Exelon SM
Nuclear

ISOE World Class ALARA Performance Award Program:

Limerick 1 & 2

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Japan Mini-ALARA Symposium

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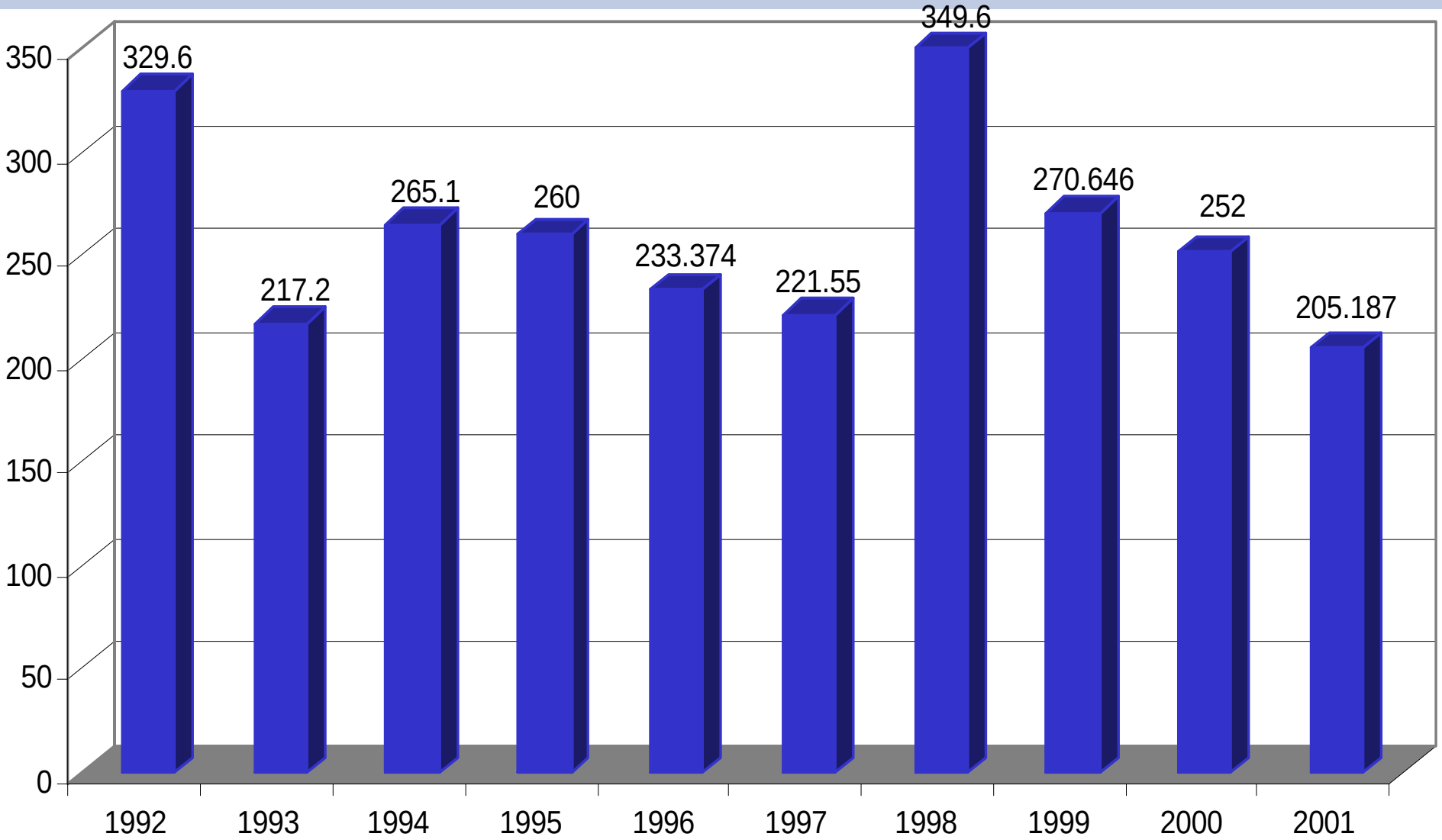
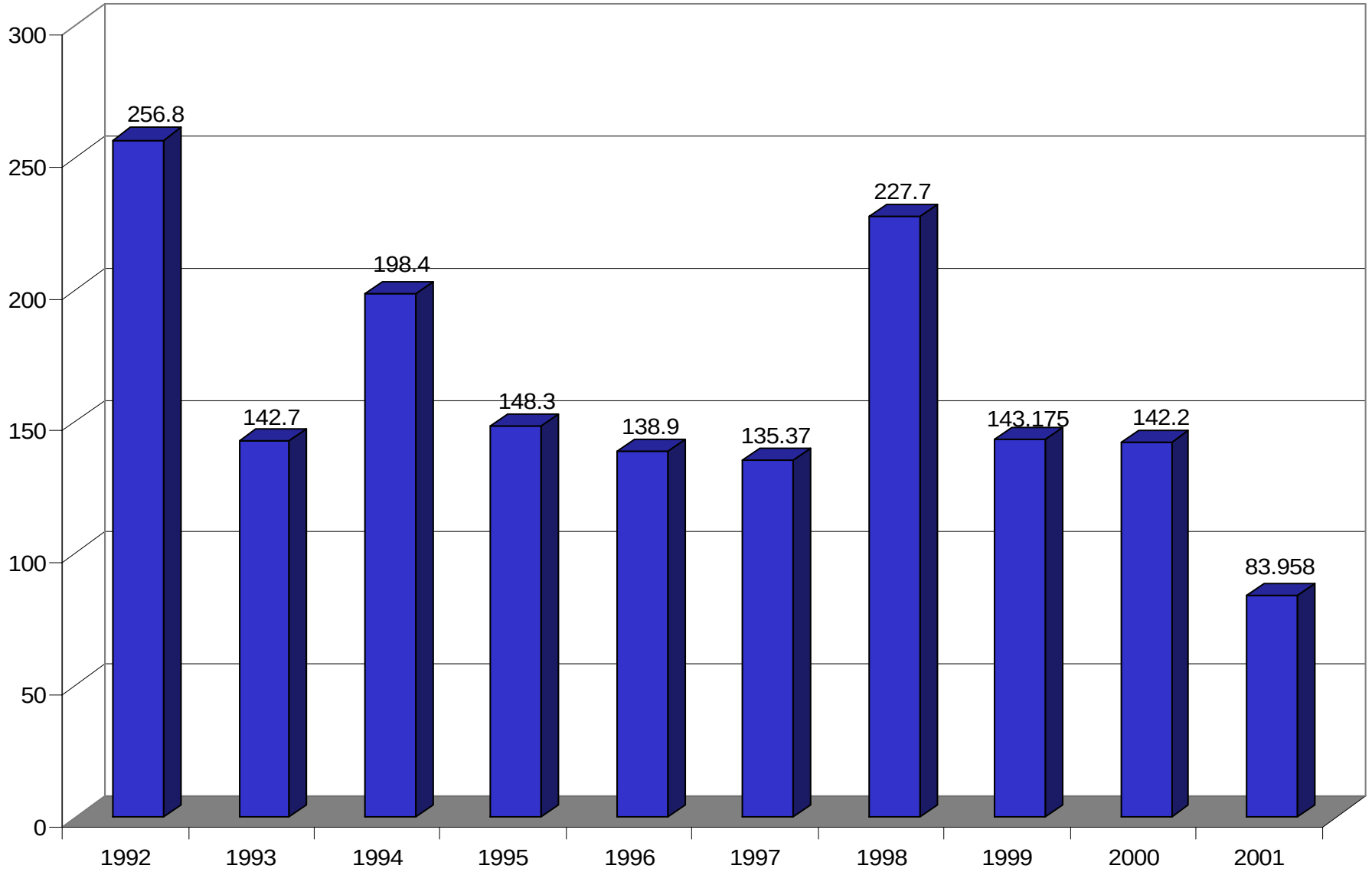
Performance Overview

- Collective Radiation Exposure = 205.187
  - 2R06 Outage – 83.958 Person-rem
  - Online Exposure – 121.229 Person-rem
    - 41.6 Person-rem for mods
    - 79.629 Person-rem for online work
- Two Year Rolling Average = 116.047

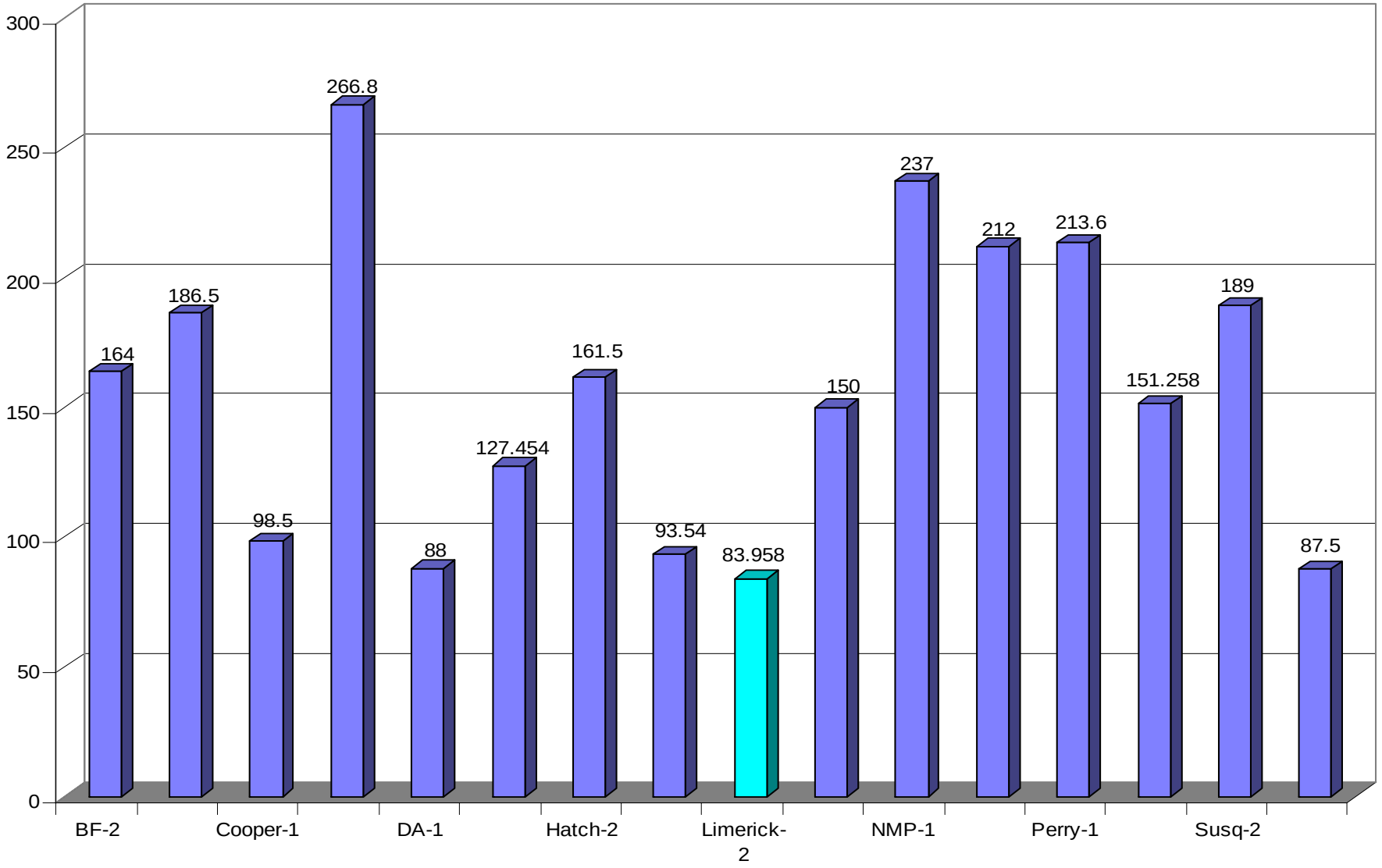
Limerick Yearly History



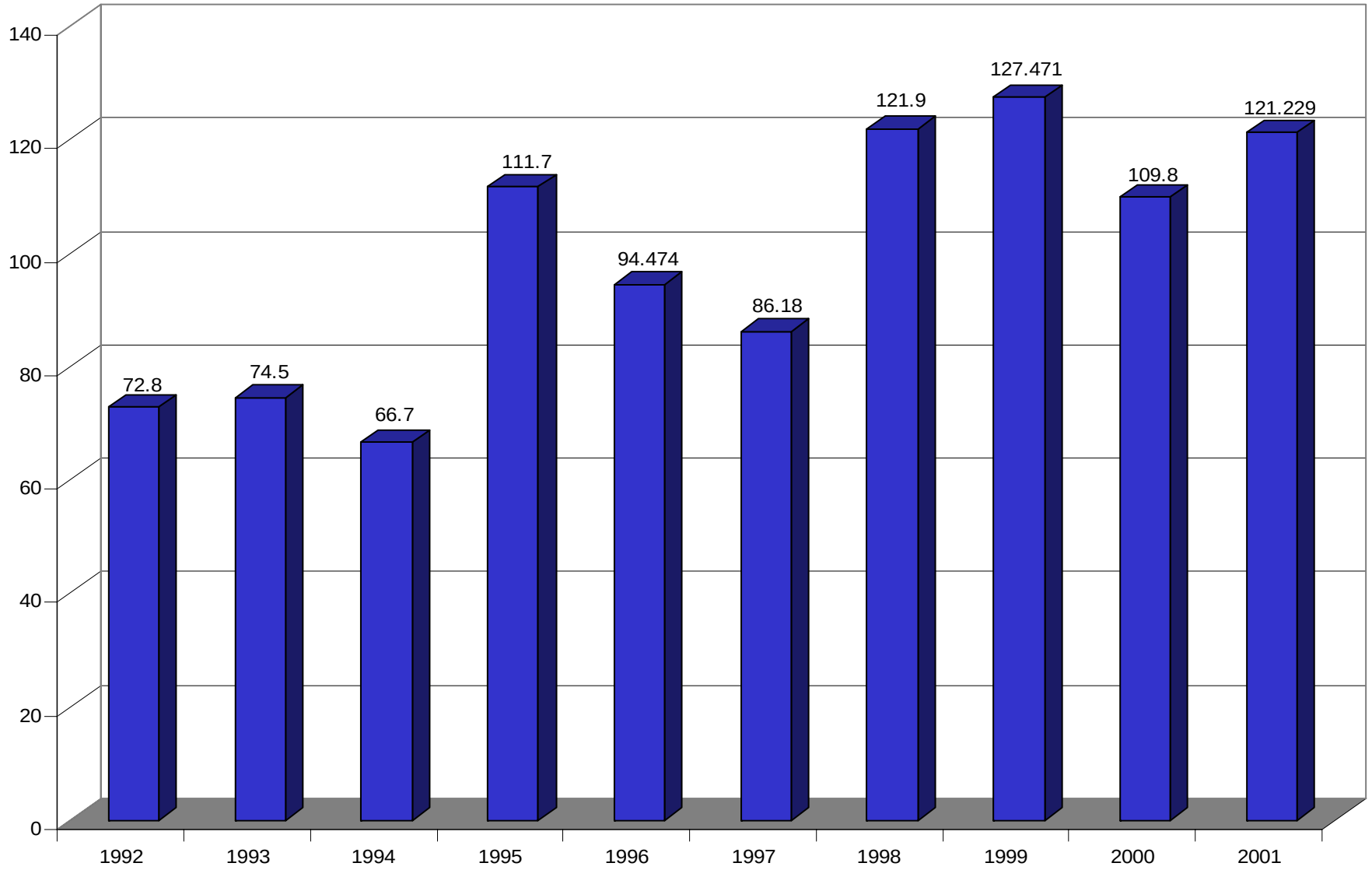
Limerick Outage History



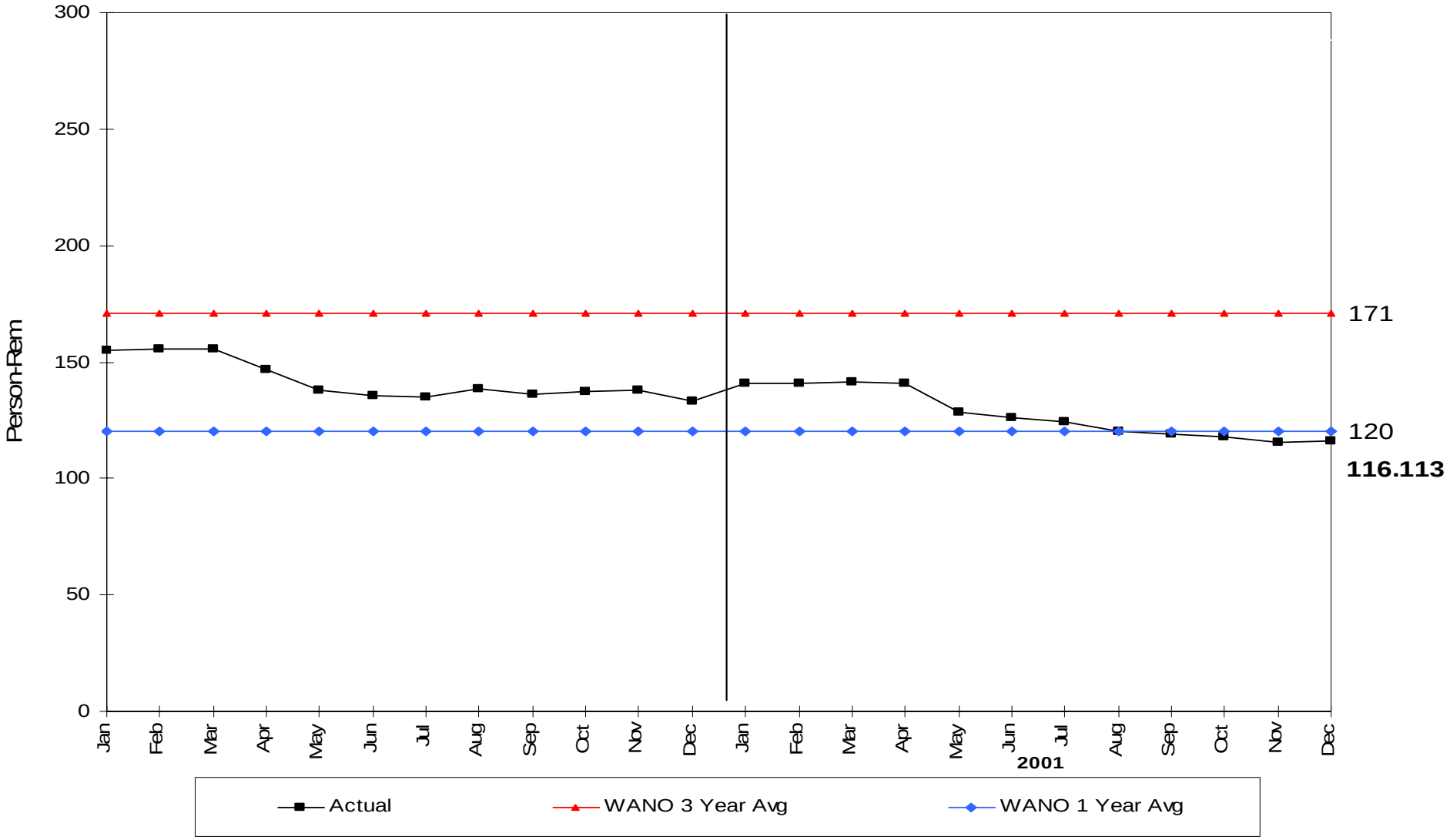
Industry Outage Exposure



Operating Dose History



Rolling Average History



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ALARA Successes

- Outage Work Management
  - Outage Control Center
  - High Impact Teams
- Department Ownership (Dose Zealots)
- Goal Setting
- Exposure Reduction Initiatives

Outage Control Center (OCC)

- Principle objective is to effectively plan, schedule and execute the outage
- Drives the execution of the outage
- Central location for outage control
  - Staffed 24 hours
  - Dedicated work stations
  - Computer and telephone access
  - Dedicated clerk support

Outage Control Center

- Drywell Coordinator
  - Manages and coordinates drywell work
  - Manned 24 hours
  - Workstation is at the Drywell control point
  - Primary point of contact to the OCC
- Communications
  - 10/30 minute rule

High Impact Teams

- Challenges teams to think “outside the box”
- Promote questioning attitudes to prepare for outage tasks
- Develop staff commitment
- Station Director/Senior Management sponsorship

High Impact Team Activities

- Develop a team charter
  - Define roles and responsibilities
  - Sets aggressive goals
  - Exposure reduction is key focus area of all teams
- Performs detailed schedule reviews
- Integrate lessons learned
- Develop and execute the plan

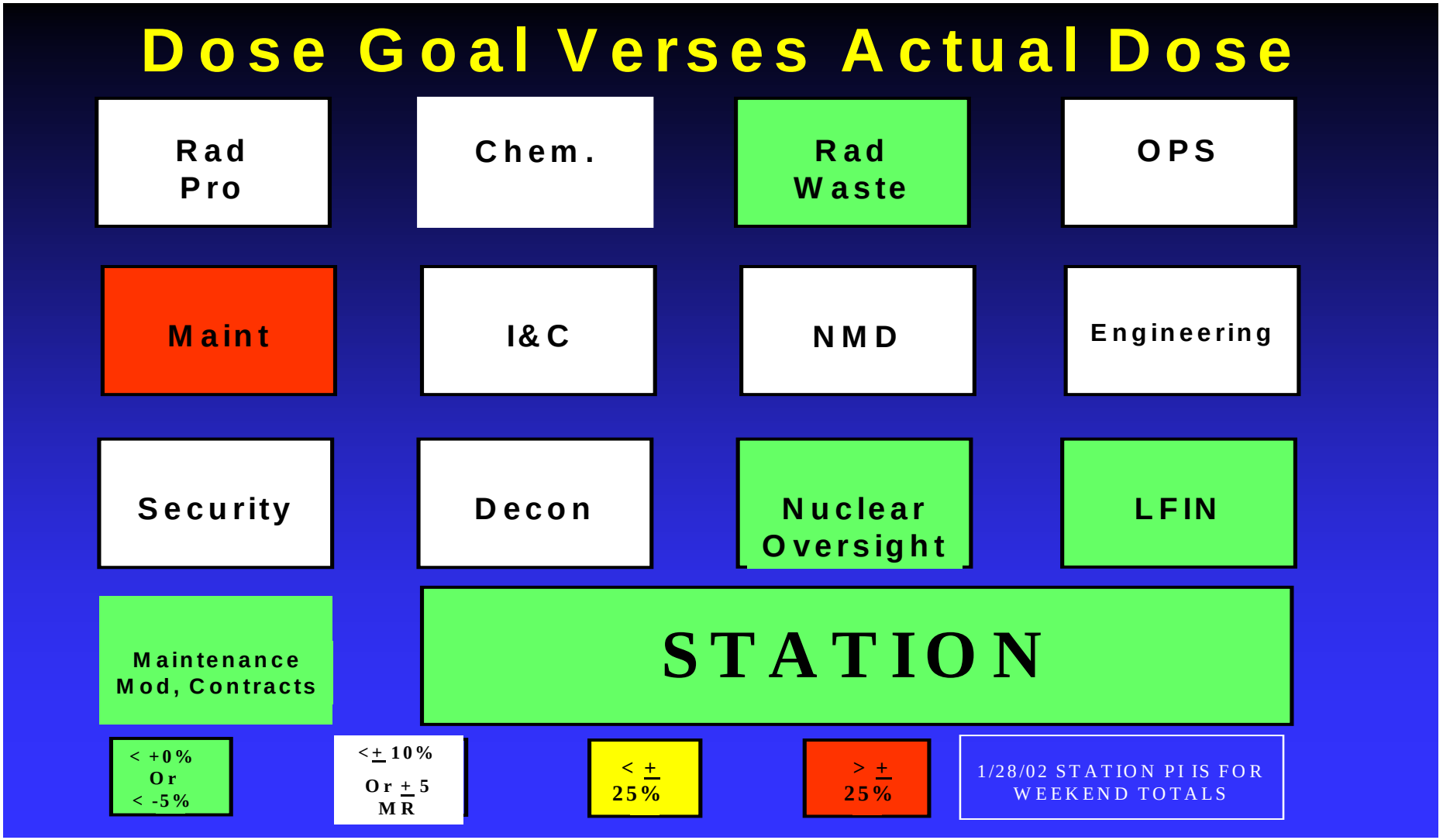
High Impact Teams – Results

- Improved and shorten Refuel Critical path
- Utilized automatic welding for RWCU valve replacements
- Implemented a 9 day drywell work window
- Reduced number of scaffolds significantly

Goal Setting

- Daily
  - Daily goals are established and tracked
  - Use the Corrective Action Program
- Weekly
  - Detailed review of work performed
  - Includes exposure relative to weekly goals
  - Meeting one week after execution

Daily Dose PI



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Weekly Exposure Detail

Monday		01/14/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	35	40	
CHEM	5	6	
RW	0	0	
OPS	13	17	
MAINT	51	46	
I&C	37	109	1
NMD	9	10	
ENG	1	2	
SEC	8	5	
DECON	9	10	
NOS	0	0	
FIN	17	0	3
LMSS	97	60	2
MMC	1	0	
	283	305	

Tuesday		01/15/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	75	65	5
CHEM	20	16	
RW	0	0	
OPS	34	97	4
MAINT	116	180	8 9
I&C	1	6	
NMD	32	12	6
ENG	1	2	
SEC	9	5	
DECON	108	180	7
NOS	0	0	
FIN	32	30	
LMSS	37	30	
MMC	4	0	
	469	623	

Wednsday		01/16/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	44	45	
CHEM	9	6	
RW	0	0	
OPS	34	95	10
MAINT	158	175	
I&C	1	4	
NMD	15	12	
ENG	1	2	
SEC	4	5	
DECON	163	160	
NOS	0	0	
FIN	0	0	
LMSS	28	25	
MMC	2	0	
	459	529	

Thursday		01/17/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	16	20	
CHEM	2	3	
RW	1	0	
OPS	8	10	
MAINT	15	10	
I&C	5	30	11
NMD	7	12	
ENG	2	2	
SEC	2	5	
DECON	5	15	
NOS	1	0	
FIN	27	30	
LMSS	44	70	12
MMC	1	0	
	136	207	

Friday		01/18/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	5	7	
CHEM	7	6	
RW	0	0	
OPS	14	18	
MAINT	14	10	
I&C	7	10	
NMD	17	10	
ENG	0	2	
SEC	6	5	
DECON	1	5	
NOS	1	0	
FIN	1	0	
LMSS	33	40	
MMC	0	0	
	106	113	

Saturday		01/19/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	7	8	
CHEM	1	2	
RW	0	0	
OPS	7	10	
MAINT	0	0	
I&C	0	0	
NMD	11	10	
ENG	0	0	
SEC	4	5	
DECON	0	0	
NOS	0	0	
FIN	0	0	
LMSS	0	0	
MMC	0	0	
	30	35	

Sunday		01/20/2002	
Work Group	Actual Dose	Dose Estimate	Note
RP	2	5	
CHEM	1	2	
RW	0	0	
OPS	7	10	
MAINT	0	0	
I&C	0	0	
NMD	0	0	
ENG	0	0	
SEC	3	5	
DECON	0	0	
NOS	0	0	
FIN	0	0	
LMSS	0	0	
MMC	0	0	
	13	22	

Notes

1. Over est time & dose 4 FWH
2. FPCCU Scaffold moved from Tuesday
3 B non regen U1 Emergent work
4. Over estimate for 2 C FWH Drian vlv
5. 2C FWH Drain vlv
6. 13 Mrem Received For New Fuel O/S
7. 104 mrem In FPCCU job not completed
8. 27 mrem on 2 H Cond Filters 80 mrem est
9. 42 mrem in FPCCU 75 mrem est
10. Over est for apply clear FPCCU 24 mrem
11. No entry into 5 C FWH Drain Valve Est 20
12. Over est FPCCU Est 60 mrem vs 35 mrem
13
14
15

YTD ACTUAL = 3,146 2002 GOAL = 177,000

All doses and estimates are in mrem

Weekly Exposure Critique

Weekly Exposure Critique Week Ending: 01/06/02

Work Requiring ALARA Pre-Job	Dose		Time	
	Estimate	Actual	Estimate	Actual
None				

Work > 100 mrem	Dose		Time	
	Estimate	Actual	Estimate	Actual
2C FWH Drain Valve Manipulations	0.02	0.202		

Emergent Work	Dose	Time
Ops entries into Unit 1 FPXH Rm ti adjust flow after placing booster pumps in service	0.02	

Department Dose	Estimate	Actual	Δ	Reason Δ
RP	0.178	0.194	0.016	
Chem	0.037	0.029	-0.008	
RW	0.000	0.000	0.000	
OPS	0.229	0.243	0.014	
Maint	0.105	0.100	-0.005	
I&C	0.026	0.026	0.000	
NMD	0.055	0.058	0.003	
Eng	0.006	0.011	0.005	
Sec	0.038	0.024	-0.014	
Deconners	0.040	0.046	0.006	
NOS	0.008	0.000	-0.008	
FIN	0.030	0.031	0.001	
Support	0.095	0.104	0.009	
MMC	0.050	0.054	0.004	
Total	**0.897**	**0.920**	**0.023**	

Delays

None

Improvement Items

0.202 person-rem received for adjustments to the 2C Feedwater Heater Drain Valve. Ops initiated CR 89010 to capture lessons learned.

Coordination Issues

None

Safety Issues

None

Line Ownership of Dose

- Exposure performance included in individual performance appraisal system
- Station exposure is included as a part of station incentive plans
- Dose zealots established for each work group
  - Senior management sponsored
  - Single Point of contact for workgroup

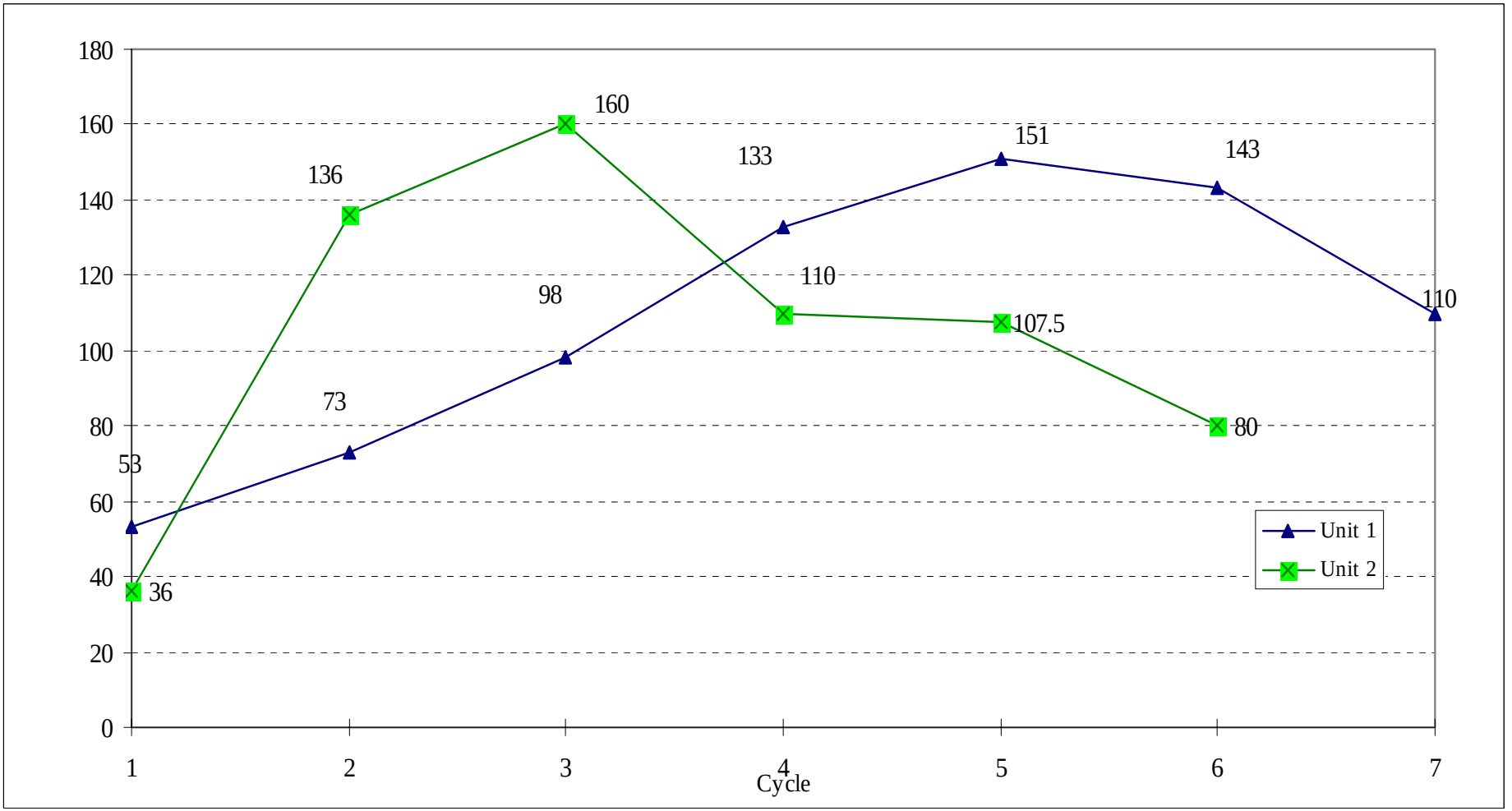
Exposure Reduction Initiatives

- Chemistry Control
- Flushes
- Modifications
  - Cavity Seal Plate Painting
  - RWCU Pumps
- Shielding

Chemistry Control

- Zinc Injection
  - Initially a natural Zinc plant
  - Implemented zinc injection in 1994
  - Converted to depleted Zinc in 1998
- Hydrogen Water Chemistry
- Noble Metal Chemical injection
  - Implemented Unit 1 – 2000, Unit 2 - 2001

BRAC Data


180
160
140
120
100
80
60
40
20
0
1
2
3
4
5
6
7
Cycle
160
136
133
151
143
110
98
110
107.5
73
53
80
36
Unit 1
Unit 2

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Flushes

- Scheduled into outage
- System Flushes
  - Shutdown cooling following loop swaps
  - Following Cavity Drain down
- Hot Spot Flushes
  - Drywell Equipment Drain Tank
  - RWCU Bottom Head Drain

Drywell Drain Tank

- Successfully removed an 850 R/hr hotspot
- Tank Design accumulates CRUD
- Worked with operations and Engineering to remove
- Post Flush dose rates were 15 R/hr.

Bottom Head Drain Line

- Hot spot of 125 R/hr
- Post flush dose rates of 1 to 2 R/hr.
- Saved 2 to 3 person-rem during outage.

Source Term Reduction

- Modifications
  - Cavity Seal Plate
  - RWCU Pump replacement
- Be wise in Selecting!

Cavity Seal Plate

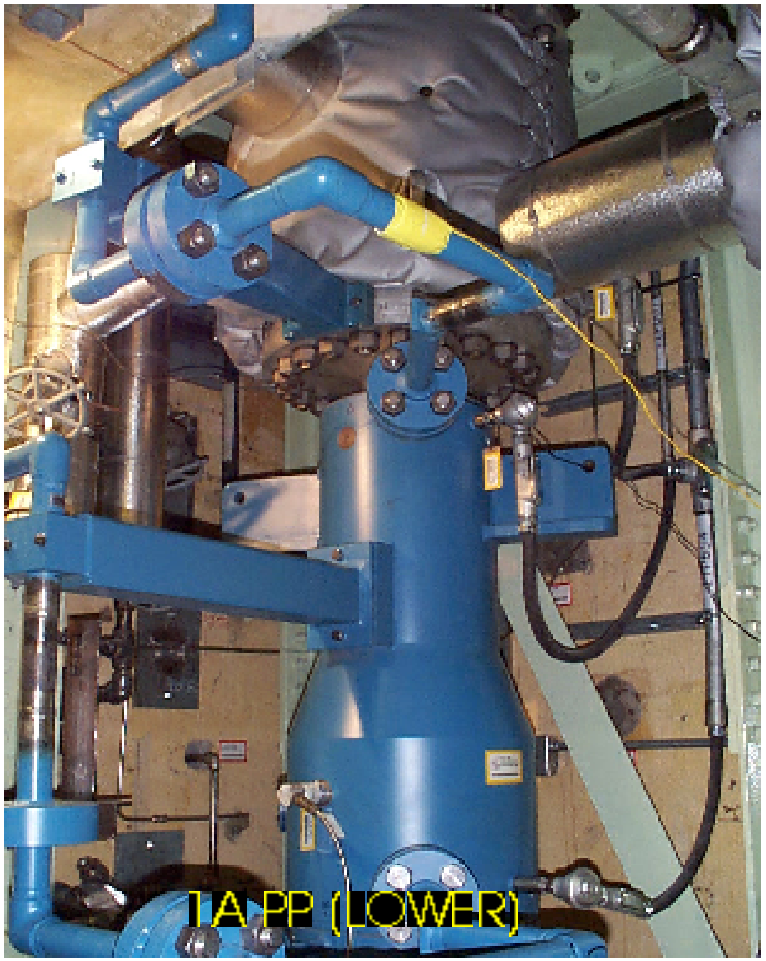
- Carbon Steel
- Black Rust layer formed in area
- Dose Rates were 30 mR/hr at 30 cm

Cavity Seal Plate

- Grit Blasted and painted the seal plate
- Dose rates are 10 mR/hr on contact
- Estimated savings of 5 to 10 person-rem each outage

RWCU Pump Mod

- Old Style Pump
  - Horizontal, mechanical seal pump
  - Located on hot side of system
  - 3 - 50% flow pumps
  - 30 person-rem/year in dose for pump and valve maintenance



- New Style Pump
  - Vertical, seal-less pump
  - 1- 100% flow pump per unit
  - Unit 1 pump has run for 2 years without issue
  - Unit 2 pump operational May 2001.

Source Term Reduction

- Shielding

RP Controls

- Scrubs
- Postings
- Maps/Zone Coverage
- Remote Monitoring

Scrubs

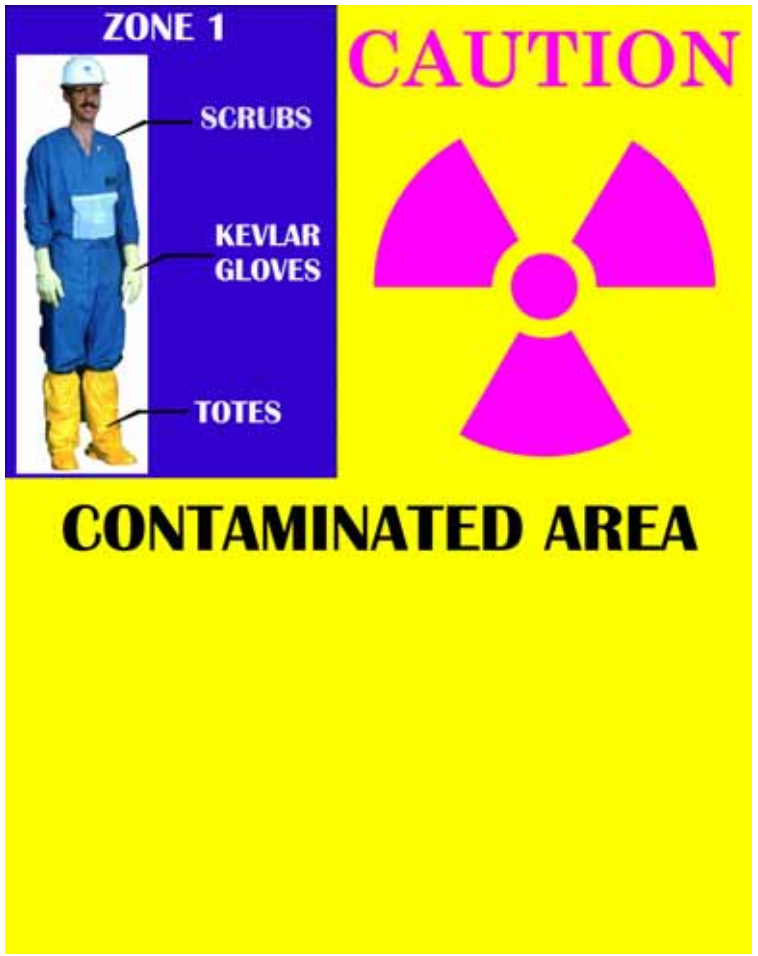
- Implemented as a result of benchmarking world class performed
- Used extensively in outages
- Plant staff wear blue scrubs, RP wears green

Postings

- Designed with work force in mind
- Ease of compliance
- Standard across the Exelon Fleet

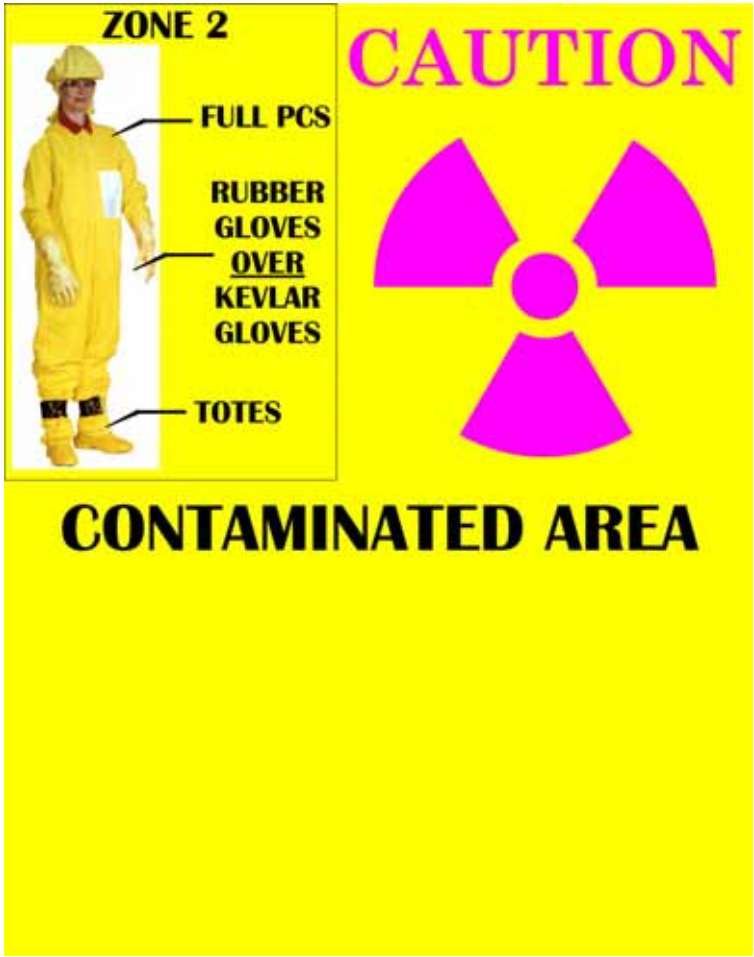
Postings – Zone 1

- Areas less than 10,000 dpm/100cm^2
- Scrubs used for inspections and minor work
- “Blue Zone” on plant maps

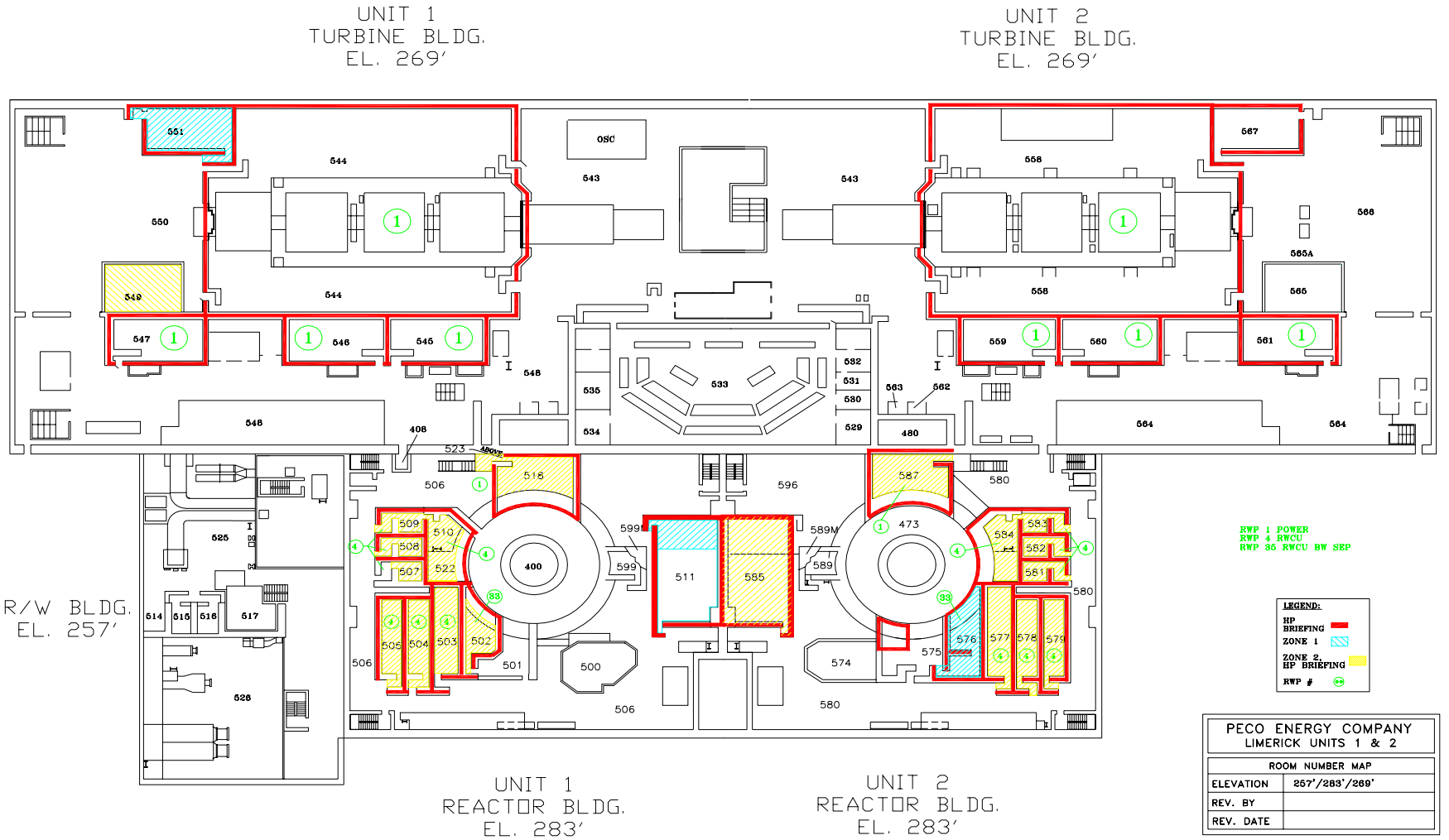


Postings – Zone 2

- Areas > 10,000 dpm/100 cm^2
- Full PC's worn over scrubs



Zone Maps


UNIT 1
TURBINE BLDG.
EL. 269'
UNIT 2
TURBINE BLDG.
EL. 269'
R/W BLDG.
EL. 257'
UNIT 1
REACTOR BLDG.
EL. 283'
UNIT 2
REACTOR BLDG.
EL. 283'
RWP 1 POWER
RWP 4 RWCU
RWP 35 RWCU BW SEP
LEGEND:
HP BRIEFING
ZONE 1
ZONE 2 HP BRIEFING
RWP #
PECO ENERGY COMPANY
LIMERICK UNITS 1 & 2
ROOM NUMBER MAP
ELEVATION 257'/283'/269'
REV. BY
REV. DATE

Remote Monitoring

- Consoles located at Drywell CP and in HPFO.
- Connected by fiber and twisted pair

Remote Monitoring

- Modification installed connection boxes in drywell and RWCU to aid in connections
- Pictures are made available over the LAN.

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Issues

- ANI Criteria - Scrubs
- Noble Metals – potential dose rate impact
- Release of Radioactive material
- ALARA SDP Process changes

Closing

- Questions?
- Thank You!