THE TRITIUM GUY

- Presented by:
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- Division of Radioactive Materials
- IL Dept. of Nuclear Safety
Generally Licensed Exit Signs

- Safe and Important: Fires, electrical blackouts
- Inexpensive, very little maintenance
- Ubiquitous (12,000+ IL)/ 350,000 in NRC jurisdictions
- Mfrd/ dist. under sp. lic. and used under general license (gl)
Exit Signs

- Glass Tubes: Gaseous Tritium
  - Pure Beta Emitter, 18.6 KeV
  - $T_{1/2} = 12.3$ Yrs/ Bio.$T_{1/2} = 10$ days
  - Phosphor=$ZnS$ on tube walls
  - Glows due to Beta interactions w/ phosphor
Problems

- Multi-Curie quantities of Hydrogen-3
- GLs not required to license or register
- Not aware of ram
- Not aware that they are regulated
- Not aware of proper disposal
- Inadequate labeling
SELF-LUMINOUS EXIT SIGN (MARKER)
RECOMMENDED MAXIMUM DISTANCE FOR LEGIBILITY: 100 FT.
RECOMMENDED EFFECTIVE LIFE: 10 YEARS
REPLACE BEFORE: 12/2005
Problems (cont.)

• Safe and effective unless you have the inquisitive, intelligent(?!?) and most dreaded of all:

THE TRITIUM GUY
NJ Tritium Guys

• 1st-teen found an exit sign
  - swim suit posters, sunflower seeds
  - Fire Dept., GM Tube. No Contamination!
  - NJ DEP investigated
  - 23 Agencies, $100,000 +, TEDE 80 mrem (256)
NJ (cont.)

- 2nd- Teen- Child Trtmt Center
  - Tantrum
  - 15 Curies, several tubes broken
  - 930,000 dpm/ 100cm² in bedroom/ 16 mrem
  - $200,000+16 mrem
IL Tritium Experience

- Nov 1, 1999--MI NWAX in Flora, IL
- Damaged sign (Self-powered Lighting, Elmsford, NY)
- Scavenger-(aka Tritium Guy)
- Home
Contamination Assessment

- Wipe samples only effective means of measurement
- IDNS Lab in Springfield. Liquid Scintillation (Phosphor interference)
- Urinalyses
- Portable Proportional Gas Flow Proportional Counter
Contamination Limits

- 340 Appendix A (Similar to NRC RG 1.86)
  - 1,000 pCi/ 100 cm²
  - 5,000 pCi/ 100 cm² Max.
  - Fixed--250 microrem/ hr @ 1 cm
Before Deco...
Before Decon

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I DNS Decontamination
Decision

• Luxury of contamination confined to a non-residence

• Luxury of time for H-3 concentration reduction over time

• Most of the source was initially removed. Contamination was like a particulate
IDNS Decontamination Decision (cont.)

- Equipment, supplies, manpower to conduct ourselves and save expense

- Opportunity for staff for practical health physics experience
Decon Methods

• Basic HP contamination control
• Rotated duties
• Non-phosphate detergent and water (detector interference)
• Iso-propyl alcohol
• Washed down and air-dried. Ventilation and heating, collander for small items
After Decon
After Decon

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Final Dose Estimates

• Tritium Guy--7.1 mrem (DOE REMedy and ANSI HPS N13.14-1994)
Final Dose Estimates (cont.)

- 250+ (NCRP 65)
  - REMedy-SAIC, integrates ICRP 30 biokinetics models, TEDE based on avg <urine> 24 hr. periods.
  - Tritium Spouse--1.07 mrem/ Tritium Daughter--1.06 mrem
  - Highest IDNS --.18 mrem
Final Cost Estimates

- Staff Time including decon, ntgs., travel = $31,735
- Bioassay analyses = $11,700
- Wipe Sample analyses = $16,650
- Disposal of 4 drums of waste = $4,000
- TOTAL = $64,085.00
Final Recommendations

- Labeling improvements
- Sales literature improvements (install and forget about for 20 years!). Enhanced communication with contractors, vendors, building owners etc.
Final Recommendations (cont.)

• Discourage proliferation simply to avoid running electrical wire.

• Install protection to avoid damage.
Final Recommendations (cont.)

• Revisit Acceptable Surface Contamination Levels in NRC RG 1.86 and related documents

• Possible technological improvements to solidify or mix phosphor with H-3 to improve detection and decon efforts

• Watch out for “Tritium Guys” in your neighborhood!