

# **The Culmination of a Series of Source Term Reduction Efforts**

Shannon Peterkin  
Radiation Protection  
Manager  
PPL Susquehanna, LLC

---

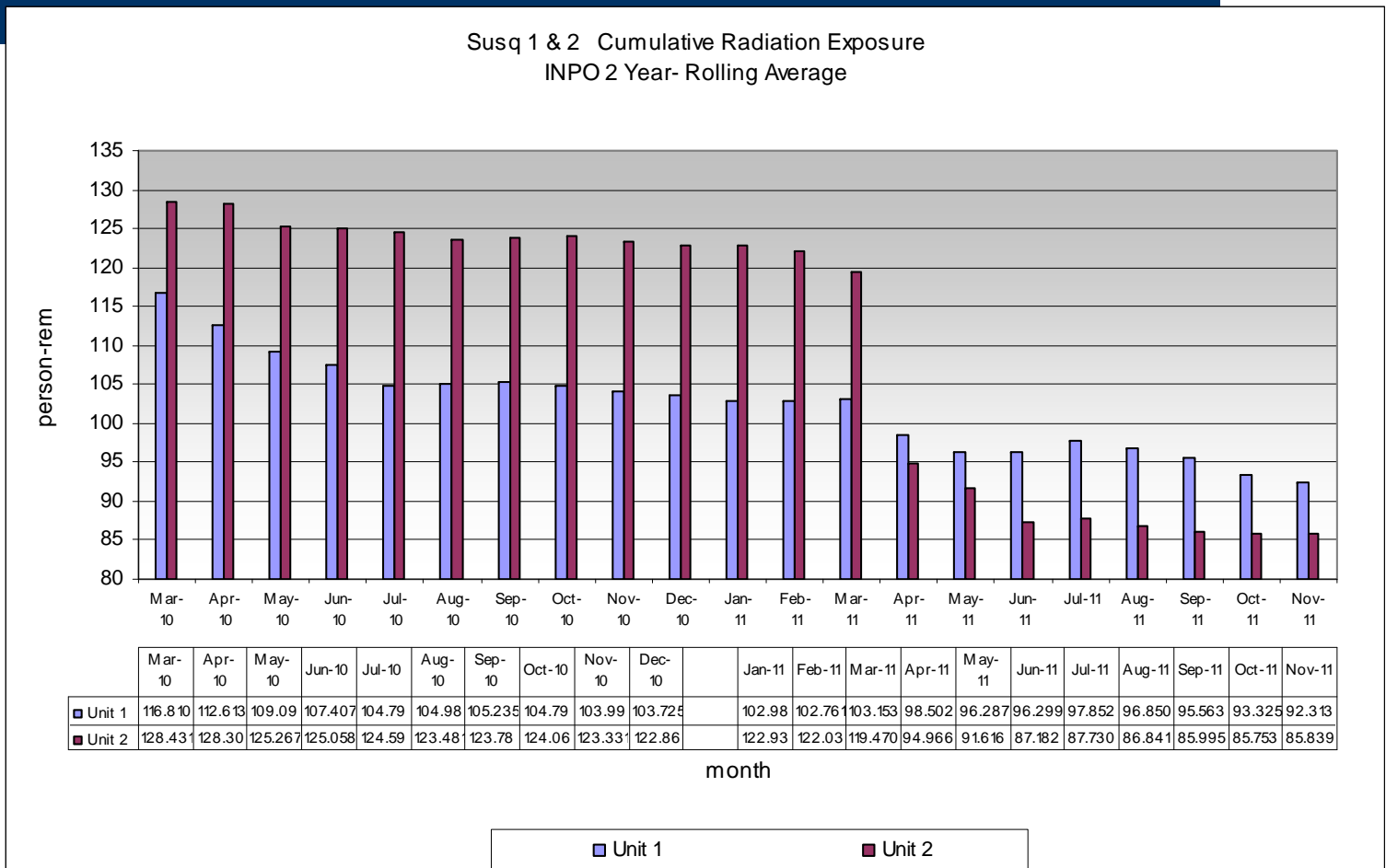
# But Really, A Story Of -

- Challenges
- Management Commitment
- Strategic Dose Reduction Planning
- Execution of the Plan
- Results

# Challenges in the 1990s

- High insoluble iron levels in feedwater
- Hydrogen Water Chemistry for Mitigation of Stress Corrosion Cracking for Reactor Vessel Internals
- Susquehanna Exposure Control  
Performance slower than the industry

# Current Suquehanna CRE Performance



# Susquehanna's Vision

- Be top quartile across a broad set of relevant measures
- Maintain excellent reactor water chemistry control
- Aggressively implement source-term and other dose reduction initiatives

# Plan Outline

---

- Source Term Reduction Projects
- Work Practice Evaluation
- Use of Technology
- Stellite Reduction
- Extended Power Uprate Challenges

# Susquehanna's Expectations

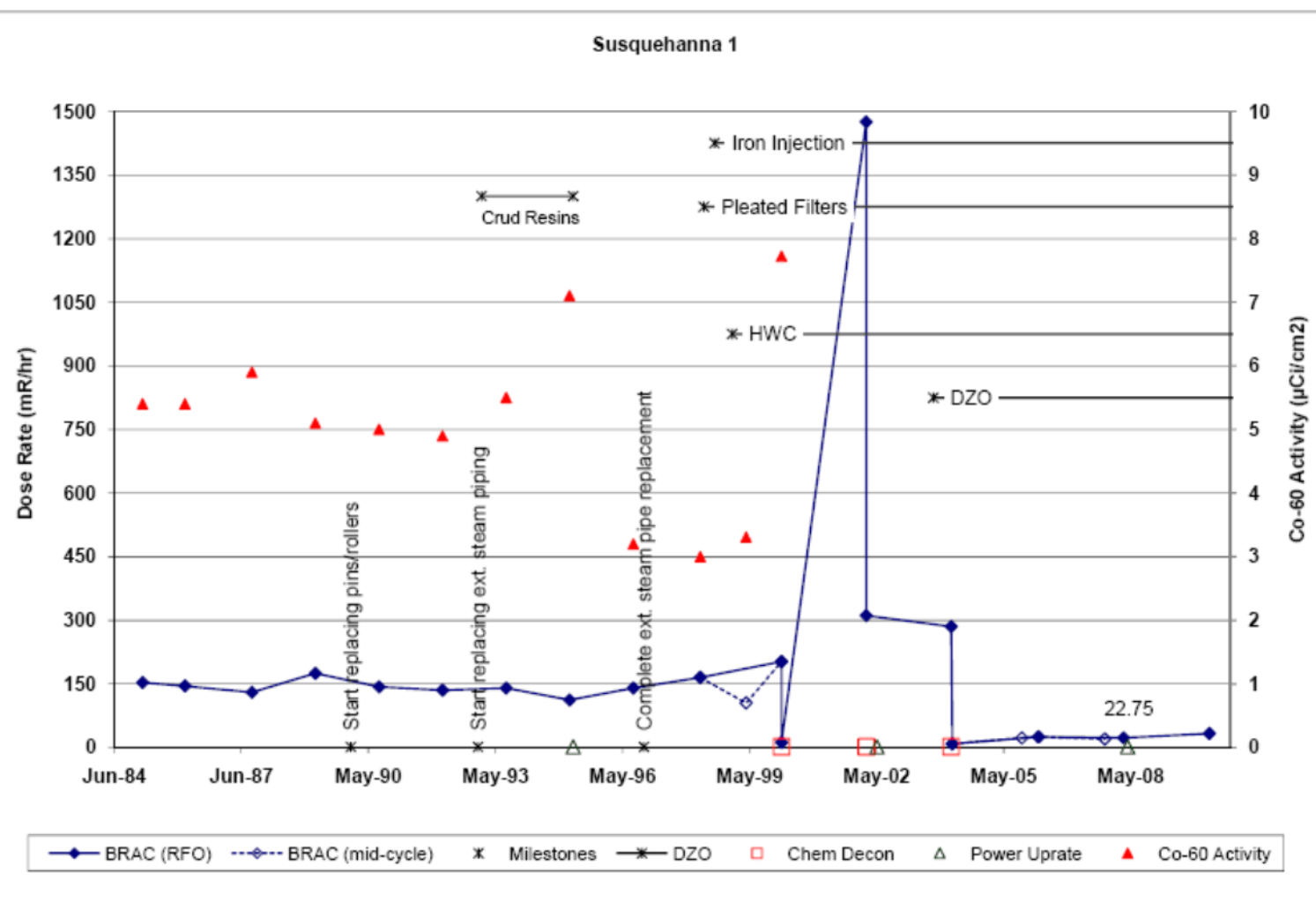
- Developed a plan for strategic goals
- Plan based on Industry Experience and Projections
- Addressed outage and operational periods
- Plan implementation recognized to require several years

# Susquehanna Project Milestones

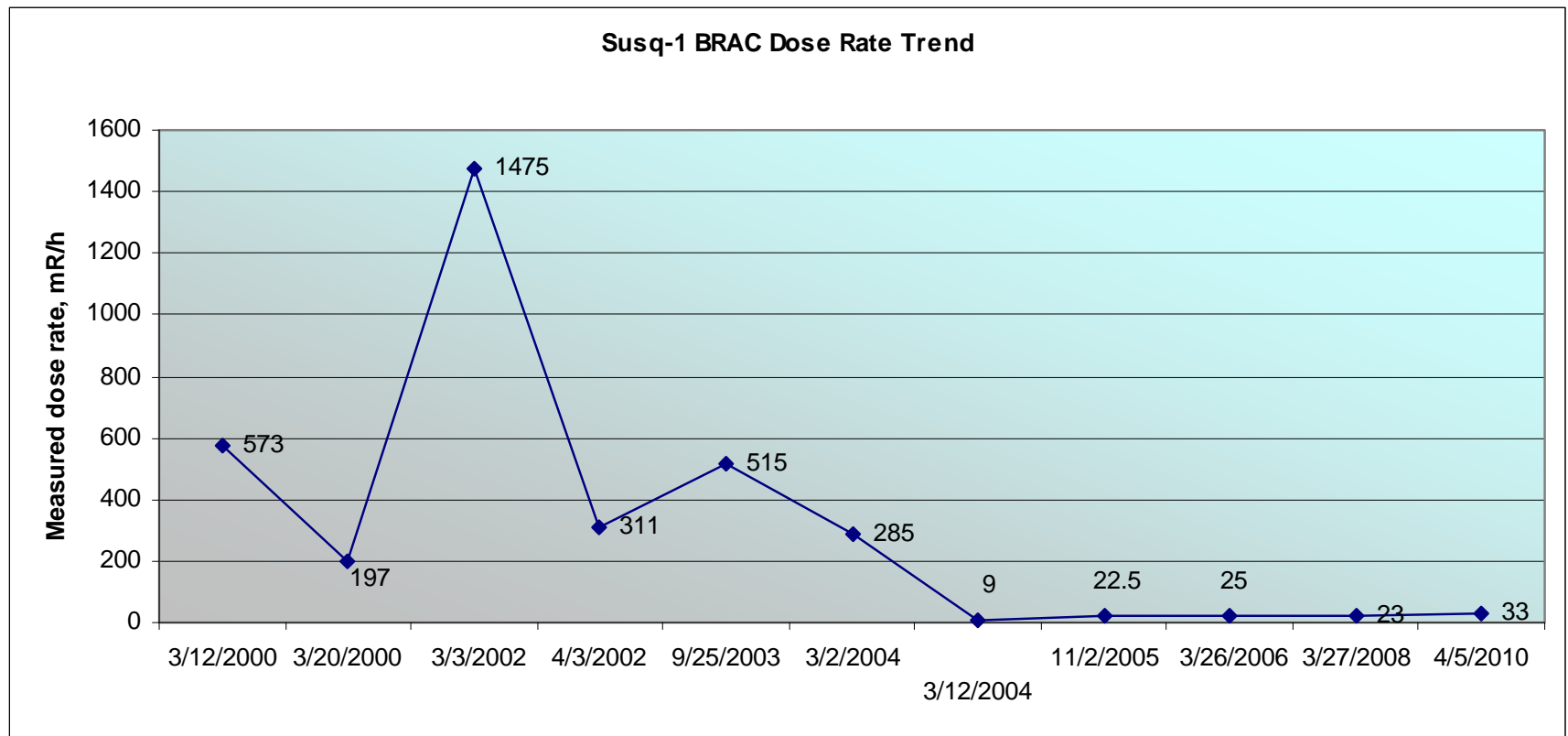
Initiatives	Unit 1	Unit 2
Condensate Filtration System	5/98	6/99
Feed water Iron Injection	8/98	7/99
Hydrogen Water Injection	2/99	8/99
Chemical Decontamination 1	3/00	3/01
Chemical Decontamination 2	3/02	N/A
Depleted Zinc Injection	10/03	12/02
Chemical Decontamination 3	3/04	3/03



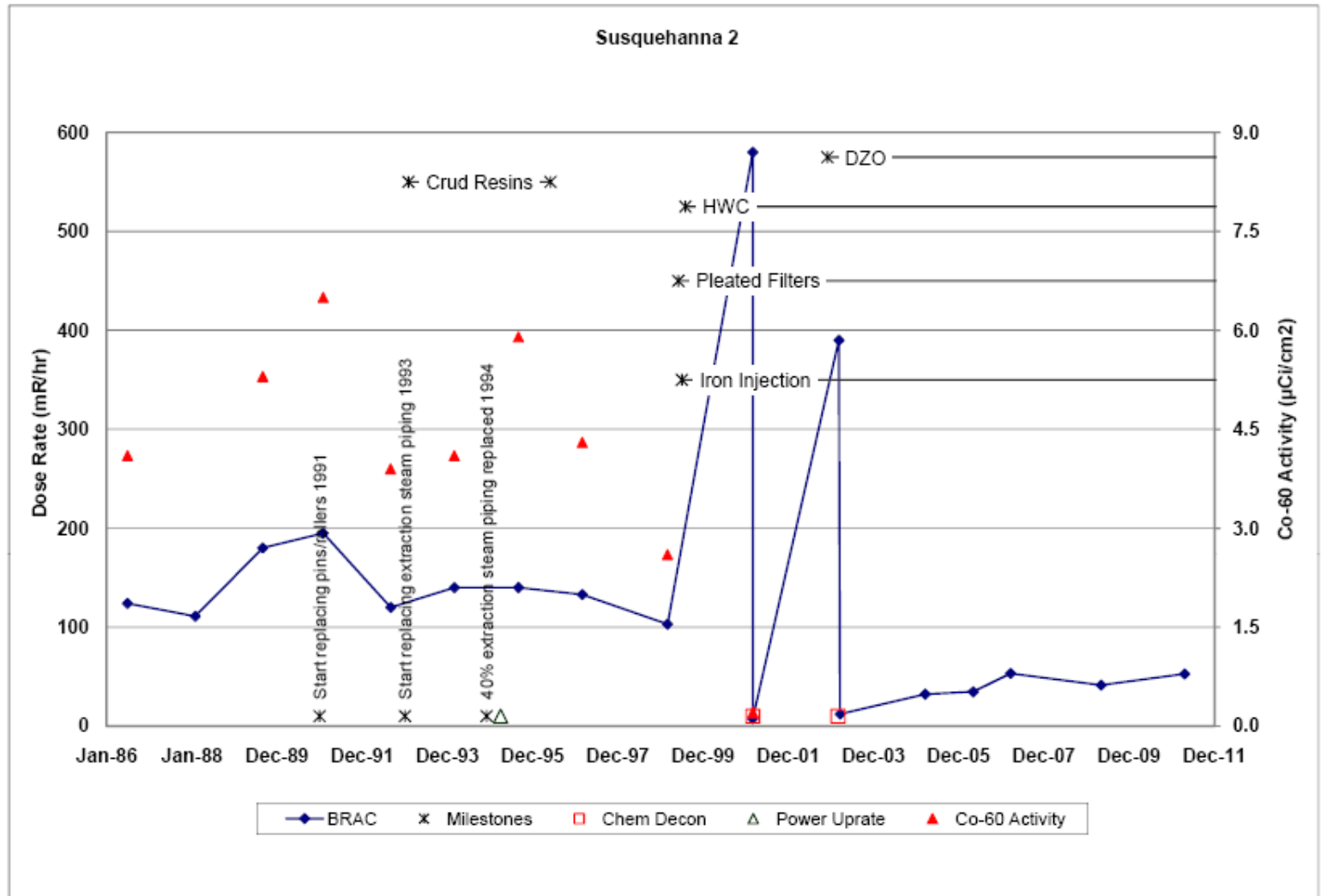
# SSES U1 Average BRAC



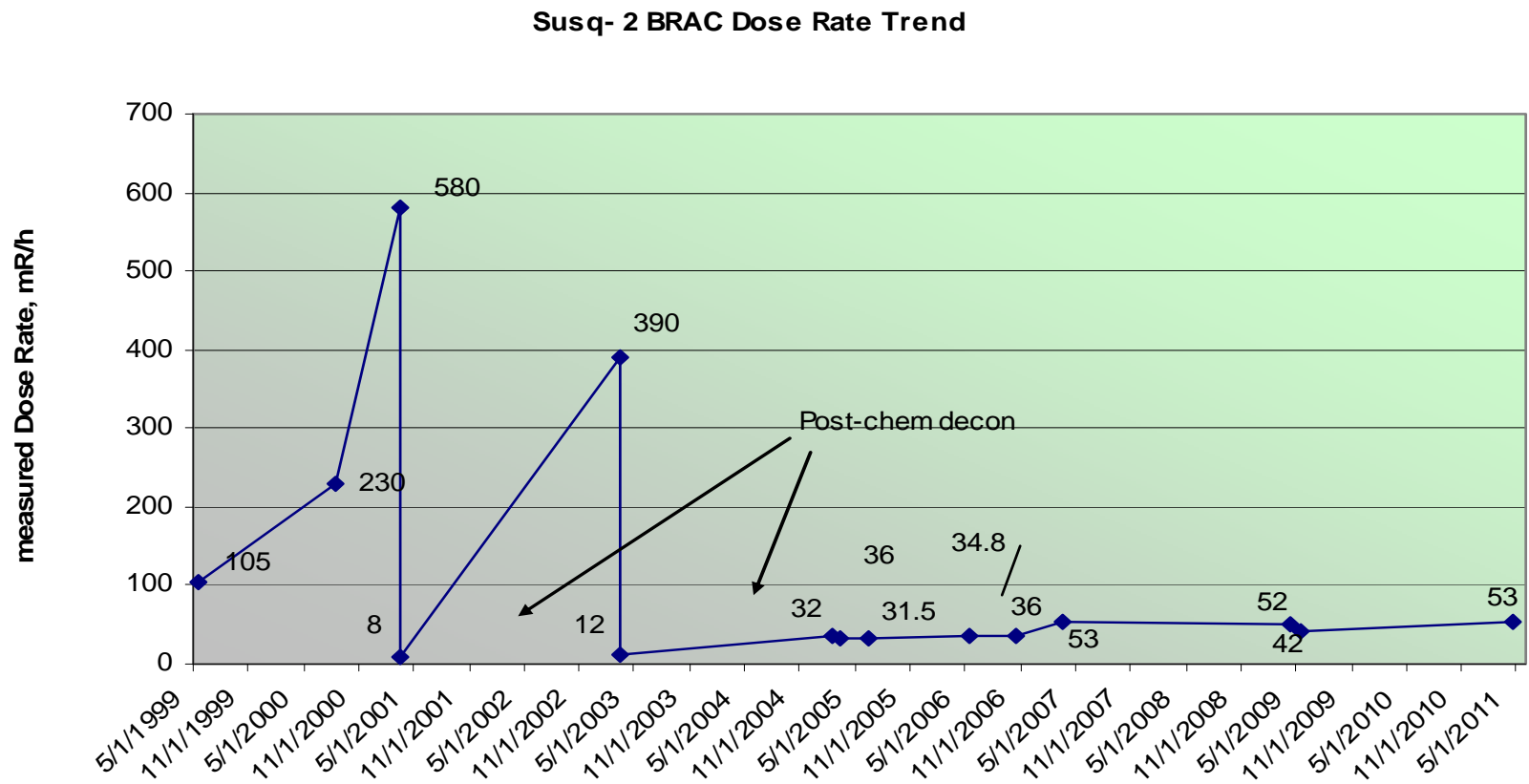
# Historical BRAC Dose Rates – Susq Unit 1



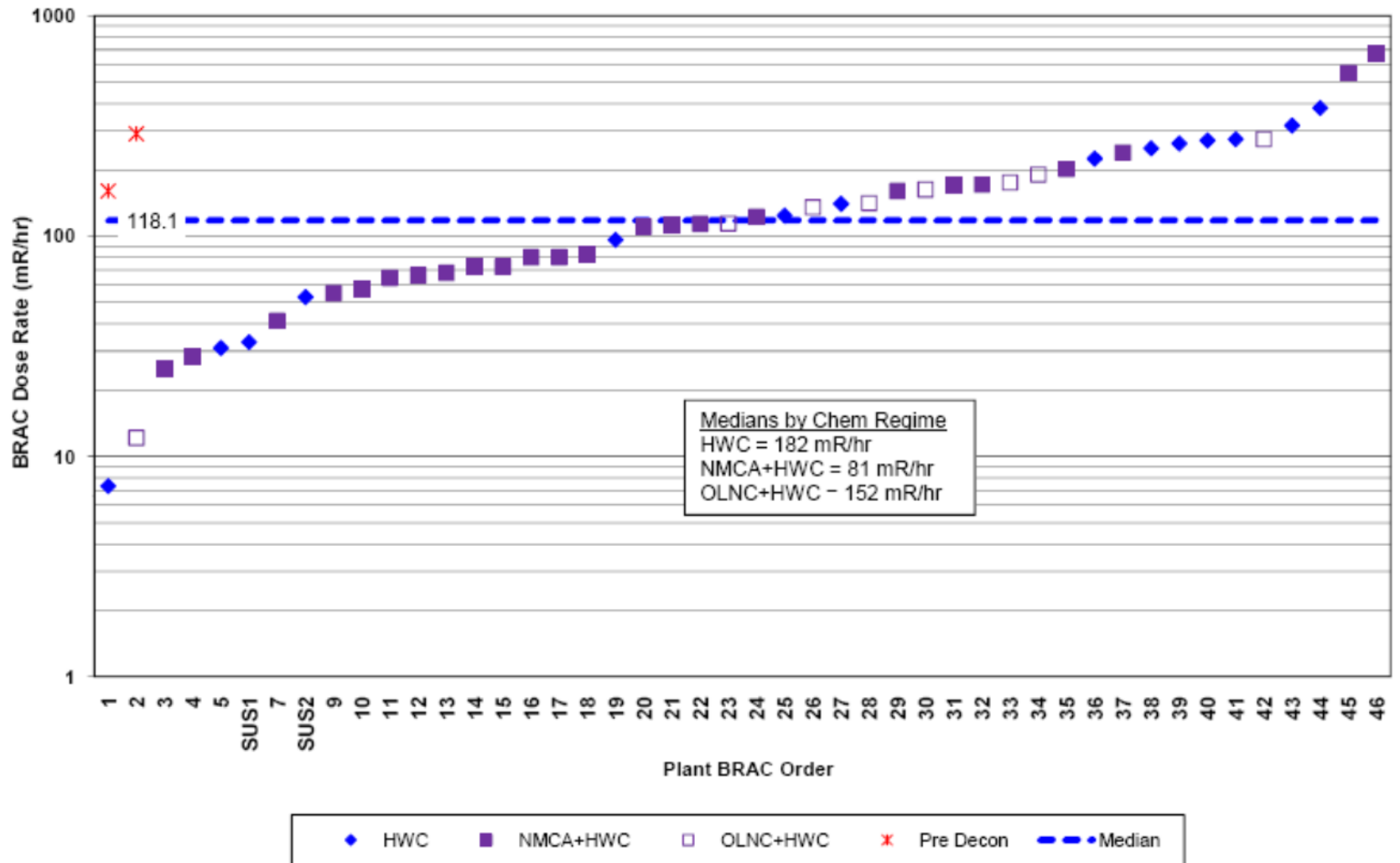
# SSES U2 Average BRAC



# Historical BRAC Dose Rates – Susq Unit 2



EPRI PROPRIETARY INFORMATION - June 2011  
 MOST RECENTLY REPORTED BRAC RESULTS FOR 46 BWRs  
 DIFFERENTIATED BY CHEMISTRY REGIME AT TIME OF MEASUREMENT



# Key Chemistry Parameters

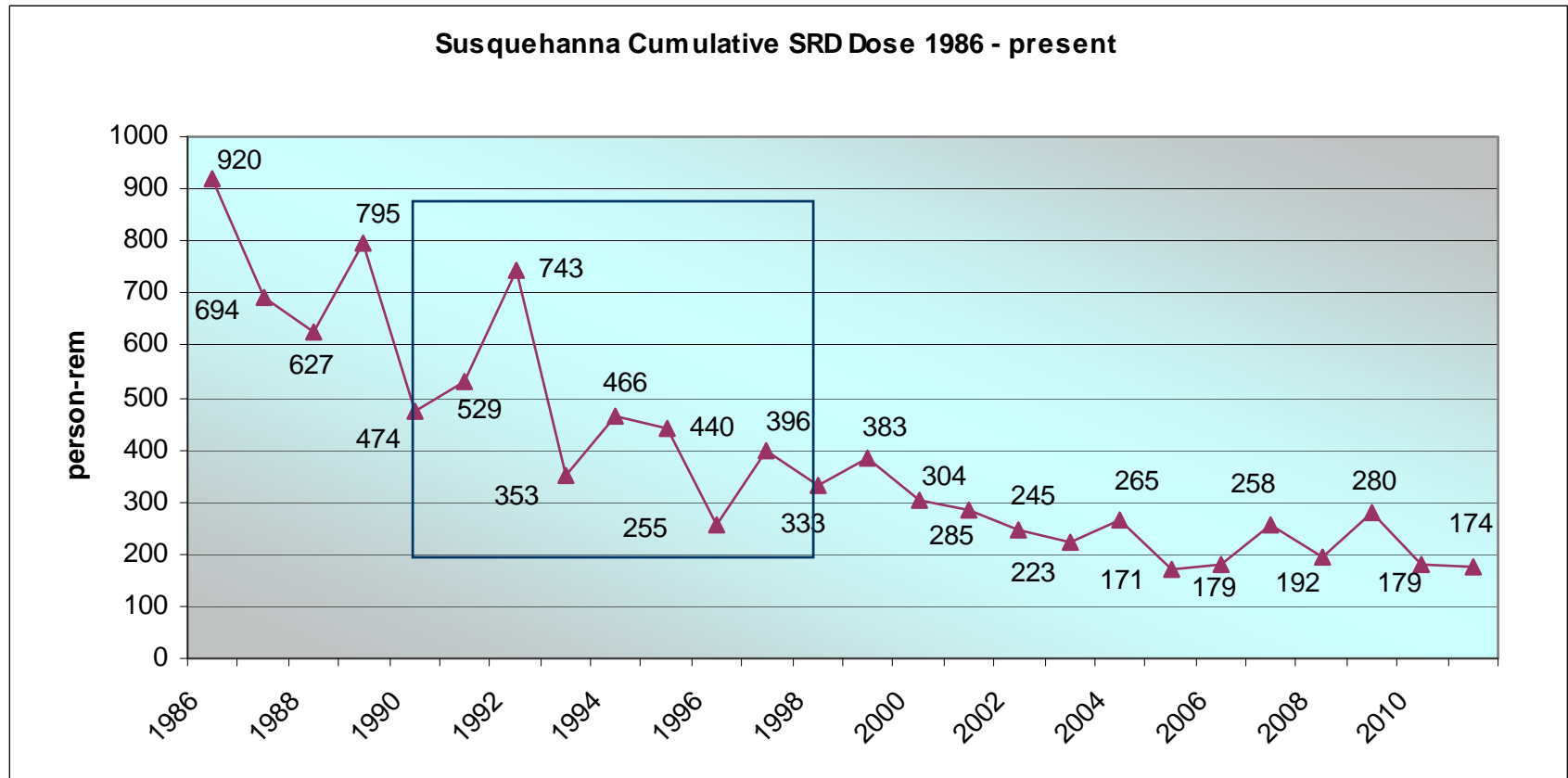
## GOALS

- HWC - operate at or near 105 scfm
- [Co-60(s)]:[FW Zn] – maintain  $< 2\text{E-}5$  uCi/ml/ppb
- Soluble Zn – 5 to 10 ppb
- [Co-60(s)] -  $< 5\text{E-}5$  uCi/ml

# ALARA Program Aspects

- Remote audio, video, and teledosimetry
- Virtual tours
- Robotics
- Steam Affected Area Exposure Rate modeling
- Risk-based ISI
- Work management improvements
- Utilize tungsten shielding
- Permanent shielding

# Susquehanna Historical Station Dose





# Extended Power Up-rate

- Extended power up-rate (EPU): 2008 – 2011
  - Approximately 95 person-rem (both units)
- Key EPU activities (dose includes both units):
  - Additional condensate filtration (CFS) vessel – 3.7 person-rem
  - Additional condensate demineralizer vessel – 14.6 person-rem

# Extended Power Uprate

- Key activities, cont.:
  - EPU related scaffold support – 8.2 person-rem
  - Condensate Pump Replacements
  - High pressure Turbine replacement – 1.4 person-rem
  - Integrated Control System for reactor feed pump speed control – 7.1 person-rem
  - Steam Dryer Replacement – 40 person-rem
  - Upgraded 3 of the 4 RWCU filter demineralizers – 2.2 person-rem

# EPU Dose Mitigating Activities

- Remote cutting of steam dryers
- Remote handling of steam dryers during transport
- Use of Lessons Learned
- Engaged work groups
- Installed additional shielding
- Utilized mock-ups
- Performed flushes of ultrasonic resin cleaners (URC) prior to removal
- Installed temporary shielding to support RWCU bypass modification in hold-pump room

# Summary

- Coordinated chemistry modifications chemical decontaminations
- Condensate filtration system with iron addition
- Lessons Learned from implementation of Depleted Zinc Oxide in relation to chemical decontamination.

## Summary, cont.

- The Co-60(s)/RCS Zn(s) ratio for moderate HWC plants
  - Maintaining the ratio is important.
  - Maintaining FW and RCS Zn (s) at desired levels.
- Maintaining hydrogen injection levels for a reducing environment and low electro chemical potential

# Summary, cont

- Results: Top quartile/decile plant - collective radiation exposure
- Result: INPO strengths – utilization of lessons learned
- Recognition:
  - Techniques Susquehanna used were not especially unusual,
  - Able to sustain excellent dose performance

# Summary, continued

---

- Recognition: Importance of planning the work and working the plan
- Recognition: One team, one commitment – there is success only by that approach