

# NRC Update on ALARA Regulatory Activities

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#### Collective Dose 1973 – 2012 (Preliminary NUREG-0713)





#### Average Number of Workers per Rx 1973 – 2012 (Preliminary NUREG-0713)





#### Average Measurable Dose / Worker 1973 – 2012 (Preliminary NUREG-0713)



<sup>\*</sup> Not adjusted for transient workers.



#### In 2010, 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



#### Module 2 – ALARA

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



### **ALARA Inspection Module**

- Verify Dose Estimates
- Process for Adjusting Exposure Estimates
- Radiation Worker & HPT Performance
- Source Term Reduction and Control
- Proper Use of Corrective Action Program



### **ALARA Inspection Module 71124.02**

- Determine plant's quartile for 3 yr dose average
- Schedule inspection hours (biennial)
  - Top quartile
  - Mid quartiles

- 44 inspection hours
- 54 inspection hours

Lowest quartile

- 64 inspection hours
- Adjust as appropriate based on the plant source term and overall ALARA effectiveness



## BWR Quartile Data 2010 to 2012

	Plant Name	Three Year Coll. TEDE per Reactor Year 2010-2012 (person-rem)	Percent Change From 2009-2011	2009-2011 Quartile (if changed)
	LIMERICK 1,2	85.337	-13% 🔻	-
1st Quartile	SUSQUEHANNA 1,2	86.835	-15% 🔻	
	RIVER BEND 1	95.249	-39% 🔻	3
	PILGRIM	96.254	-46% 🔻	4
	DRESDEN 2,3	98.311	-14% 🔻	2
	HATCH 1,2	102.327	1% 🔺	-
	FERMI 2	105.181	-1% 🔻	
2nd Quartile	MONTICELLO	110.633	-29% 🔻	3
	HOPE CREEK 1	113.151	-4% 🔻	
	QUAD CITIES 1,2	120.729	-15% 🔻	-
	DUANE ARNOLD	121.593	-2% 🔻	
	PERRY	127.809	-60% 🔻	4

Average 133.336



# BWR Quartile Data – 2010 to 2012

		121.000	00/0		Augraga 122 226
3rd Quartile	OYSTER CREEK	139.477	44% 🔺	1	< Average 155.550
	FITZPATRICK	141.663	46% 🔺	1	
	VERMONT YANKEE	142.643	-4% 🔻	-	
	COLUMBIA GENERATING	145.277	-37% 🔻	4	
	BROWNS FERRY 1,2,3	146.413	10% 🔺	2	
	PEACH BOTTOM 2,3	152.436	-1% 🔻	-	
4th Quartile	CLINTON	154.217	-7% 🔻	3	
	LASALLE 1,2	158.279	-7% 🔻	-	
	GRAND GULF	161.944	102% 🔺	1	
	NINE MILE POINT 1,2	171.287	20% 🔺	3	
	BRUNSWICK 1,2	193.059	2% 🔺	-	
	COOPER STATION	229.950	4% 🔺	-	
	Average per Reactor-Year	133.336	-7% 🔻		



## PWR Quartiles 2010 to 2012

	Plant Name	Three-Year Coll. TEDE per Reactor Year 2010-2012 (person-rem)	Percent Change From 2009-2011	2009-2011 Quartile (if changed)
1st Quartile	CRYSTAL RIVER 3	14.030	-84% 🔻	4
	PALO VERDE 1,2,3	25.953	-14% 🔻	-
	FARLEY 1,2	31.440	-6% 🔻	-
	COOK 1,2	31.593	5% 🔺	-
	DIABLO CANYON 1,2	33.436	-59% 🔻	4
	SUMMER 1	38.657	29% 🔺	-
	PRAIRIE ISLAND 1,2	38.688	39% 🔺	-
	WATTS BAR 1	39.998	-1% 🔻	-
	CATAWBA 1,2	40.678	-23% 🔻	2
	KEWAUNEE	41.060	-12% 🔻	-
	BEAVER VALLEY 1,2	41.226	-29% 🔻	3
2nd Quartile	SEABROOK	41.239	-21% 🔻	-
	SALEM 1,2	41.925	-18% 🔻	-
	FORT CALHOUN	42.789	-36% 🔻	3
	ARKANSAS 1,2	43.361	-18% 🔻	-
	MCGUIRE 1,2	43.941	-6% 🔻	1
	VOGTLE 1,2	44.572	-7% 🔻	1
	SOUTH TEXAS 1,2	44.590	-10% 🔻	-
	CALLAWAY 1	47.825	0% 🔻	1
	COMANCHE PEAK 1,2	48.711	6% 🔺	1
	BRAIDWOOD 1,2	50.279	9% 🔺	1



## PWR Quartiles 2010 to 2012

	WOLF CREEK 1	50.788	-30% 🔻	-	
tile	ROBINSON 2	51.602	61% 🔺	1	
	GINNA	52.838	9% 🔺	1	
	MILLSTONE 2,3	54.046	-21% 🔻	-	
uar	POINT BEACH 1,2	54.189	-7% 🔻	-	
3rd Qu	HARRIS	55.716	30% 🔺	1	
	OCONEE 1,2,3	56.310	-9% 🔻	-	
	CALVERT CLIFFS 1,2	56.557	6% 🔺	2	< Average 57 022
	BYRON 1,2	58.584	-8% 🔻	-	< Average 57.925
-	THREE MILE ISLAND 1	60.614	-56% 🔻	4	
	INDIAN POINT 2,3	61.960	-19% 🔻	3	
	NORTH ANNA 1,2	63.262	8% 🔺	3	
	TURKEY POINT 3,4	65.038	24% 🔺	2	
4th Quartile	SURRY 1,2	65.600	-6% 🔻	3	
	SAN ONOFRE 2,3	75.087	11% 🔺	3	
	SEQUOYAH 1,2	76.202	37% 🔺	2	
	ST. LUCIE 1,2	113.002	8% 🔺	-	
	WATERFORD 3	121.723	1% 🔺	-	
	PALISADES	162.219	-4% 🔻	-	
	DAVIS-BESSE	193.509	7% 🔺	-	
	Average per Reactor-Year	57.923	-3% 🔻		



#### "Violation" vs "Findings" under ROP

- Violation or "regulatory" compliance is based on whether licensees have adequate procedures to track and reduce collective dose
- Compliance is not based on whether individual doses are the absolute minimum, or use of all possible ALARA methods
- Performance deficiencies against own procedures (planning, implementation)



#### **Individual Doses**

- Performance indicator (PI) program applies to an individual's unintended exposure
- Example: An individual 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
  - More than 100 mrem unintended dose is PI occurrence



#### ALARA is based on Collective Dose NRC Screening Methods

- Performance Deficiency screening:
  - Minor if:  $\leq$  5 rem collective dose, or
  - Minor if: ≥ 5 rem, but ≤ 50% above the planned, intended collective dose
  - At least Green Finding if:  $\geq$  5 rem dose AND  $\geq$  50% greater than planned, intended collective dose



### Example: Inadequate job execution

- Performance deficiency in shielding installation
  - Shielding package not installed
  - Original dose estimate being exceeded
  - The actual dose > 5 rem, but was less than 50% of revised, justifiable dose estimate
  - Minor performance deficiency, use CAP



### **Screening for White Findings**

- Does 3 yr rolling average exceed screening thresholds?
  - PWRs 135 rem
  - BWRs 240 rem
  - If thresholds are not exceeded, then Green Finding
  - NOTE: Palisades (162 rem) and Davis Besse (193 rem) exceed these thresholds (No BWRs exceeded thresholds)
- If PWR > 135 rem or BWR > 240 rem
  - Did actual dose exceed 25 rem?
    - No, then a Green finding
    - Yes, then a White finding
  - Were there more than 4 occurrences where actual dose > 5 rem and > 50% above dose estimate?
    - No, then a Green finding
    - Yes, then a White finding



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

- If the performance deficiency is licenseeidentified and entered into CAP program, then the finding is not issued
- If the performance deficiency was either:
  - 1) self revealing or
  - 2) NRC identified, then the finding is issued



## ALARA Findings – 4 Causes:

• Cause #1: Failure to plan work (5)

 Cause #2: Failure to follow procedures/work instructions (2)

Cause #3: Poor work instructions (1)

• Cause #4: Poor craft job execution (1)



# #1 Failure to Adequately Plan and Control Work ML13221A584

CVCS repair work was fast-tracked

Lack of understanding of the work scope

Mismanagement of foreseeable problems



# **#1** Radiation Exposure ALARA During Refueling Activities ML13310A647

Inadequate planning and control of work

Reactor reassembly and cavity decon

• Estimate 9.950 rem; actual 18.9 rem



# **#1** Refueling Floor Activities ML12216A055

- Did not plan, evaluate, and implement strategies to minimize dose
- 25 person rem and actual dose was 45 person rem
- Did not justify increases dose



# **#1** Inadequate Job Planning ML12304A062

- CRA work
  - Estimate 3.5 rem, actual 11.6 rem
- Vessel wet work
  - Revised estimate 10.5 rem, actual 22 rem



# **#1** Failure to Adequately Plan and Control Work ML13042A373

- Fuel Pool Heater exchanger replacement
- Did not perform adequate pre-outage walkdowns
- Estimate 1,905 RWP-hours, actual 12,237
- Estimate of 3.74 rem, actual 23.9 rem



### #2 Failure to Follow Procedures ML12314A29639

- Nonsafety-related gaskets were used
- Inadequate walkdowns were conducted
- Work activities were not planned
- Estimated 2.1, actual 7.6 rem



#### **#2** Rx cavity cleanup (demineralizers) ML13042A373

 RWP required that if dose rates increased by more than 0.2 millirem/hour, change the resins

• Both fuel pool demineralizer trains were inoperable at least 25 days

• Estimated 4.6 rem, actual 8.24 rem



# **#3** Failure to Provide Adequate Work Instructions

- Dose exceeded 5 rem and more than 50% of initial estimate
- Inadequate maintenance procedure for Installing Reactor Water Cleanup Pump Seals
- Corrective action to revise all reactor water cleanup procedures and model work orders Note: The Finding is under the ALARA program



# **#4** Poor Job Execution ML12304A062

- Cond-HX-9 Replacement and Repairs
- Estimate 10.3 rem, actual 19.4 rem
- Lack of experience and poor job execution



### **Questions and Discussion**



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