

Brookhaven Graphite Research Reactor (BGRR)

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BGRR Complex



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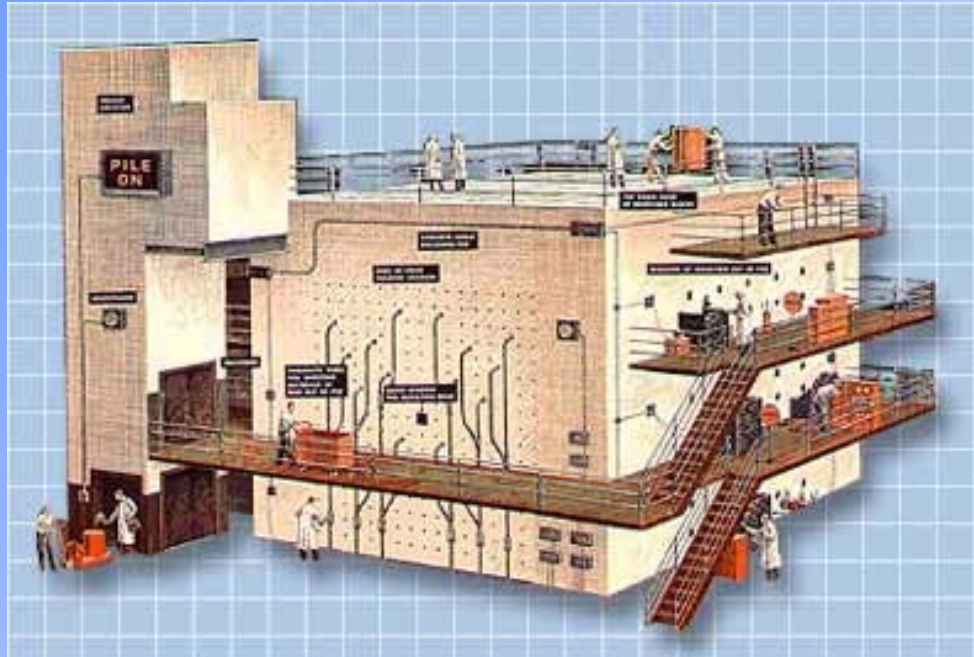


BGRR General Background

- First reactor built for peacetime research on the atom
- Located on Long Island, New York
- Accomplished great science from 1950 to 1968
- All fuel removed in 1972
- Decommissioning began in 2001
- Decommissioning completed in 2014



BGRR Description



Reactor was 25ft by 25ft cube of graphite.

Fueled by uranium fuel rods, cooled by circulating air

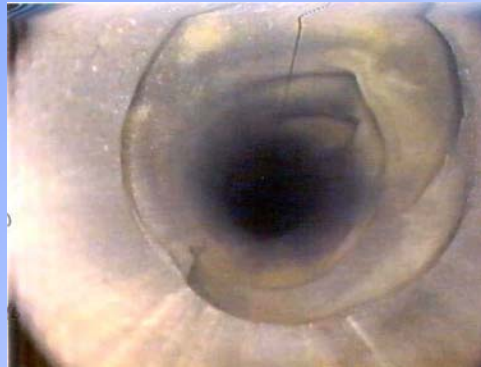
Surrounded on sides and top by 5 ft thick steel-encased concrete bioshield wall to protect researchers

History and Decommissioning Planning

- Historic operation logs indicated several fuel failures
- Performed video inspection of fuel channels
- Obtained radiological characterization data

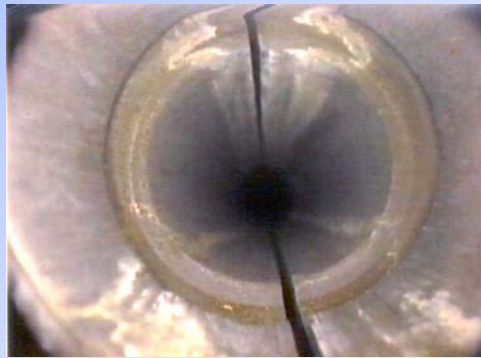


BGRR Fuel Channels



Distorted fuel channels

Gaps in graphite mating surfaces



Caused by excessive heat of failed nuclear fuel

Characterization Data

- Graphite
- Biological Shield
- Control Rods
- 701 Building

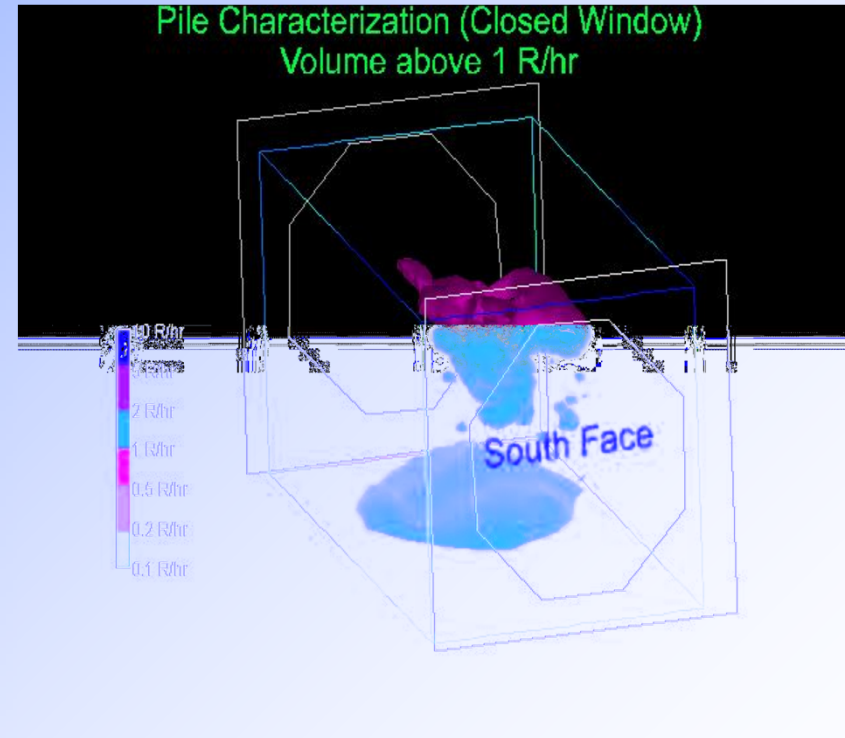
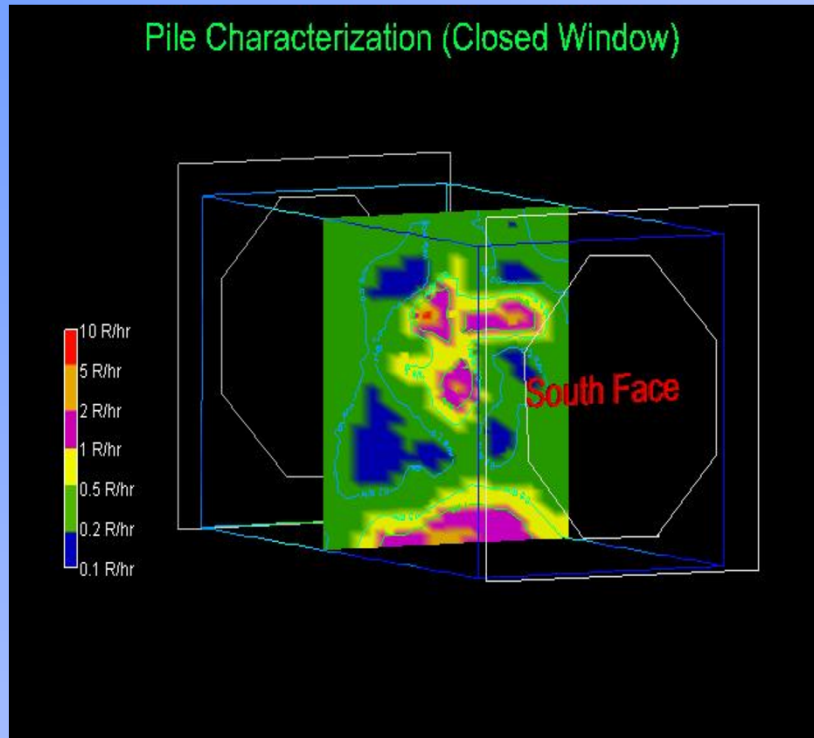
Characterization Data - Graphite Inventory

Nuclide	Curies	Percent
C-14	571	73%
Ni-63	97	12%
H-3	78	10%
Eu-152	21	3%
Total Activity	786 (all nuclides)	

Total Graphite Weight = 1,460,000 lbs

TRU = 0.25 Ci (0.36 nCi/gram)

Internal Pile Dose Rates (Year 2000)



Note: Maximum dose rate detected 80 R/hr

Removal of Pile Fan Sump



- 5'x7'x10' Deep Concrete Vault
- Excavated surrounding soil
- Removed in one piece



Removal of Canal and Water Treatment House



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Removal of Above-Ground Ducts



- ~200' of ducting
- Segmented into 12 pieces
- Largest piece ~300,000 lbs

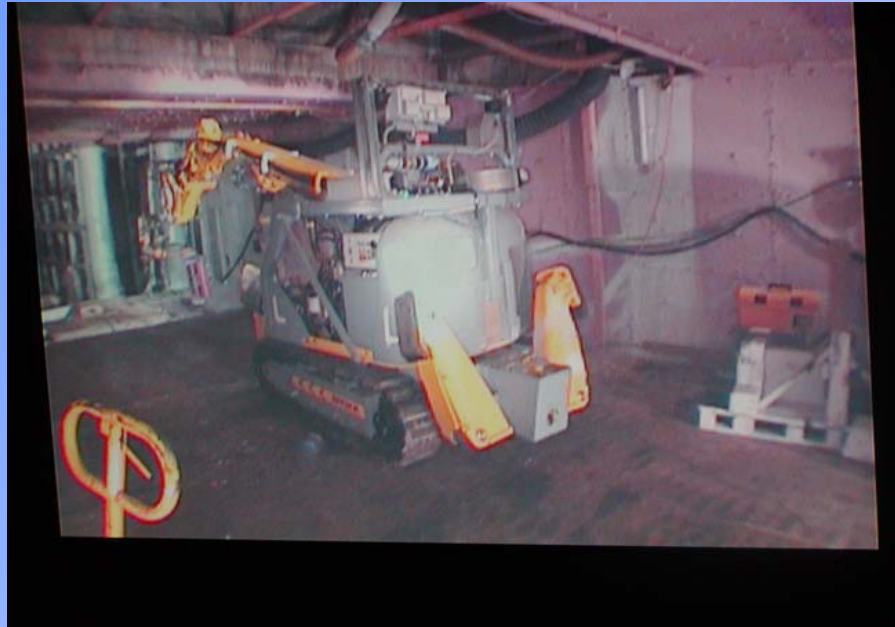


Concrete Demolition with Brokk Machine



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Below-Ground Duct Coolers, Filters and Primary Liner Removal

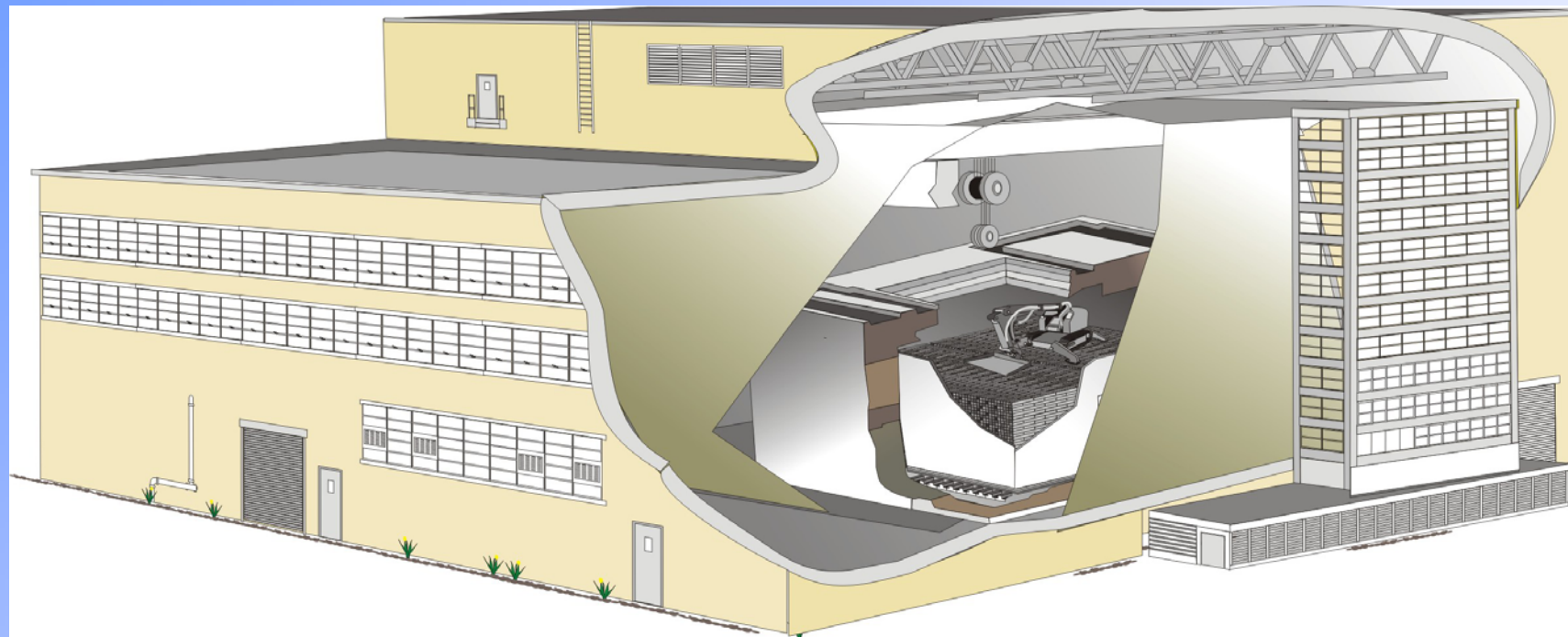


Filter Removal

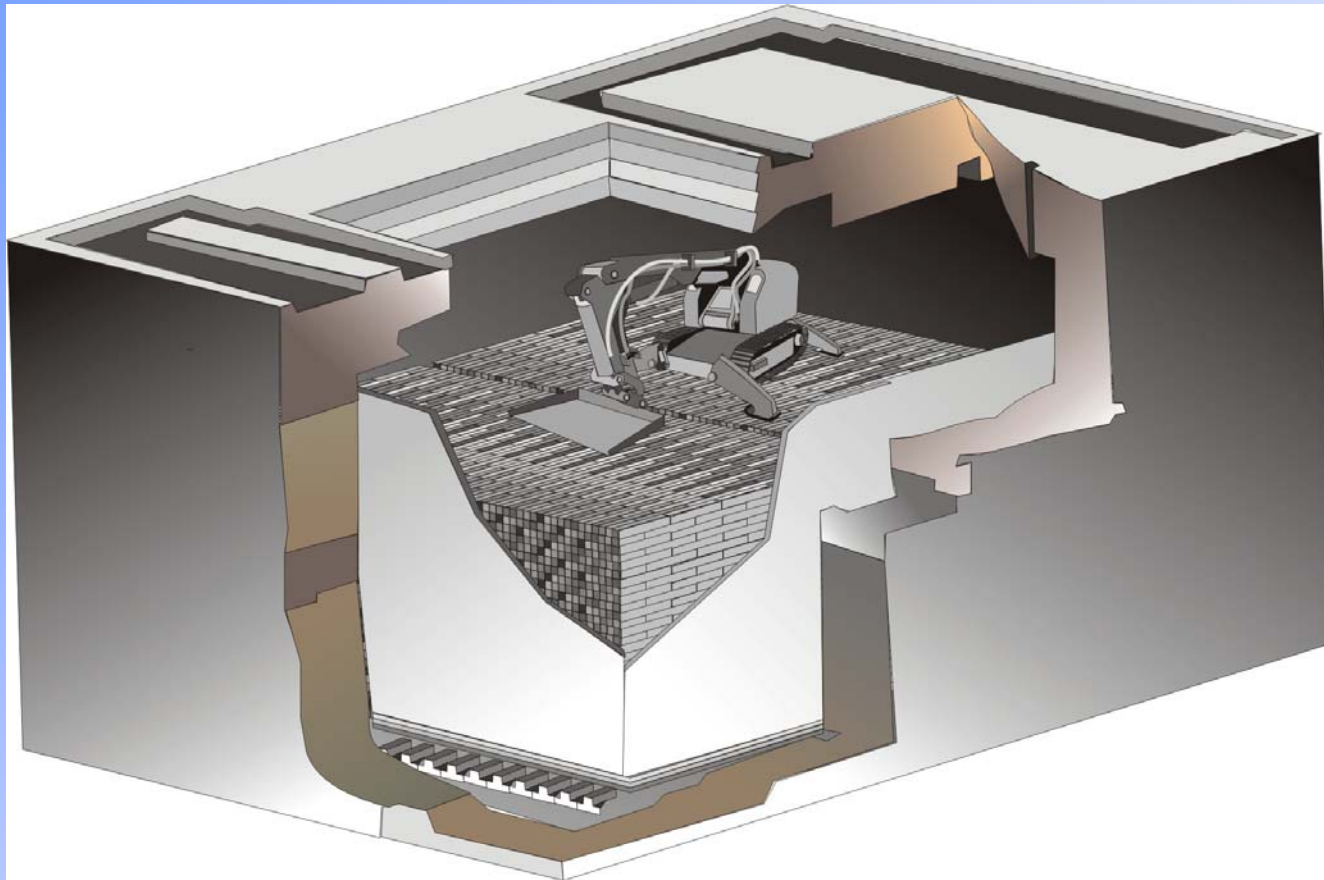


Liner Removal

BGRR Conceptual Graphite Removal



BGRR Conceptual Graphite Removal



Pile Top – Crane Installation



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Pile Removal Scope of Work

- Removal of boron shot (approx. 1000 pounds)
- Removal of the 16 control rods from the graphite pile and package for disposal
- Removal of the removable concrete plugs from the top of the biological shield to access the graphite pile
- Removal of the air membrane to access the pile
- Removal graphite pile (approx. 60,000 blocks) down to steel bedplates and package for disposal

Pile Waste Management

- Graphite waste packaged in “supersacks” (soft-sided containers) and placed into 144 cubic foot metal boxes.
- Total boxes -195
- Shipped by truck (91 shipments) to Nevada
- Some boxes required shielding (approx.39)

Bioshield Waste Management

- Concrete waste packaged into 650 “supersacks” (soft-sided containers) and placed into “gondola” rail cars (approx. 44 gondolas)
- Activated metal packaged into 33 “intermodal” steel boxes and placed onto flatbed rail cars (approx. 8)
- Shipped by rail to commercial burial facility in Utah

Health and Safety Management

- Removal design (utilized robotics) minimized personnel entries into pile cavity (As Low As reasonably Achievable - ALARA)
- Qualified personnel through training and mock-up testing
- Ventilation system designed for maximum dust control and to prevent environmental release

BGRR
Before Decommissioning



BGRR
After Decommissioning

