

# PROJECT OVERVIEW FOR SM-1A FORT GREELY, AK DEACTIVATED NUCLEAR POWER PLANT PROGRAM

## Fort Greely Community Update Meeting

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*"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."*



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# AGENDA

- Introduction and Welcome Remarks
  - Brenda Barber
  - Hans Honerlah
- U.S. Army Nuclear Power Program; Deactivated Nuclear Power Plant Program
  - Hans Honerlah
- Regulatory Framework for the Deactivated Nuclear Power Plant Program
  - Hans Honerlah
- Historical Overview SM-1A
  - Hans Honerlah
- Decommissioning Planning and Implementation
  - Brenda Barber
- Closing Remarks
  - Brenda Barber



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# U.S. ARMY NUCLEAR POWER PROGRAM

- 1952 Department of Defense (DoD) study to determine the feasibility of developing reactor plants to serve military power needs on land.
- Joint program between DoD and the Atomic Energy Commission.
- Each service participated in the Army managed program.



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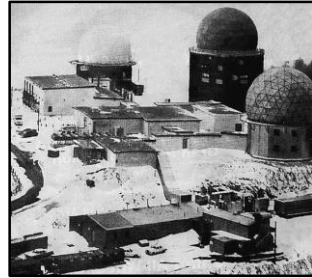
# U.S. ARMY NUCLEAR POWER PROGRAM

- Six DOD power reactors fielded between 1957-1976

Four Army:



One Air Force:



One Navy:



- Two at National Reactor Testing Station, Idaho



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# ARMY DEACTIVATED NUCLEAR POWER PLANT PROGRAM

- PM2A at Camp Century Greenland was fully decommissioned, the three others were placed into SAFSTOR and are controlled under Army issued Permits, and still require decommissioning
- For the three Army deactivated (fuel removed) reactors placed into safe storage, USACE:
  - Ensures the security of the residual radioactive materials present in the reactors
  - Ensures structural integrity of the facilities and performs required maintenance
  - Performs environmental monitoring to ensure exposure to the public is below limits and 'As Low As Reasonably Achievable'
  - Plans and performs final decommissioning within 60 years post-shutdown



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# CURRENT REGULATORY FRAMEWORK AND OVERSIGHT

- Defense Utilization Facilities Authorized by Section 91.b. of the Atomic Energy Act of 1954
- Section 110.b. of the AEA Excludes DOD Utilization Facilities from AEC/NRC Licensing
- Army Reactor Program (AR 50-7)
- Compliance With Federal Standards Required
- Army Radiation Safety Program (DA PAM 385-24)
- USACE Developed Radiation Protection Programs
- Army Reactor Permits Issued to USACE by U.S. Army Nuclear and Countering WMD Agency (USANCA) in G-3/5/7
- Army Reactor Council Provides Oversight



# SM-1A OPERATION AT FORT GREELY, AK



- Stationary, Medium Power, Prototype
- 20 MWt; 1,640 KWe
- First pressure suppression containment
- First steam generator replacement in US
- Deactivated, reactor areas encased, secondary systems converted to fuel boilers

Site is still operational as the Central Heating Plant for the Fort Greely Installation; Doyon Utilities operates the utility plant at the site



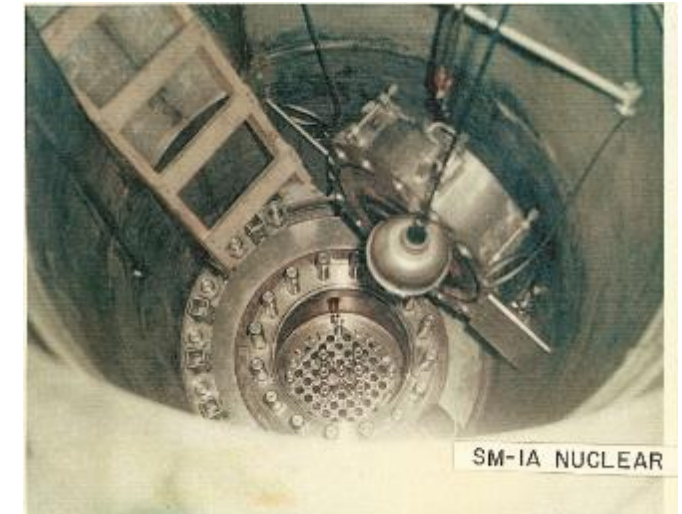
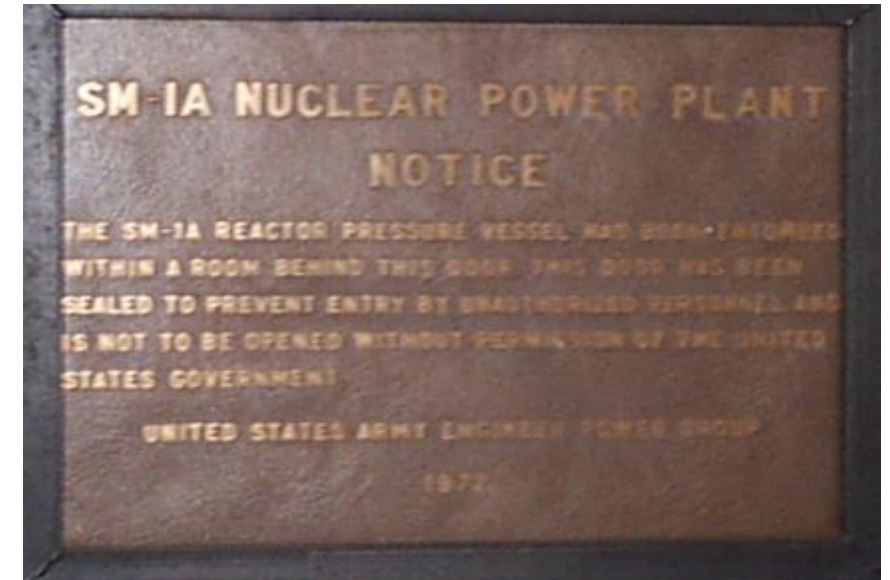
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# SM-1A TIMELINE: DETAILS

- SM-1A Construction Start: 1958
- SM-1A Reactor Startup: March 1962
  - Core II installed: April 1964
  - Core III installed: Jan 1966
  - Core IV installed: Aug 1970
- Pressure Vessel Annealed: Aug 1967
- Last Operation: March 1972
- Minimal Decommissioning and Entombment: 1973
  - Deactivated, reactor areas encased, secondary systems converted to fuel boilers
- USACHPPM Survey: June 1997
- BRAC Pipeline and Dilution Well Removal: 1997-2000
- Core Component Activation Analysis: 2008
- USACE Historical Site Assessment: 2008
- USACE Gamma Walkover Report: 2011
- USACE Characterization Survey Report: 2014



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# INITIAL DEACTIVATION AND ENCASEMENT ACTIVITIES

- Decommissioning activities are documented in the May 1974 Decommissioning Report
- Fuel, control-rods, absorber elements, and neutron sources were shipped off site
- Primary and secondary system was flushed with a chemical solution
- Fuel handling structure over the spent-fuel pit was removed
- Dilution station capped after it was filled with sand
- Demineralizer Room sealed
  - Waste placed in Demineralizer Room
- Removed wastewater pipeline & dilution station
  - 1997 BRAC action and site closed with a Record of Decision



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# INITIAL DEACTIVATION AND ENCASEMENT ACTIVITIES

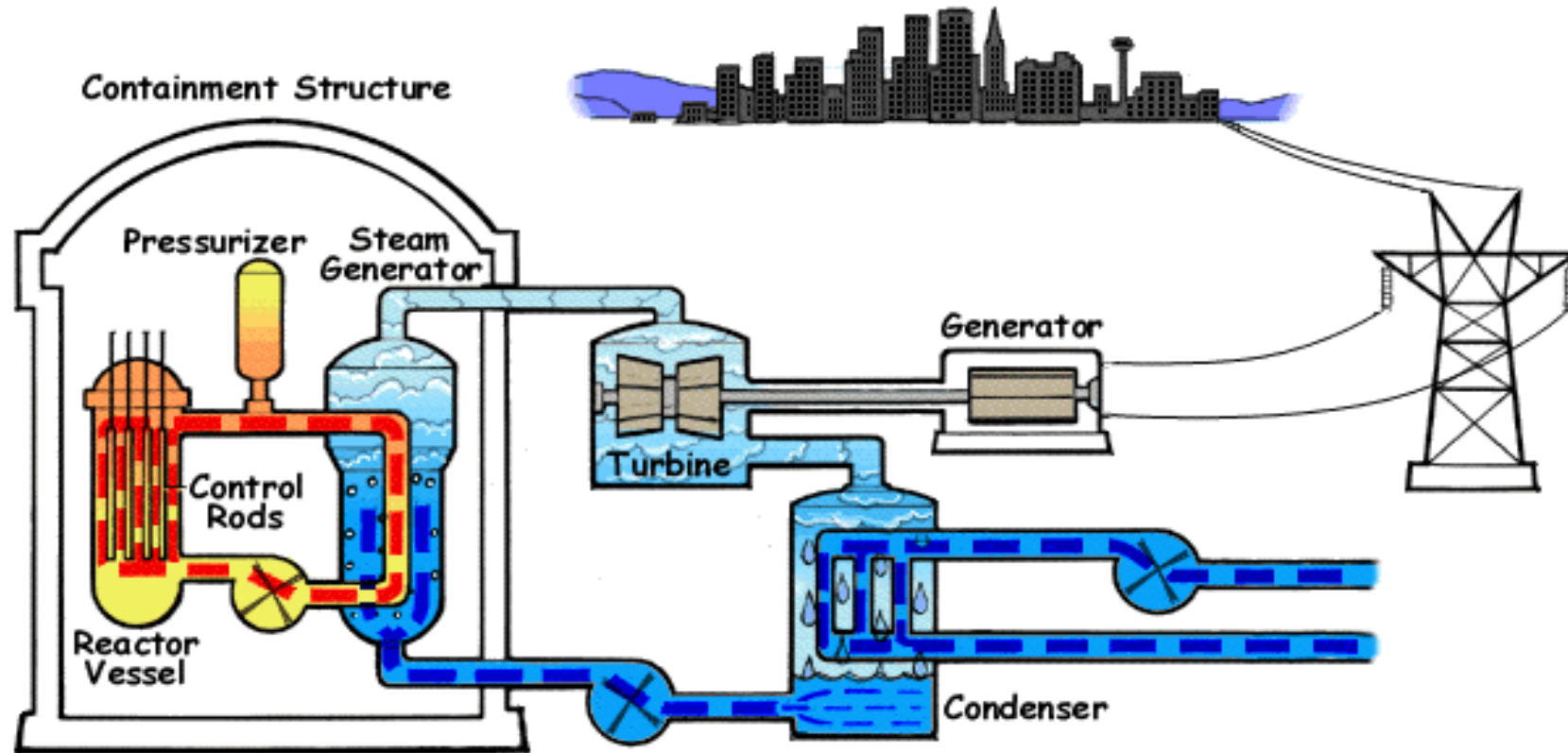
- Portions of the SM-1A were encased and include the Vapor Container (VC), Spent Fuel Pit, Hot Waste Tanks, Pipe Pit, Condensate Tank Pit (contaminated materials were included in the encasement)
- New concrete cover placed over the floors of lower reactor building and Building J-5
- Two time capsules placed within the encasement
- Access door to outer Demineralizer Room and other penetrations to it were sealed
- Miscellaneous low level radioactive waste placed in the Demineralizer Room



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# TYPICAL PRESSURIZED WATER REACTOR OPERATIONS

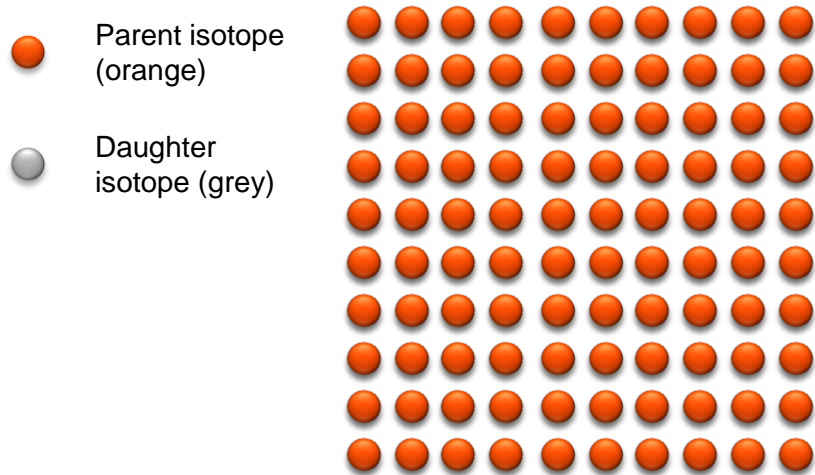


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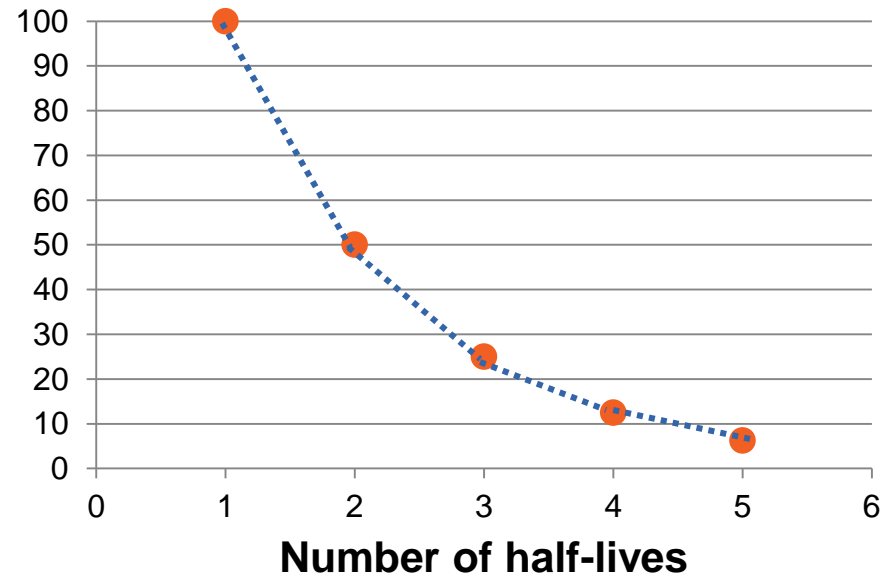




# SAFSTOR ALLOWS FOR RADIOACTIVE DECAY



- Half life is the time it takes for 1/2 of the atoms to decay.
- The half-life of Co-60 is 5.27 yrs.
- The half-life of Ni-63 is 100.1 yrs.

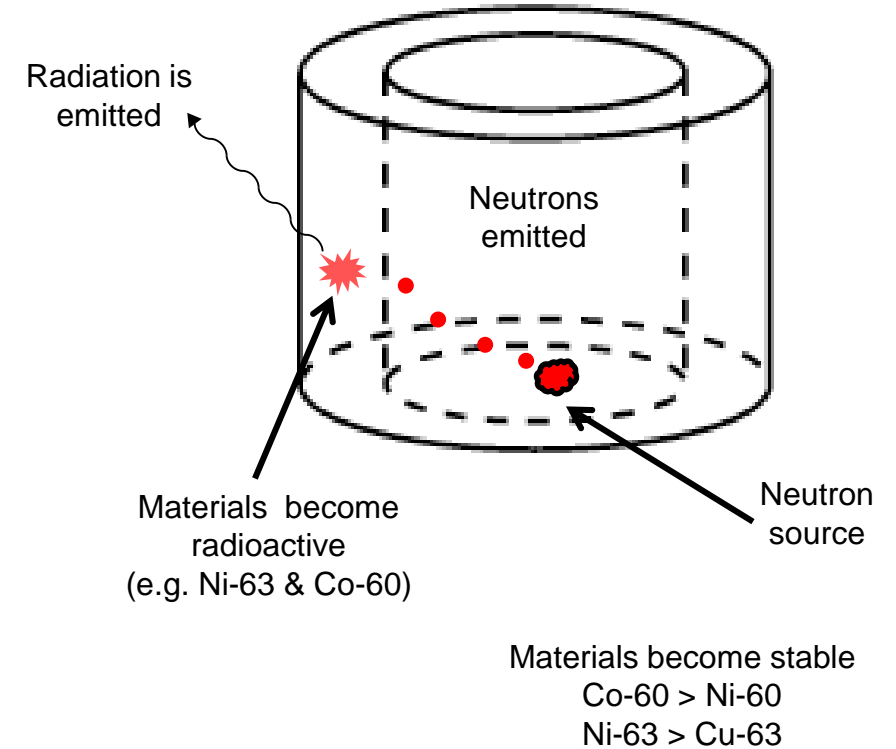


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# SM-1A PRIMARY RADIONUCLIDES

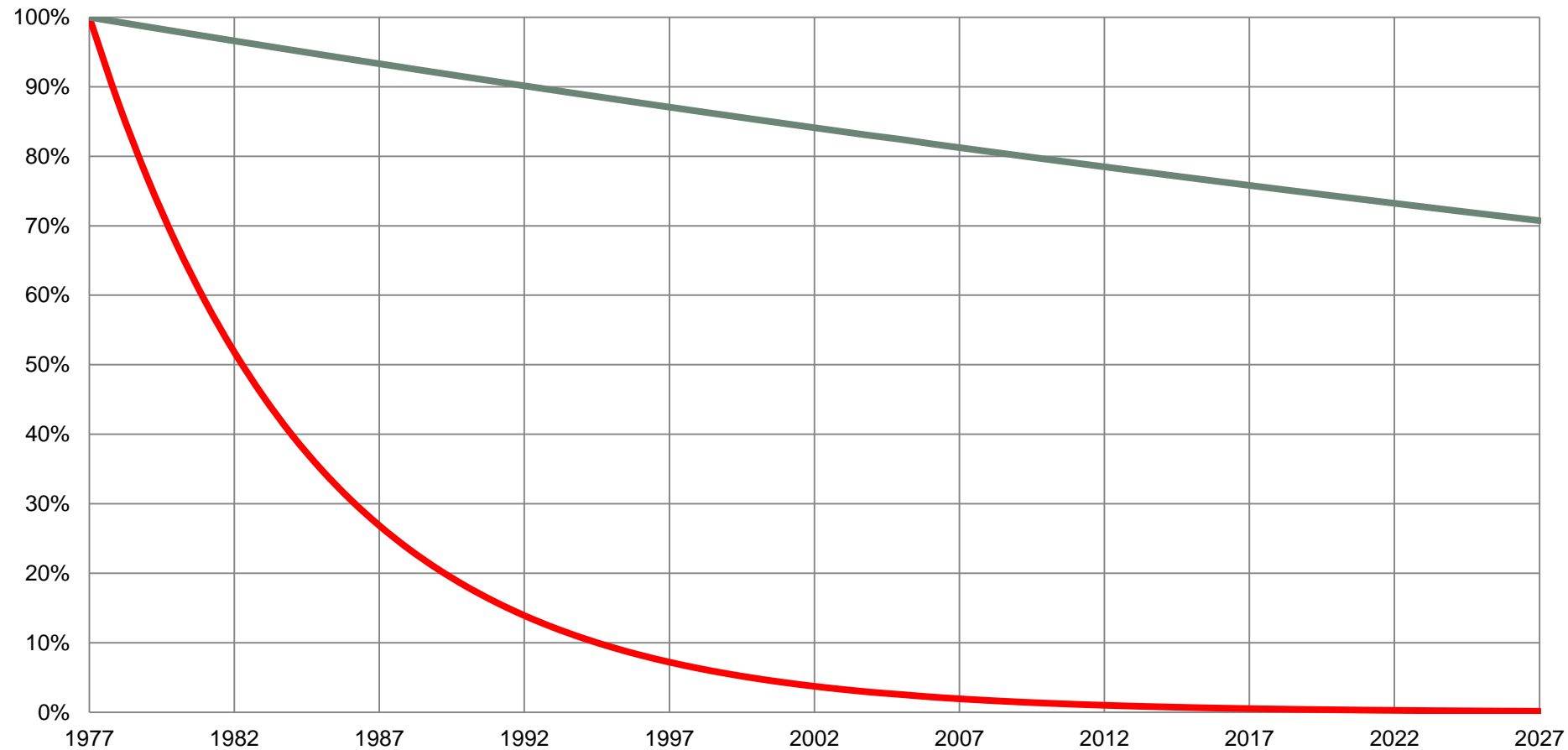
- Primary radionuclides are activation products
  - Co-60 - emits beta and gamma radiation
  - Ni-63 - emits low-energy beta radiation
- Most of the activity is in the form of radioactive metal in the reactor pressure vessel and the primary shield tank
- Small amounts of activity is present in the form of contamination on or within debris and soils (primarily Cs-137 and Sr-90)



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# RADIOACTIVE DECAY SINCE SHUTDOWN



— Co-60 gamma emitting isotope  
and has a 5.27 year half-life

— Ni-63 low energy beta emitting isotope  
and has a 100.1 year half-life

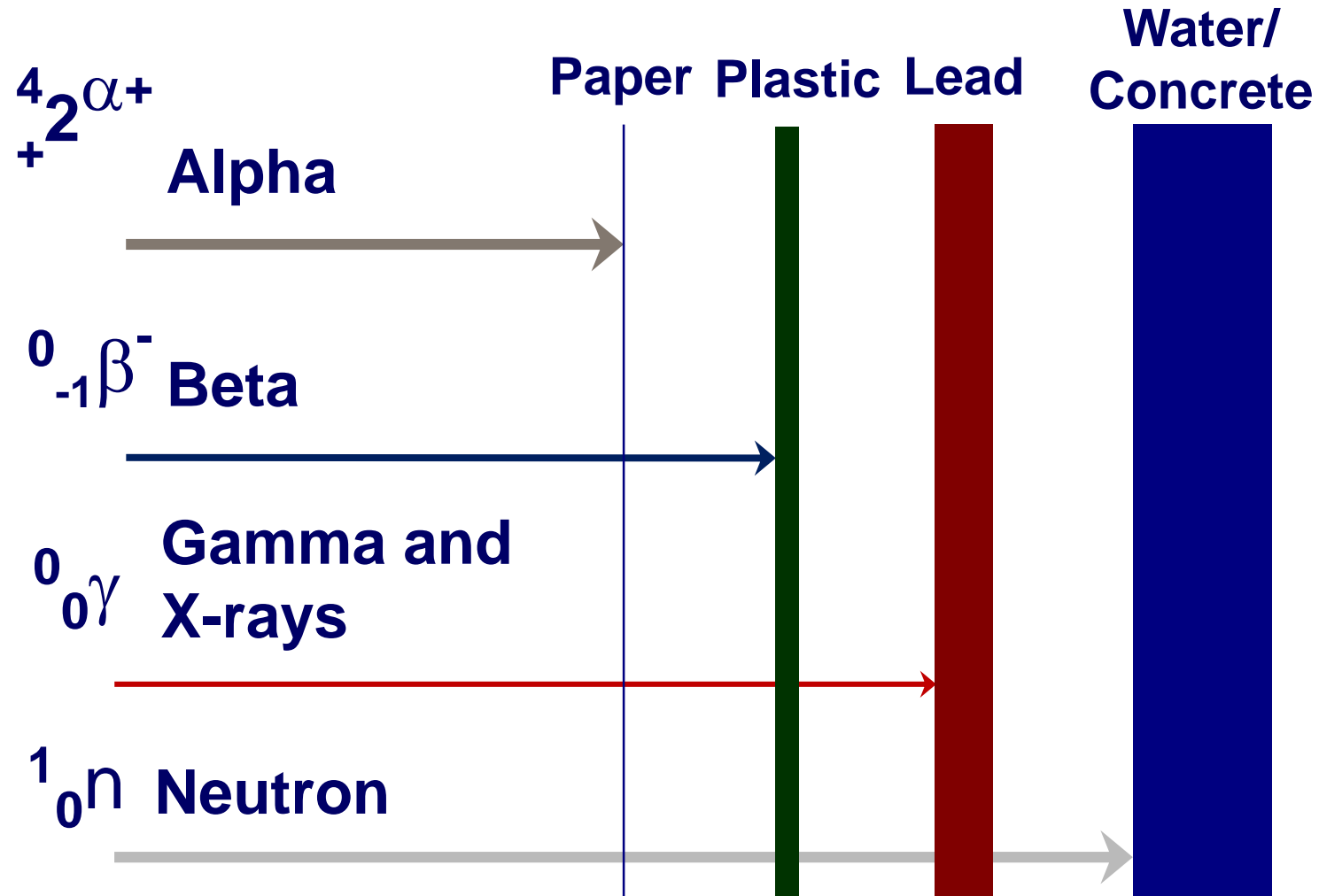


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# BASIC TYPES OF IONIZING RADIATION



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# ROPACS AND COPACS

- ROPCs – Primary Radionuclides of Potential Concern (half-lives > 5 years)
  - Soil and/or building materials: H-3, Sr-90, Tc-99, Cs-137
  - Primary and secondary systems: Co-60, Sr-90, Cs-137
  - Activated metals: Co-60, Ni-63
  - Activated concrete: Eu-125, Eu-154
- COPCs – Contaminants of Potential Concern
  - Building materials: Asbestos, lead-based paint, PCBs
    - PCB transformers removed in 1994
  - Shielding materials: elemental lead
  - Soil: Lead, petroleum-based hydrocarbons (diesel fuel spills)



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# SM-1A DECOMMISSIONING PLANNING

- Decommissioning Planning is underway – anticipate completion by 2021
  - Scope includes:
    - Review of historical documents associated with the All Hazards Analysis
    - Prepare planning documents that will support the Army Reactor Office issuing the USACE a decommissioning permit for the SM-1A reactor
    - Comply with other relevant Federal and State requirements that will support the long-term decommissioning planning
    - Ensure adherence of project activities to Nuclear Regulatory Commission (NRC), Army, and Federal standards and guidance, as well as, other Federal standards and guidance where relevant, and
    - Coordinate with appropriate federal, state, and public parties to support issuance of decommissioning permit and other National Environmental Policy Act (NEPA) requirements
- Major Decommissioning Planning Documents
  - Final Disposal Plan, Schedule and Cost Estimate
  - Waste Management Plan
  - Environmental Assessment
  - Section 106 Effects Assessment and agreement document
  - Decommissioning Plan



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# REGULATORY FRAMEWORK

- Regulators
  - Removal of radioactive materials – Army Reactor Office (ARO)
  - Historical/Cultural – AK State Historic Preservation Office (SHPO)
  - Environmental protection/permitting – EPA and State
- Applicable Regulations
  - Atomic Energy Act
  - National Environmental Policy Act
  - Clean Air Act
  - Clean Water Act
  - Endangered Species Act
  - Others?



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# PROJECT STAKEHOLDERS

- Regulators
- Property owners and tenants (Ft. Greely, Army Garrison Alaska, Doyon Utilities)
- Other government agencies (USACE, Defense Logistics Agency, etc.)
- Public interest groups/neighbors
- Local, State, Tribal and Federal elected officials
- Local jurisdictions



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# PROJECT TEAM

- Members of the project and oversight team include:
  - Professional Engineers
  - Certified Health Physicists (Radiation Safety)
  - Certified Industrial Hygienists
  - Environmental Scientists
  - Regulatory Specialists
  - Safety Specialists
  - Qualified Technicians



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# FEDERAL OVERSIGHT

- U.S. Army Corps of Engineers will provide quality assurance over the contractor and their quality control program
- Corps of Engineers National Environmental Center of Expertise
- Army Reactor Office and Reactor Council
- Oak Ridge Associated Universities – Independent Review



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# PUBLIC ENGAGEMENT

- The Army is committed to transparently sharing accurate information in a timely manner throughout this project and among all relevant parties, making sure information is coordinated and concerns from stakeholders are quickly addressed
- Multiple opportunities for public engagement are being incorporated into the decommissioning planning, including public information sessions like this one to inform the community of our ongoing planning, and again once the draft Environmental Assessment is available for public review
- Members of the public are invited to sign up for the SM-1A project update e-mail list by sending a request to [CENAB-CC@usace.army.mil](mailto:CENAB-CC@usace.army.mil)

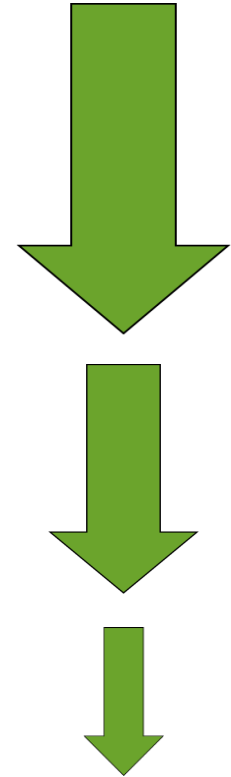


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# DECOMMISSIONING RISKS AND HOW WE REDUCE THEM

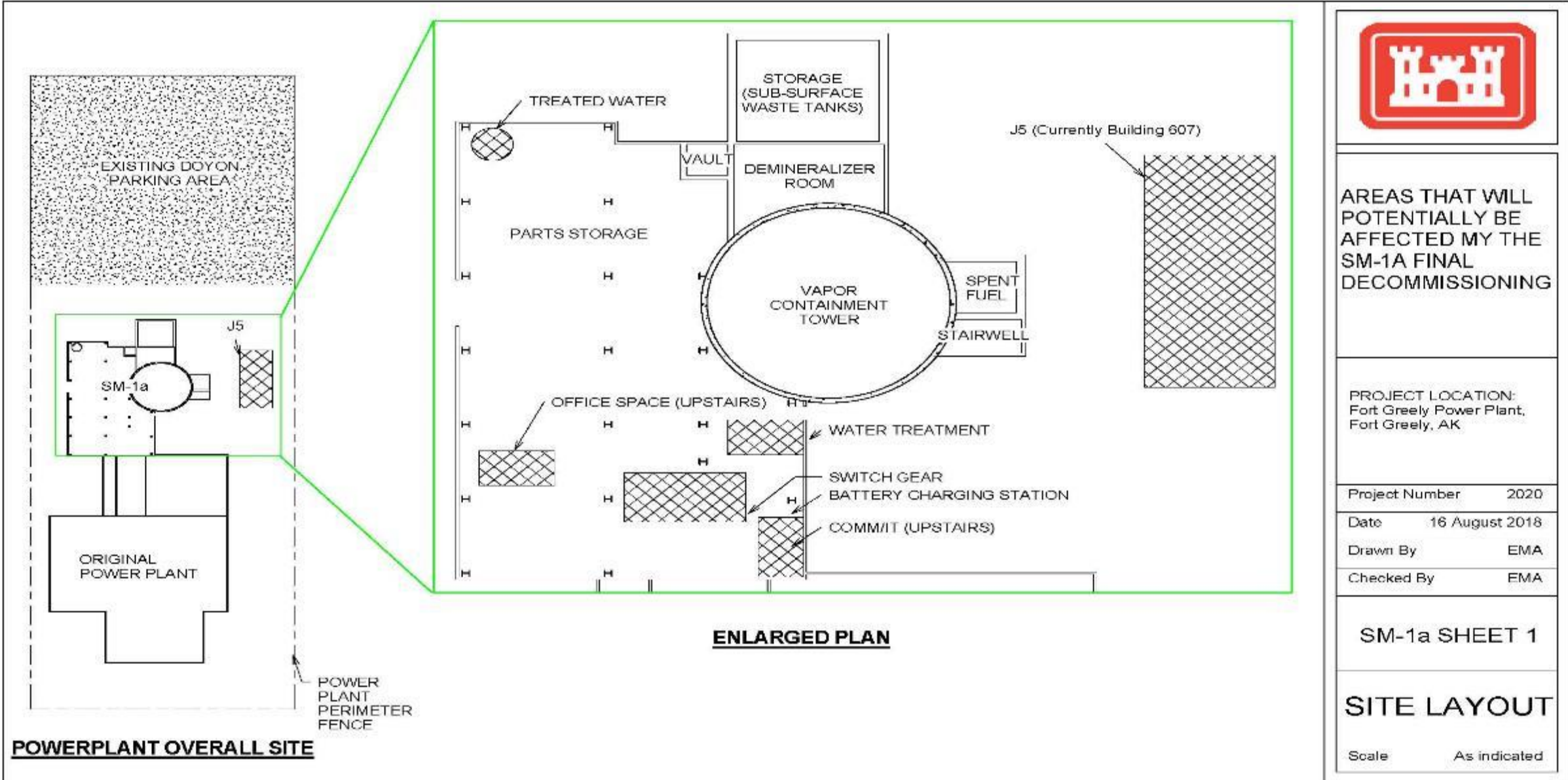
- Safety is the Army's number one priority - The safety and health of the community and our workers are paramount to the success of our project
- Trained professionals will use proven techniques and precautions to ensure the safety of the workers and the public
- Work will be completed within containment and all wastes will be properly packaged in compliance with Department of Transportation Guidance



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# AFFECTED AREAS OF SM-1A (BLDG. 606)





# SM-1A DECOMMISSIONING IMPLEMENTATION ACTIVITIES

- The selected contractor will prepare plans that will support the decommissioning of the SM-1A in accordance with contract PWS and the Decommissioning Permit issued to the USACE;
- Decommission/disposal of materials in accordance with final plans, decommissioning permits, and relevant Federal and State requirements; and
  - Project management (cost controls, scheduling, manpower resourcing, etc.)
  - Prepare work plans, safety and radiological plans, and prepare complex engineering assessments
  - Removal of all reactor components and radiologically contaminated materials
  - Prepare all radiological waste for proper shipment; then transport and dispose of the waste
  - Perform radiological surveys
  - Perform demolition of non-contaminated equipment and building components
  - Excavate contaminated soils
- Final site restoration

**Adherence to NRC and Army, as well as other Federal standards and guidance where relevant and as required by the Army Reactor Office and USACE.**

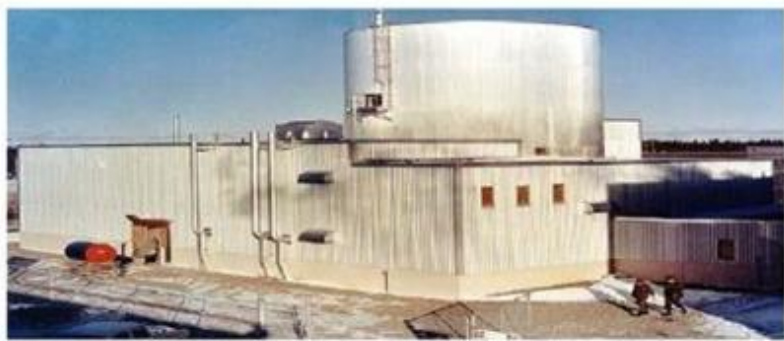


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# WASTE SEGREGATION PROCESS

## WHERE DOES IT ALL GO?



< 25%



**LOW LEVEL RADIOACTIVE WASTE TO A LICENSED DISPOSAL FACILITY (Lower 48)**

- **RADIOLOGICALLY ACTIVATED**
  - REACTOR PRESSURE VESSEL (RPV)
  - OTHER REACTOR COMPONENTS
- **RADIOLOGICALLY CONTAMINATED**
  - PRIMARY and SECONDARY REACTOR SYSTEMS
  - LIQUID WASTE MANAGEMENT SYSTEM
  - CONTAMINATED SOIL AND DEBRIS

> 50%



**CLEAN MATERIAL & EQUIPMENT (M&E) AND DEMOLITION DEBRIS FOR DISPOSAL OR RECYCLED (Regional Alaska)**

- ELECTRICAL DISTRIBUTION EQUIPMENT
- CONTROL ROOM CONSOLES
- BUILDING DEBRIS
  - STEEL
  - CONCRETE

< 25%



**HAZARDOUS WASTE FORMS TO PERMITTED LANDFILLS (Lower 48)**

- SOIL AND DEBRIS CONTAMINATED WITH VERY LOW LEVELS OF RADIOACTIVITY
- ASBESTOS INSULATION, FLOOR TILES, MASTICS, PCBs, ETC.
- LEAD-CONTAMINATED SOILS
- UNIVERSAL WASTE (fluorescent bulbs, mercury-containing equipment, etc.)

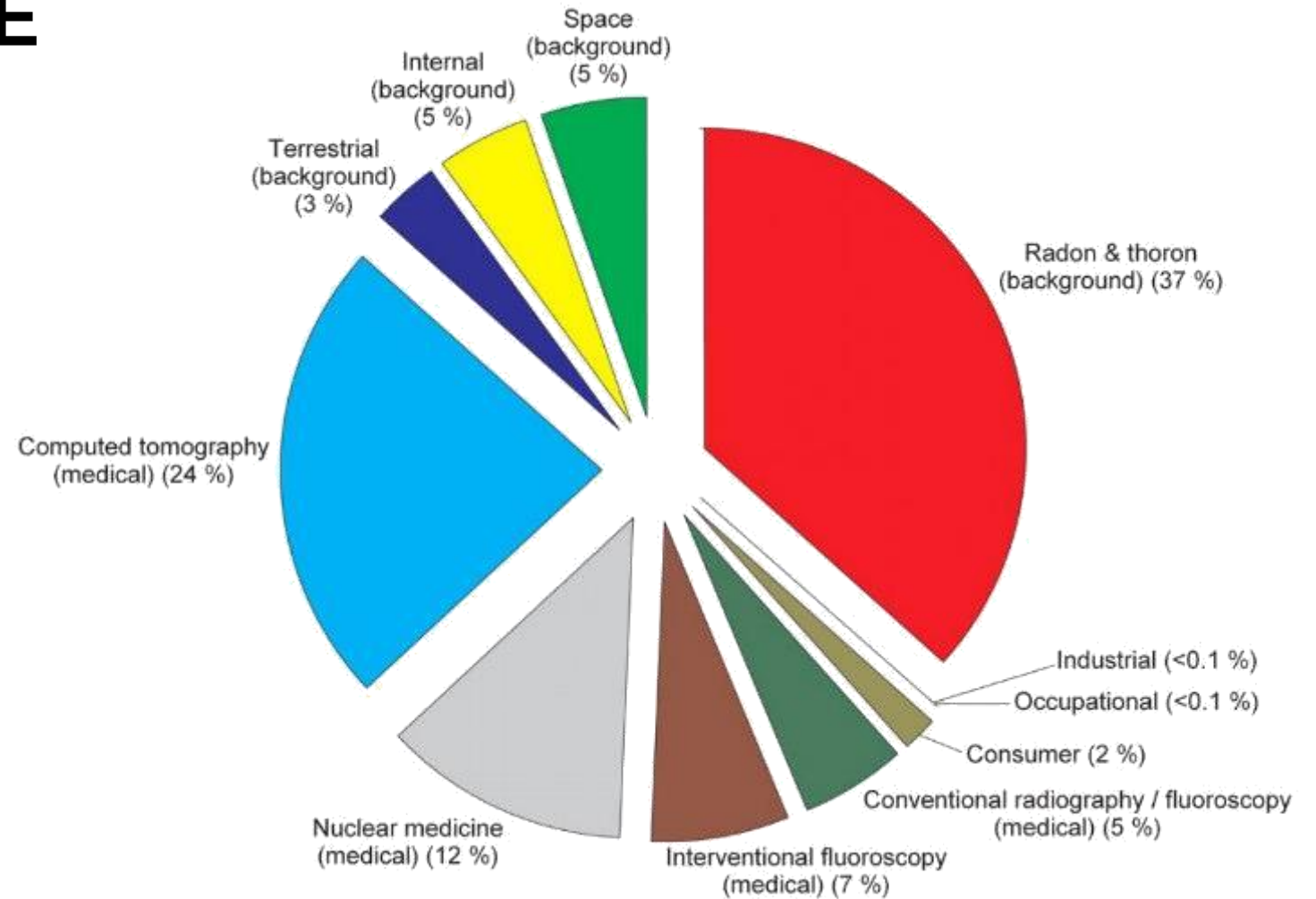


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# RADIOLOGICAL FUNDAMENTALS SOURCES OF RADIATION EXPOSURE

- Since the beginning of time, all living creatures have been, and are still being, exposed to radiation.
- Nonetheless, most people are not aware of all the natural and man-made sources of radiation in our environment.



Average dose to individual in US is 620 mrem/yr

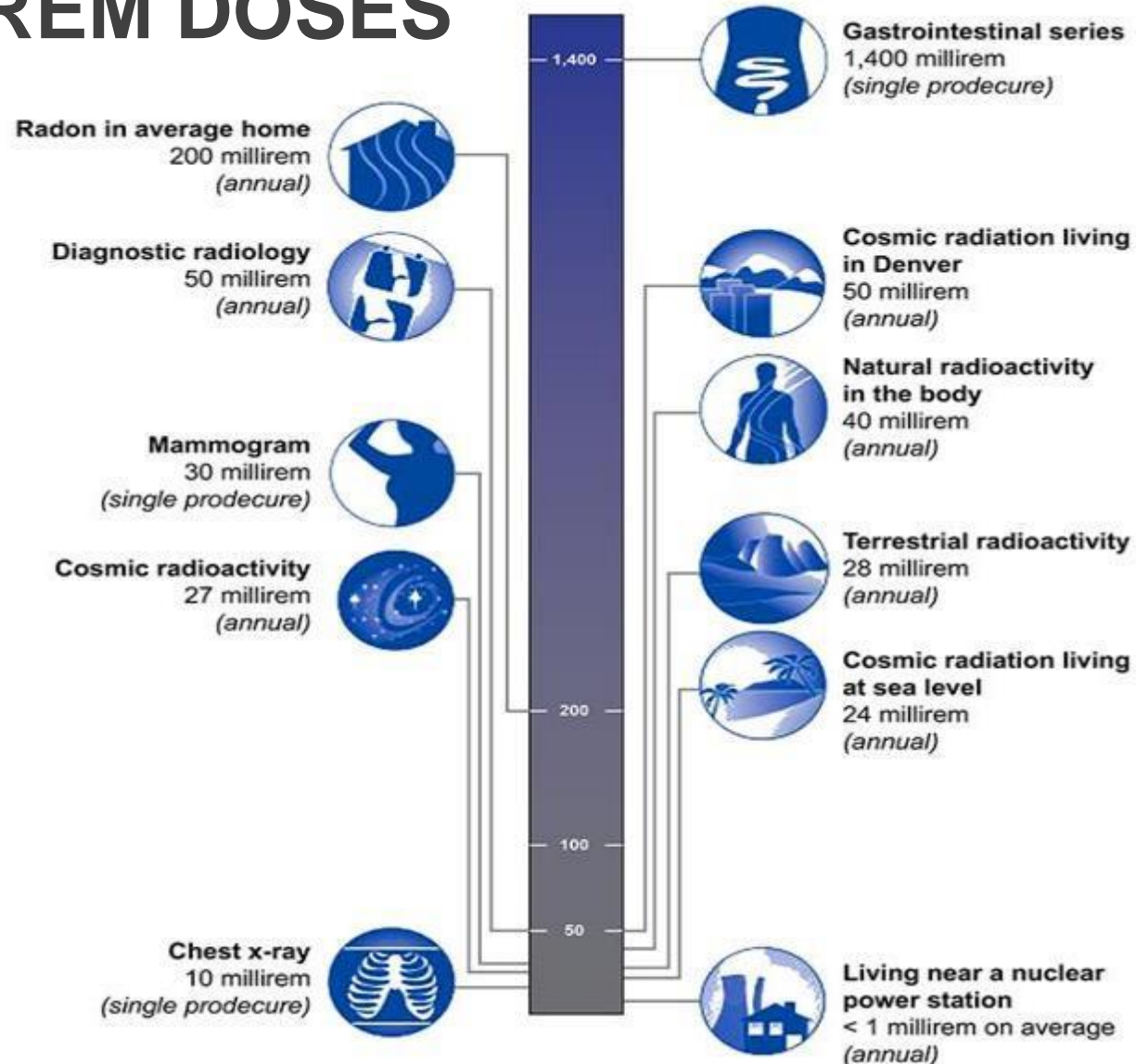


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# RELATIVE DOSES FROM RADIATION SOURCES – MILLIREM DOSES

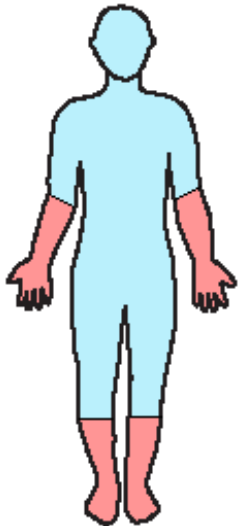


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# RADIATION DOSE LIMITS

- Occupational and Public Dose Limits

Type of exposure	NRC Limits (mrem/y)			Whole Body  Extremities
	Adult Worker	Minor Worker	Member of the General Public	
Whole Body	5,000	500	100	
Organ or Tissue	50,000	5,000	N/A	
Lens of the Eye	15,000	1,500	N/A	
Skin or Extremity	50,000	5,000	N/A	
Embryo/Fetus (of a declared pregnant worker)	500	N/A	N/A	

- NRC Decommissioning Criteria to be used for the SM-1A is 25 mrem/y
- Free release of material and equipment for recycle is 1 mrem/y



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# QUESTIONS AND HOW TO LEARN MORE

Learn more about the SM-1A Project online at:

<https://www.nab.usace.army.mil/SM-1A/>

Sign up for the SM-1A stakeholder update e-mail list by e-mailing:

[CENAB-CC@usace.army.mil](mailto:CENAB-CC@usace.army.mil)



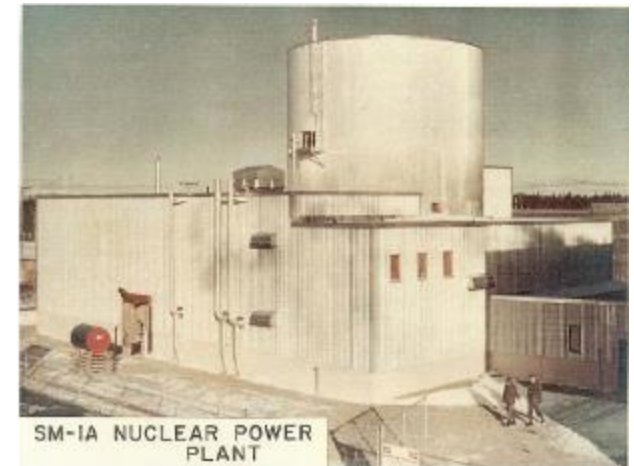
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**Thank you for attending today's event.  
USACE appreciates your input on the  
SM-1A Deactivated Nuclear Power Plant  
Decommissioning and Dismantlement Project.**



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