Radiation Protection: How Did We Get Here; Where Should We Have Gone?

US Customs and Border Protection's Approach to Radiation Protection

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Disclaimer

Remarks here represent the historical radiation protection development (1996-2008) used by U.S. Customs & Border Protection.

This presentation is from my recollection.

Historical Perspective

Perspective of three decades of experience:

38 U.S. Nuclear Regulatory Commission Licenses;

Broad Industrial, SNM, Specific Licenses

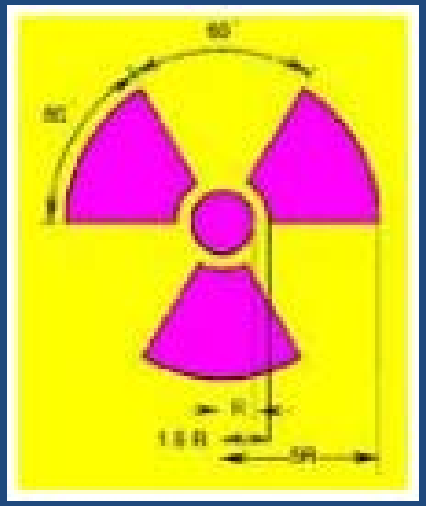
Medical, Irradiator and Homeland Security Uses

2 U.S. Department of Energy SNM Permits; &

2 Canadian Nuclear Safety Commission Licences;

Historical Perspective

Occupational Exposure Protection:

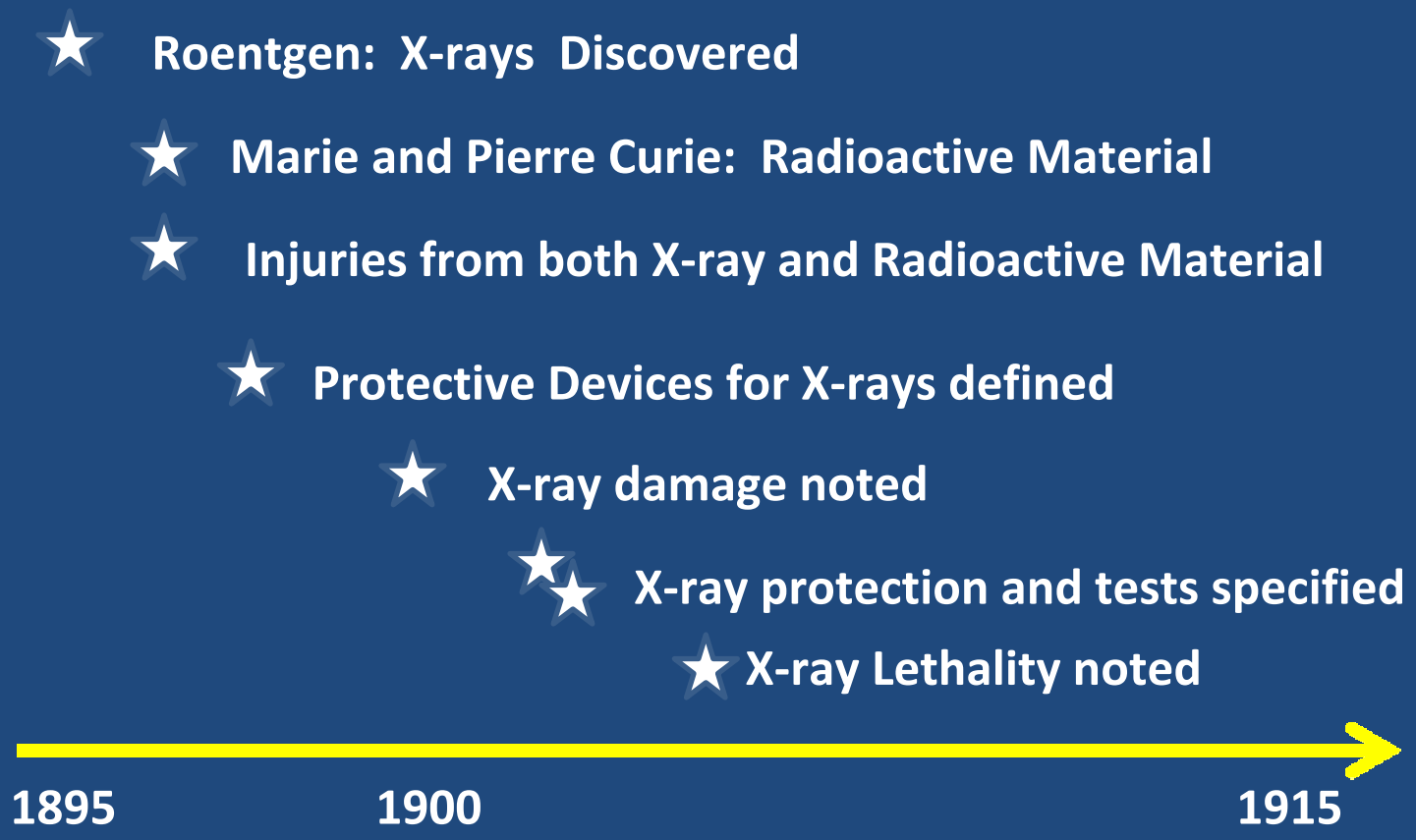


- Material Handlers (e.g., Radiographers)
- Medical Personnel
- **Public**

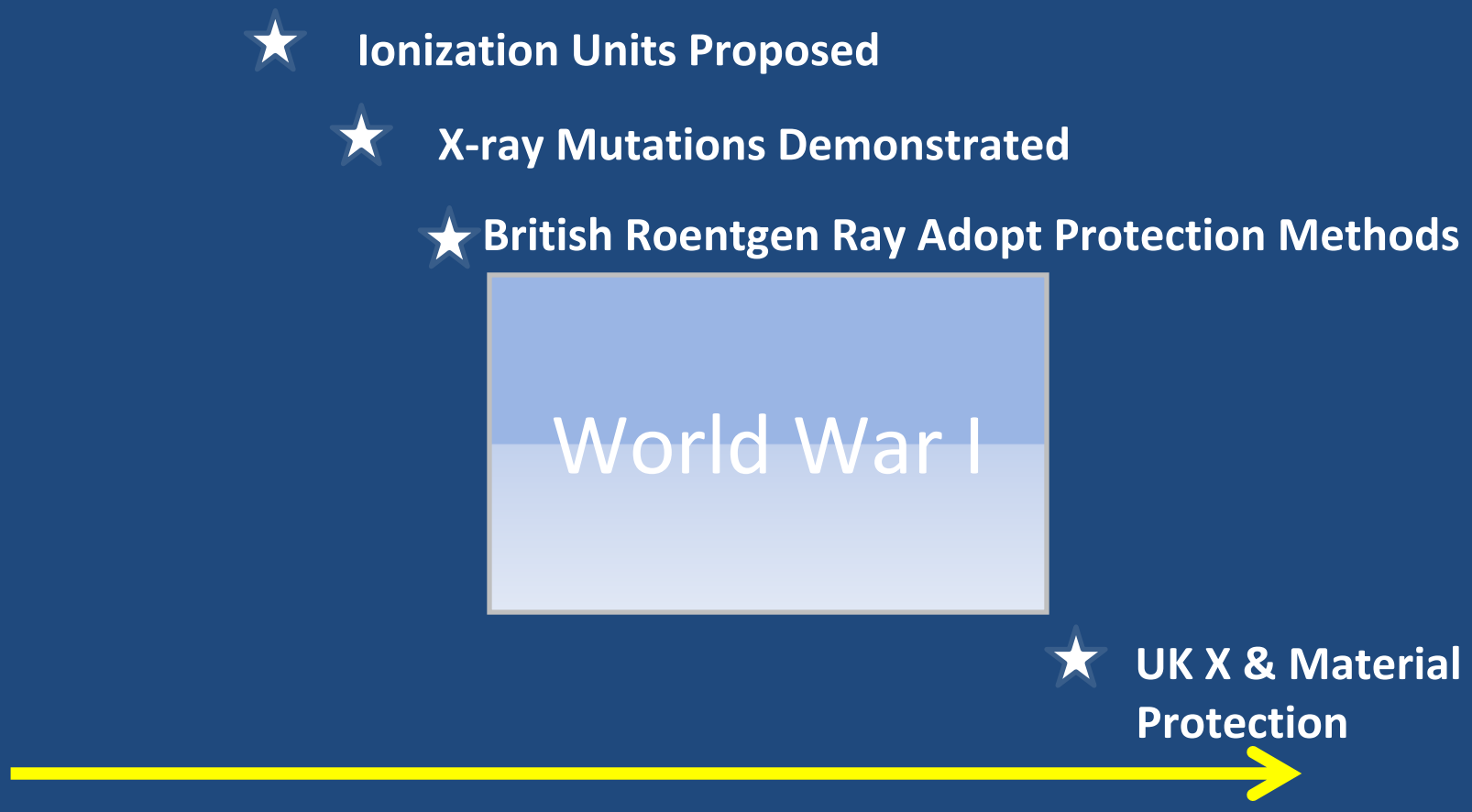
Pre and Post 2001 Radiation Protection Priorities

Handlers & Users	Public
Medical Personnel	Medical Personnel & Patient
Public	Handlers & Users

Occupational Limits Over Time



Occupational Limits Over Time



Occupational Limits Over Time

★ Tolerance Dose Proposed

★ Tolerance Dose Proposed 0.01 SED/Month

★ Dutch 1. SED per 90,000 working hours

★ Roentgen unit adopted

★US Advisory Committee X-Ray & Radium

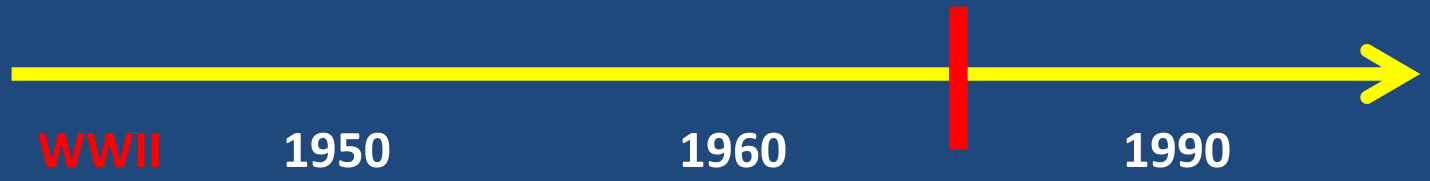
★ USACXRP Recommends .2R/day

★ USACXRP 5R/day for Hands

1921 1925 1930 1935 WW2

Occupational Limits Over Time

- MANHATTAN Project
- NCRP lowers MPD to .3R/week & Risk/Benefit
- ICRP Adopts .3R/week
- ICRP Recommends MPD of 5R/year (Occupational)
- NCRP Recommends MPD of 5R/year (Occupationa
  & 0.5R/year for General Population
- US 100 mR Public
  500 mR Pregnant



Recent

- **Europe: < 0.05 Sievert/year *[5 REM*], recommended <0.02 for most years**
- **General Public Exposure: <1 milli-Sievert/year *[100millli-REM]***

Anti-Terrorism Applications >2001

1) Rapid growth in gamma and x-ray scanning

    - No longer “just in labs or hospitals”

2) Many more uses for Non-Radiation Workers

3) Introduction of Human Scanning

Rapid Fielding of Systems

Non-Radiation Workers

- Goal: To keep below 1milli-Sievert/year
  [100 milli-REM/year]

$$\frac{\text{1 milli-Sievert/year}}{\text{2,000 hours/year}} \rightarrow \text{0.5microSv/hour}$$

History

- Exposure levels are verified by:
- Simulations prior to fielding
- Control of Training and Trainers
- Regular verification during use
- National Treasury Employee Union participation
- Periodic review by Field Health Physicists
- Quarterly Radiation Safety Committee