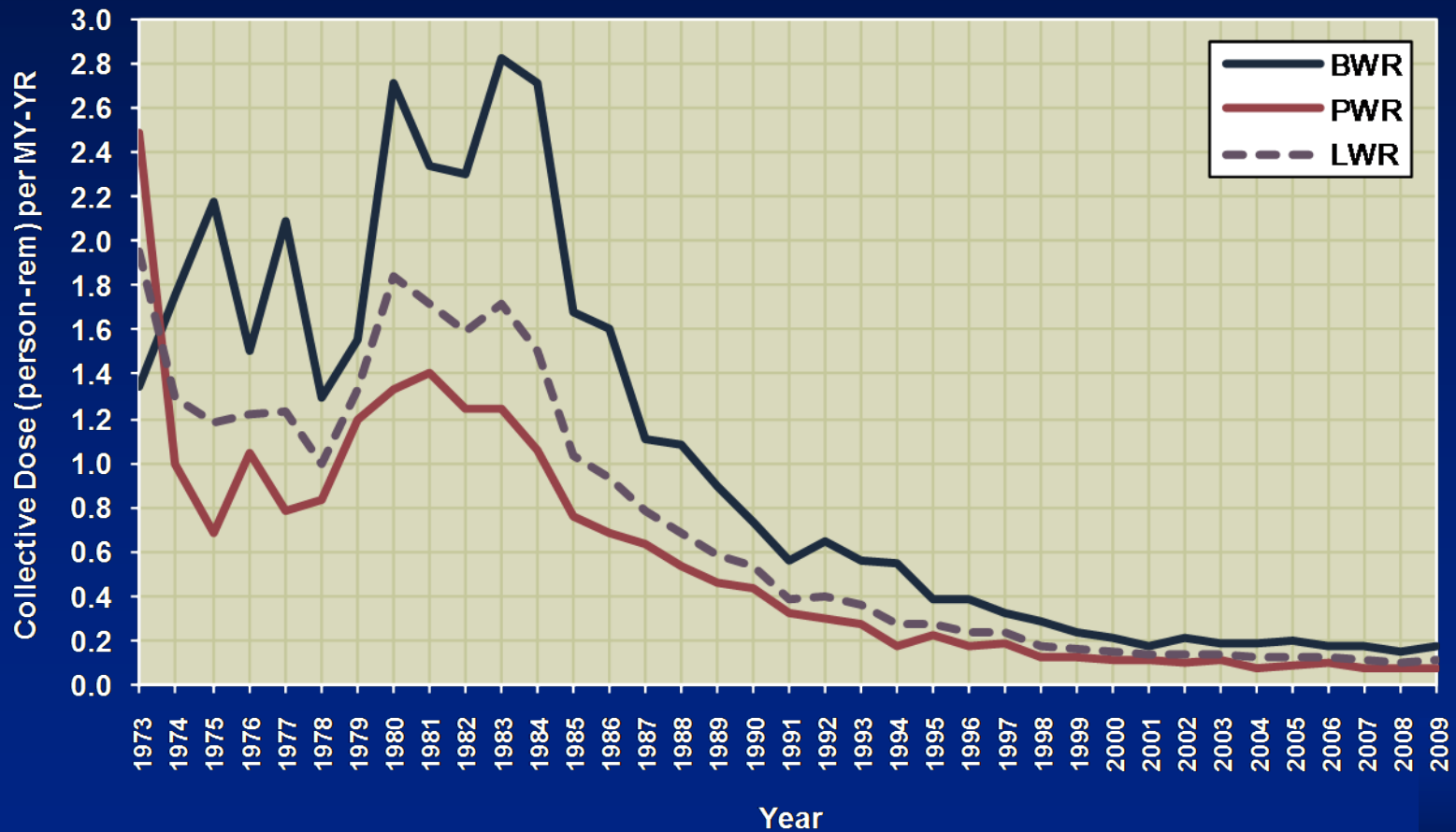
Collective Dose 1973 – 2009

(Preliminary NUREG-0713)



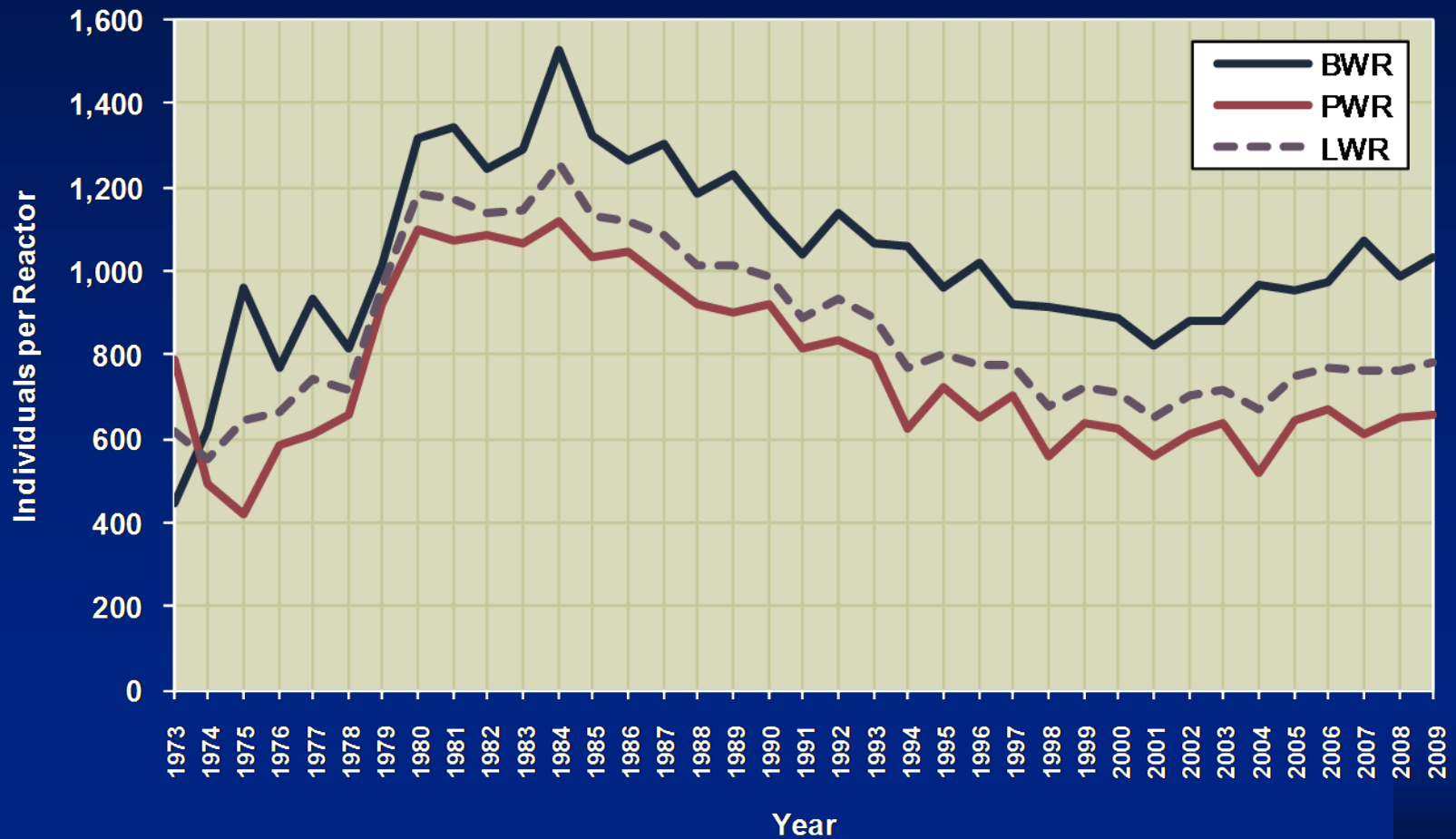
Collective Dose per Megawatt-Year *

1973 – 2009 (Preliminary NUREG-0713)



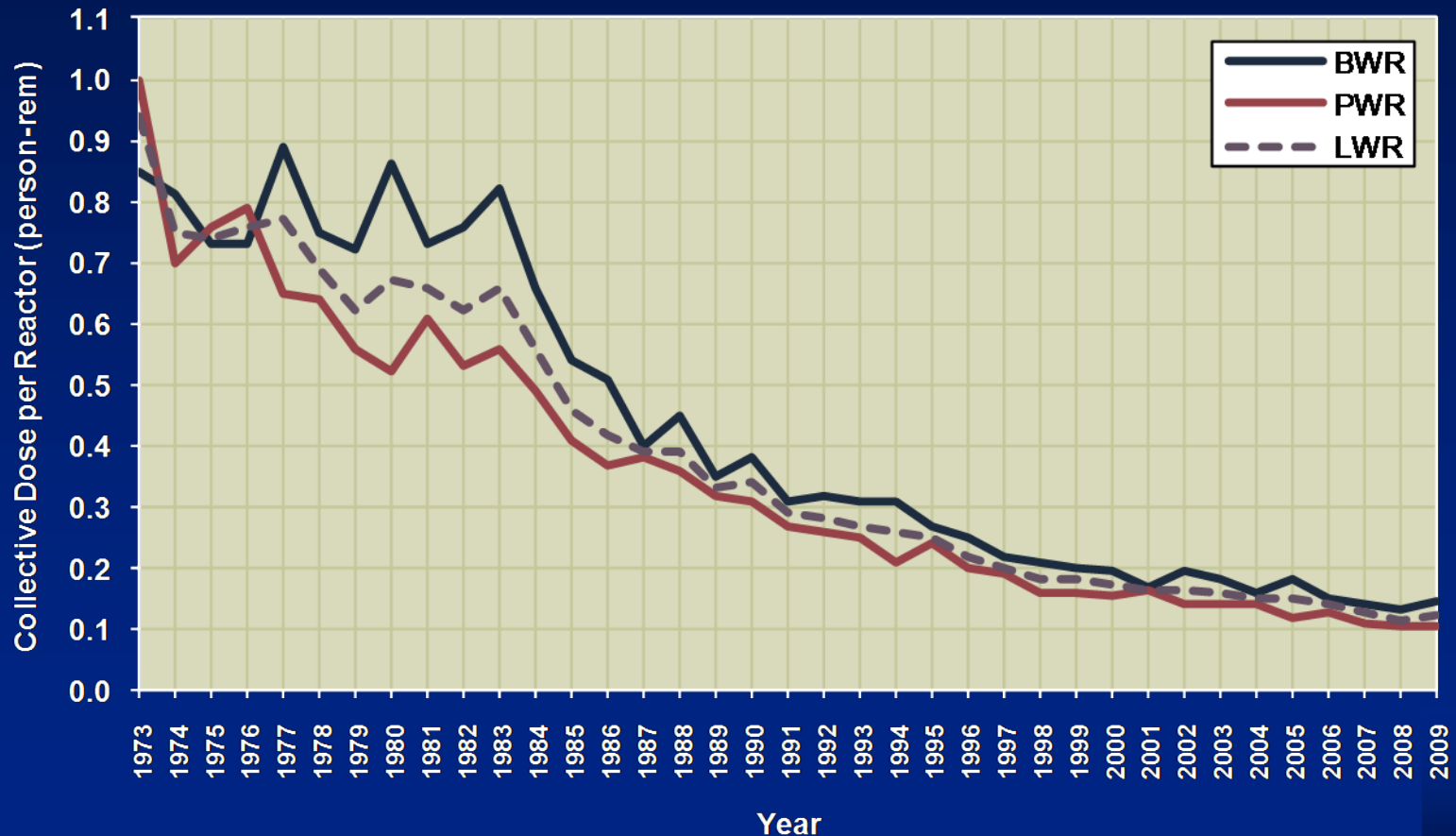
* Gross electricity is shown for 1973–1996, net electricity is shown for 1997–2009.

Average Number of Workers per Rx 1973 – 2009 (Preliminary NUREG-0713)



Average Measurable Dose / Worker

1973 – 2009 (Preliminary NUREG-0713)



* Not adjusted for transient workers.

2009 PWR TYRA Averages Are Good

- Median TYRA = 59 person-rem
- Average TYRA is = 68 person-rem
- 3 PWRs over NRC SDP criteria of 135 person-Rem

2009 BWR TYRA Averages Are Good

- Median TYRA = 132 person-rem
- Average TYRA = 144 person-rem
- 1 BWR over NRC SDP criteria of 240 person-rem

Averages are not the NRC Focus

- Recognition that individual plants with higher dose
 - Need strong ALARA programs
 - Need strong management support
- Individual jobs
 - Many jobs will go well
 - Focus needed on individual jobs that need re-planning, re-budgeting

Limitations on use of TYRA as a Performance Metric

- Recognizing that:
 - 2 year refueling cycles
 - One-time high dose work scopes
 - Head & generator replacements
 - Insulation and sump mods
 - Pressurizer inconel weld inspections
- Plant designs are not equal

Use of TYRA

- Although TYRA is a limited performance metric, it does give a broad indication of radiological challenges to ALARA programs
- TYRA is used to risk-inform ALARA inspection hours

ALARA Inspection Module 71124.02

- Long term industry ALARA performance has resulted in decreased ALARA inspection hours:
- Schedule inspection hours on average (biennial)
 - Low dose quartile reduced* from 64 to 44 hours
 - Mid dose quartile reduced* from 80 to 54 hours
 - High dose quartile reduced* from 96 to 64 hours
- * Adjust as appropriate based on the plant source term and overall ALARA effectiveness

Inspection items - 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 dose adjustments:
 - are well founded / based on good reasoning, or
 - if they are just adjusted due to 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)

- 1st, inspector identifies an “Issue of Concern”
- 2nd, determine if there is a “Performance Deficiency”
- 3rd, screen the PD for Minor or More Than Minor
 - If more than minor, then evaluate under Significance Determination Process
 - Determine Green, White, Yellow, Red finding

Performance Deficiency – 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 performance deficiency 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”
- Depends on circumstances, and the NRC inspector’s evaluation of its significance

ALARA Regulatory basis – (FR 56, 5/21/1991)

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

ALARA “Violations” vs. “Findings”

- “Violations” are a failure to comply with statute, regulation, order, license condition, or technical specification
 - ALARA “violations” are reserved for broad-scope, multiple performance deficiencies against 20.1101(b) that requires use of ALARA procedures and controls
- “Findings” are performance deficiencies of more than minor significance based on licensee established “standards” (e.g., procedures)

Radworker Individual Dose

- Normally, ALARA findings are NOT based on any one individual's unintended dose
- Instead, the performance indicator (PI) program is applied (or alternately, a Finding is documented as a performance deficiency in radiation exposure control)
- Example: A worker gets “unintended exposure” (e.g., identified via alarming dosimeter)
 - NRC expects licensees to use CAP program and fix problem
 - ROP oversight uses the performance indicator (PI) program

IMC 612, Appendix E

- Minor, More Than Minor Examples

- PD is identified
 - Minor “PD” if: ≤ 5 rem collective dose, or
 - Minor “PD” if: ≥ 5 rem, but $\leq 50\%$ above the planned, intended collective dose
 - More than Minor “Finding” if: ≥ 5 rem dose AND $\geq 50\%$ of planned, intended collective dose

Example: Expanded work scope

- Determine if there is a “performance deficiency”
 - Was job re-planned; wrong tools, inadequate shielding, workers not trained, briefed?
 - Did schedule pressure not allow time for ALARA techniques?
 - Was job re-budgeted properly?

Minor Performance Deficiency

- If the PD is “minor,”
 - PD entered into Corrective Action Program
 - Post job review
 - Lessons learned to prevent mistakes repeated?

More Than Minor Findings

- If PD was more-than-minor, then a “Finding”
- Screen for safety significance
 - Green - very low safety significance
 - White - low to moderate safety significance
 - Yellow – substantial safety significance
 - Red – high safety significance

ALARA Finding – Significance Determination

- Does 3 yr rolling average exceed industry averages?
 - PWRs – 135 rem
 - BWRs – 240 rem
- If not exceeded, then it's a green finding
- If TYRA exceeded thresholds, then:
 - Did job dose exceed 25 rem?
 - No, then it's a green finding if < 4 occurrences
 - Yes, then it's a white finding
 - Were there more than 4 occurrences > 5 rem?
 - 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 cited / issued
- If the PD was either:
 - 1) self revealing or
 - 2) NRC identified,
then the finding is cited / issued

Common Cause of ALARA Findings

- Scheduled work not well planned
- Scheduled work not worked as planned, work controls not implemented as planned
- Emergent, unscheduled work was not recognized, stopped, and planned
- Work scope changes not communicated to HP/ALARA groups
- HP/ALARA groups did not respond to work scope changes
- Dose budgets for additional work scope were not revised or well documented

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