REMP (and Later) RETS Audits

• PBAPS and OC audits in 2004 and 2005 had similar issues:
• Nature of DAW
• 10CFR61 analysis of wastes
• A Tooth Fairy Project issue.
• Issues with recent RETS inspection.
Oyster Creek Particulars

- Single unit BWR
- 1930 MWTh
- One elevated release point (380’s stack)
- Three (3) ground level release points.
- O.C. is a zero release plant in terms of liquids.
PBAPS Particulars

- Two unit BWR
- Unit 2: 3293 MWth (1973)
- Unit 3: 3293 MWth (1974)
- One elevated release point 785’ msl. (629’ agl)
- Two Building vents and aux boiler are ground-level release points.
- PBAPS has a single liquid release point.
PBAPS RETS Audit

- Conducted November 2004
- 10CFR61 nuclides trended
- Data set on next slide.
Liquid Doses Due to Transuranics

- 10CFR61 analysis on liquid releases not done.
- Instead, doses calculated based on scaling factors from the RWCU resin.
- The liquid doses due to transuranics do not become significant until the gross alpha becomes more than 100 times the minimum detectable concentration.
Gaseous Doses Due to Transuranics

- 10CFR61 analysis on gaseous releases not done.
- Instead, doses calculated based on scaling factors from the RWCU resin.
- The gaseous doses due to transuranics do not become significant until the gross alpha becomes more than 10 times the minimum detectable concentration.
PBAPS Conclusions

• The doses due to 10CFR61 nuclides using scaling factors do not approach any ODCM limits. The factors would have to increase by more than a factor of 10 before any limits would be exceeded.
O. C. REMP Audit of December 2004

- NRC Inspector noted presence of Fe-55 in DAW shipped for burial.
- Fe-55 was ≈ 80% of total activity.
- Has plant source term changed due to:
  - FW H₂ injection (1992)
  - DZO application (2000)
  - Noble metals application (2002)
Is Activity associated with DAW going up the stack?

• Should the gaseous effluent reflect this possible change in source term?
• Using a very conservative calculation, we “scaled in” results from 10CFR61 analyses into our gaseous effluents.
  – Result - Slightly higher effluents released.
Hypothetical Scaling in Radionuclides

- Monthly Stack filters had following radionuclides:
  - I-131    I-133    Sr-90
  - 1E-5    2E-5     4E-5 (all μCi)

- 10CFR61 Analysis of DAW showed:
  - Am-241   Cm-244   Sr-90
  - 5E-5    2E-4     2E-5 (all μCi)

- Ratio the Sr-90’s and multiply transuranics by the ratio and assign them to effluents. Perform dose calculations.

- Minimal dose consequences.
Is there a Link between 10CFR61 Analysis Results and Activity Associated with DAW?

- Monthly composite filters sent to vendor lab for Sr-89, 90 & gross alpha.
- Half of composite filters are saved for further analysis.
- Agreed to send one month’s composites for 10CFR61 analysis (Feb 2004).
- Unexpected results from the composite filter analysis.
Results of Composite Filters

• 10CFR61 analysis yielded Ni-63 and others:
  – Mn-54
  – Co-58
  – Co-60
  – Cs-137
• …but NO Fe-55. Why not?!
• …and why the presence of γ emitters which we didn’t detect when we counted them on our γ spectroscopy system?
Second Question First:

• We count filters for 1000 seconds.
• Vendor reported counting for 12 hours.
• We included those $\gamma$ emitters from the above results in the ARERR.
But What About the Fe-55?

• What is DAW?
• In general, it is solids that do not include resins and filter media.
• So how do you perform 10CFR61 analysis on pipes, wires, scaffolds etc.?
  – Answer: Use smears.
  – …or, you use filter sludge activity as a surrogate for DAW (Common BWR industry practice.)
• Filter sludge has lots of Fe and Fe-55 in it.
The Tooth Fairy Issue

- Sr-90 detected on “broadleaf vegetation” in our garden.
- It wasn’t vegetables – it was tree leaves.
- Leaves used because the garden dried up.
- We’re still not out of the woods:
What if the Deer Ate the Tree Leaves?

• Calculation of concentration of radionuclide in Deer Meat:

\[
C_{iv} = \frac{D}{Q} \sum_{i} \left\{ \frac{r(1 - \text{EXP}(-\lambda E_i T_e))}{Y_v \lambda E_i} + \frac{B_i(1 - \text{EXP}(-\lambda I_{T_i}))}{P \lambda_i} \right\} \text{EXP}(-\lambda I_{T_i}) \text{EXP}(-\lambda I_{T_t})
\]

• \( C_{iv} = 3.0 \text{E-7 pCi/kg of Sr-90 in deer meat} \)
Dose to the Hunter

• Dose from the environmental ingestion pathways is generally of the form:

\[ D_{ja} = T \sum_{i} DFI_{ija}[U_{avFgCiv} + U_{amCim} + U_{afCif} + U_{alFICil}] \]

Dose to the hunter who would shoot the deer and eat the deer meat was on the order of E-8 mRem.
Results of OC RETS Inspection
March 2005

• Item 1: Failure to assess dose per requirement in the ODCM

• ODCM States: Cumulative dose contributions for the current calendar quarter and current calendar year for … shall be determined … at least once per 31 days …
  – Key word is “cumulative.”
Inspection Results

- Item 2: T.S. require dose assessment if AOG is not in service and we approach 2% of dose limit.
  - Procedure created
- Item 3: Found a drum marked “Radioactive Material” upside down over a storm drain.
  - Clean $H_2O$ incorrectly placed in wrong drum.
- Item 4: Vendor Sr-89 cross $\sqrt{\text{sample}}$ failed its QC.
  - Recalculation results were OK.
- Item 5: Used outdated method to calculate alarm set points for stack and ground-level releases.
  - Revised calculation for alarm set points.
Are there any questions?