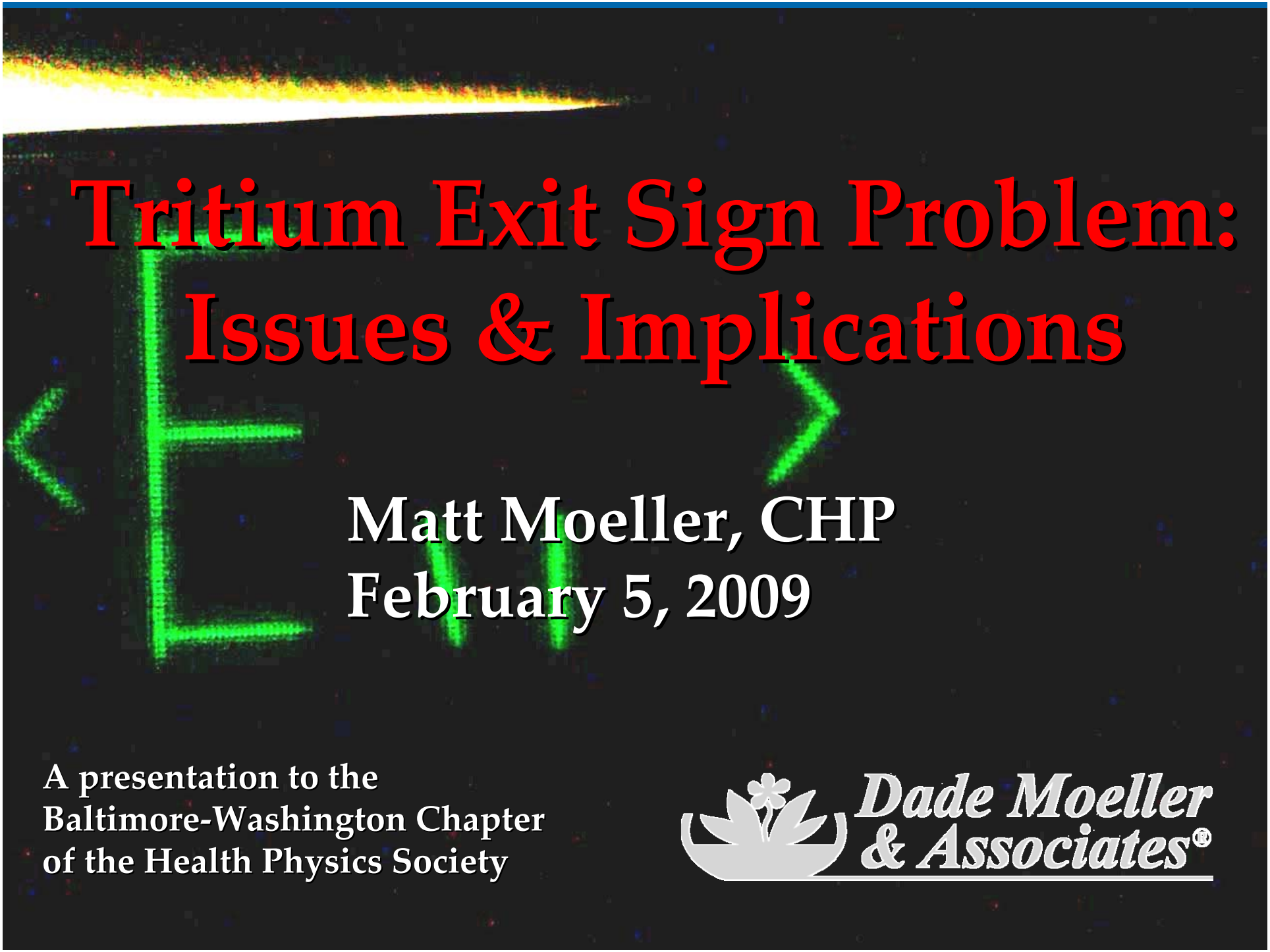

Tritium Exit Sign Problem: Issues & Implications

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of the Health Physics Society

Dade Moeller & Associates®

Tritium Exit Signs: Basics

- Glass tubes internally coated with phosphor and containing tritium gas
- Typically contain 10 to 20 Ci of ^{3}H
- Several different manufacturers
- Cheap and reliable if not mishandled
- Breakage is common in certain settings such as in a school gym, around a forklift operation, or where a sign near the floor is required (e.g., CA)

Intact Sign (SRB Technologies)

Intact Sign (Isolite, 1991)

Regulatory Background

- 10 CFR 31
- 10 CFR 32
- NUREG-1556
- NRC Regulatory Issue Summary (2006)
- NRC News Press Release (2009)
- Note: Agreement states may choose to be more restrictive

10 CFR 31: General Domestic Licenses for Byproduct Material

- Relevant language found in §31.5
- General licensees who possess TES must:
  - Appoint an individual responsible for ensuring compliance with the requirements
  - Ensure that labels are intact
  - Suspend operation of broken signs

10 CFR 31: General Domestic Licenses for Byproduct Material

- General licensees who possess TES must:
  - Return unwanted or broken signs to a specific licensee authorized to receive them (typically a manufacturer)
  - Report lost, stolen or transferred signs to the appropriate regulatory agency within 30 days

10 CFR 32: Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material

- **Relevant language found in §32.51a: Manufacturers of TES must provide information to the general licensee receiving the signs, to include:**
  - **A copy of the requirements pertaining to a general licensee**

10 CFR 32: Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material

- A list of services that can only be performed by a specific licensee
- Information on acceptable disposal options
- A reminder that NRC can issue penalties for improper disposal

NUREG-1556: Consolidated Guidance for Materials Licensees

- Relevant language found in Volume 16 (Program-Specific Guidance About Licenses Authorizing Distribution to General Licensees)
- Appendix L: Guidance on Self-Luminous Exits
- Question and answer format, reiterates the requirements of 10 CFR 31.5
- Expands on key issues such as how to make the required reports, how to determine if a sign is functional, and what to do if a sign is broken to minimize the spread of contamination

NRC Regulatory Issue Summary 2006-25: Requirements for the Distribution and Possession of Tritium Exit Signs and the Requirements in 10 CFR 31.5 and 32.51a

- Published December 7, 2006
- Reiterated the requirements for TES distributors and general licensees
- Arose from concerns expressed by two states (PA and NJ) regarding elevated levels of tritium detected in landfills
- EPA and CRCPD also expressed concerns

Problems Encountered

- Despite the requirements, possessors of TES are often unaware of the requirements
- Similar to radium dial issue, responsible person may not be identified especially when new ownership or management occurs
- TES are often mishandled when broken
- EPA concerns regarding tritium leachate in landfills pointed to TES disposal as the problem (see their online training course at www.trainex.org)

NRC Press Release No. 09-011:
NRC Requests Organizations to Report on Tritium Exit Signs in Their Possession

- Published January 16, 2009
- Requests 62 organizations to check TES in their possession and compare to records
- Focuses primarily on non-Agreement States, entities with 500 or more signs

NRC Press Release No. 09-011:
NRC Requests Organizations to Report on Tritium Exit Signs in Their Possession

- Likely that many more organizations will ultimately be impacted
- Reiterates that TES pose little or no threat to public health, and pose no security risk
- Arose from experiences reported by a large retailer

Broken Sign (slight damage)

Broken Sign (moderate damage)

Broken Sign (presumably moderate damage)

Broken Sign (severe damage)

Typical Contamination Levels

- Even fully intact signs can have slight levels of contamination (<100 dpm/100 cm^2) immediately behind the sign mounting location
- Broken signs can result in measurable contamination up to 1 ft to the side of the mounting location and on the floor below
- Contamination levels are relatively proportional to the extent of breakage, and are typically less than 1,000 dpm/100 cm^2 but can exceed 10,000 dpm/100 cm^2 in extreme cases
- Ability to decontaminate dependent on type of surface (e.g., plywood, metal, concrete)

Potential Radiation Doses

- Doses of ~1 mrem or less are possible if a person is in close proximity to a sign when it is broken (e.g., forklift operator)
- Doses up to ~10 mrem are possible if a person is purposefully breaking a sign
- Such scenarios were considered in the NRC rulemaking process
- See PNL-10620

Disposal Issues

- Signs (intact or broken) may be returned to the manufacturer, assuming they are still in business
- Some manufacturers (e.g., Isolite) accept other manufacturers' signs for a small fee
- Signs may not be disposed of in sanitary trash under any circumstance, even if only pieces of the sign remain
- Contaminated materials (e.g., floor sweepings, plywood header pieces) may or may not require disposal as LLRW depending on regulatory interpretation

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