Tritium Extraction Facility ALARA

Marvin Barnett
Joye Brotherton
TEF Description

- Tritium Producing Burnable Absorber Rods (TPBARs) irradiated at TVA
- Shipped to SRS
- TEF built to extract the tritium
- Designed for 14 shipments/yr
- TPBARs are highly radioactive
- Requires extensive shielding
Source Term

- Size: approximately 8.4 in. square and 12 ft. tall
- Co-60 due to steel activation
- Dose Rate: 50,000 R/hr at 1 ft
Shielding

- 0.25 mrem/hr
- Bulk Shielding
- Streaming
Bulk Shielding

- Walls
  - Concrete
  - Several Penetrations (large and small)

- Doors
  - Steel
  - Streaming Concerns
Penetrations

- 3-legged
- Imbedded steel
- External shield box
Door Streaming

- ½ in. gaps
- Steel in walls
- Steel lip
- Labyrinth
Dose Assessment

- Determine dose rate in all areas
- Develop Time and Motion Data
- Calculate person-rem associated with each operation
- Associate person-rem with dollar values
- Examine high dollar operations
Shield Verification

- ANSI/ANS 6.3.1
- Not feasible to bring in a source
- Use TPBARs for testing
- Need confidence personnel safety

3 Steps

- Determine conservatism in design
- Test installation of equipment necessary for personnel radiation protection
- Bring in TPBARs and test shields
Conservatism Analysis

- Small source tests of selected penetrations and concrete
- Review construction QA
- Concluded no risk to personnel safety
Start-Up Testing

- Verify monitors and alarms working
- Verify shield door operation
- Verify shield plug installation
Testing with TPBAR

- Segment shield structure in grids for measurement
- Determine if TPBAR can test shield
- Test verifiable shields
- Check each incoming TPBAR