



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Radiation Protection

Decontamination and Decommissioning in Pennsylvania

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and Bryan R. Werner, MS**

**CAC Meeting
October 19, 2021**

Tom Wolf, Governor

Patrick McDonnell, Secretary

D&D in PA

Robert C. Maiers
1954-2021



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The authors have no conflicts of interest.

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CAC Meeting

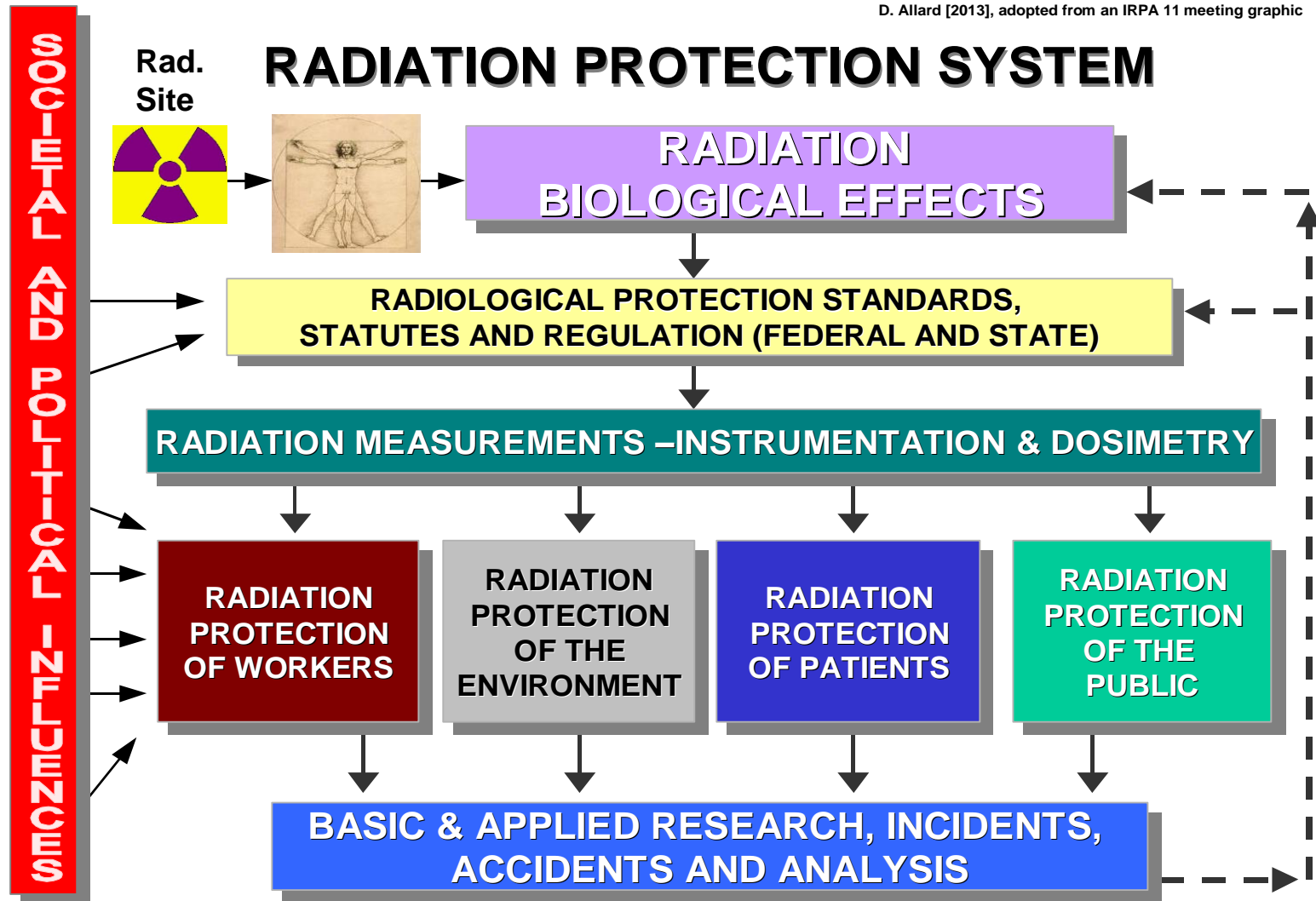
Objective of this Presentation

- **Provide an overview of BRP's role in facility D&D in the Commonwealth**
- **Describe the various categories of D&D projects**
- **Note the various state and federal standards and agencies involved**



RP System in the USA and PA

D. Allard [2013], adopted from an IRPA 11 meeting graphic



Agencies Involved in RP

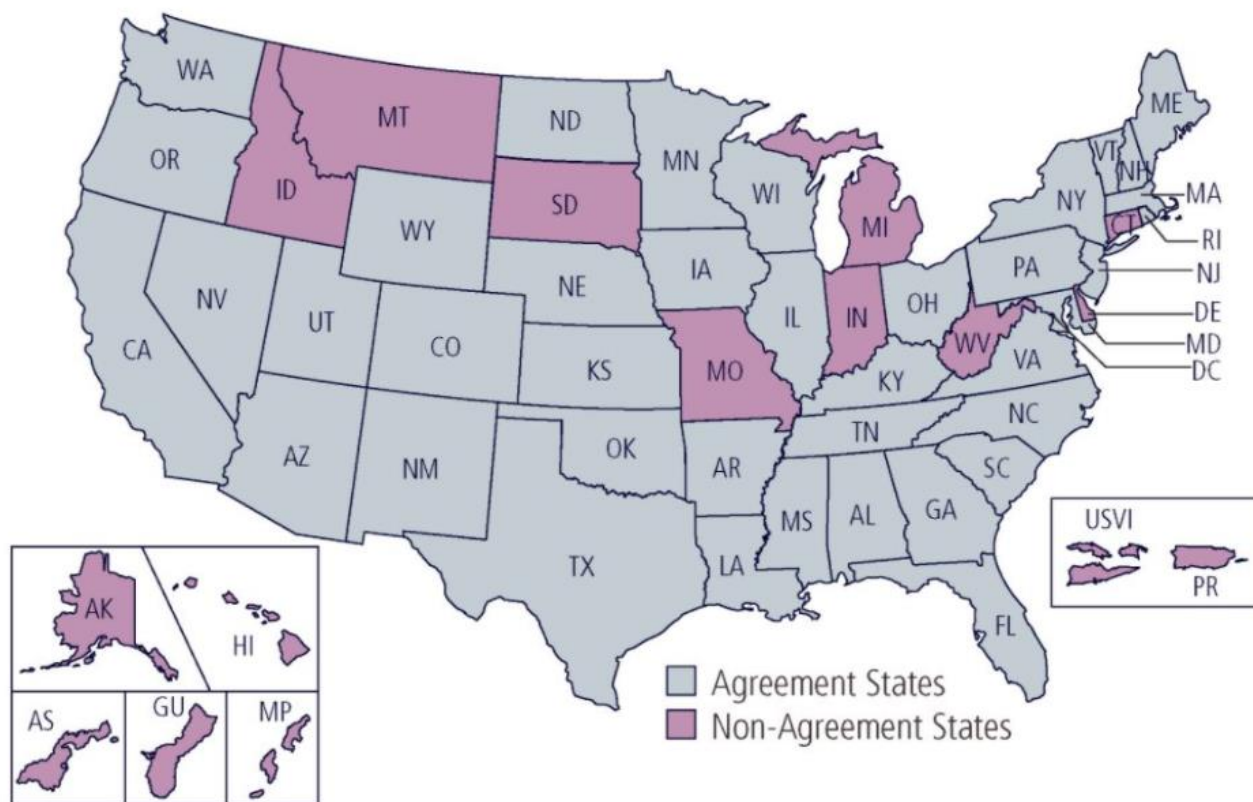
Radiation Control in Pennsylvania



**DEP: X rays,
Accelerators,
Radon, and
Radioactive
Materials &
Emerg. Prep.**

NRC Agreement State Program

Site Clean-up to NRC and/or EPA Standards



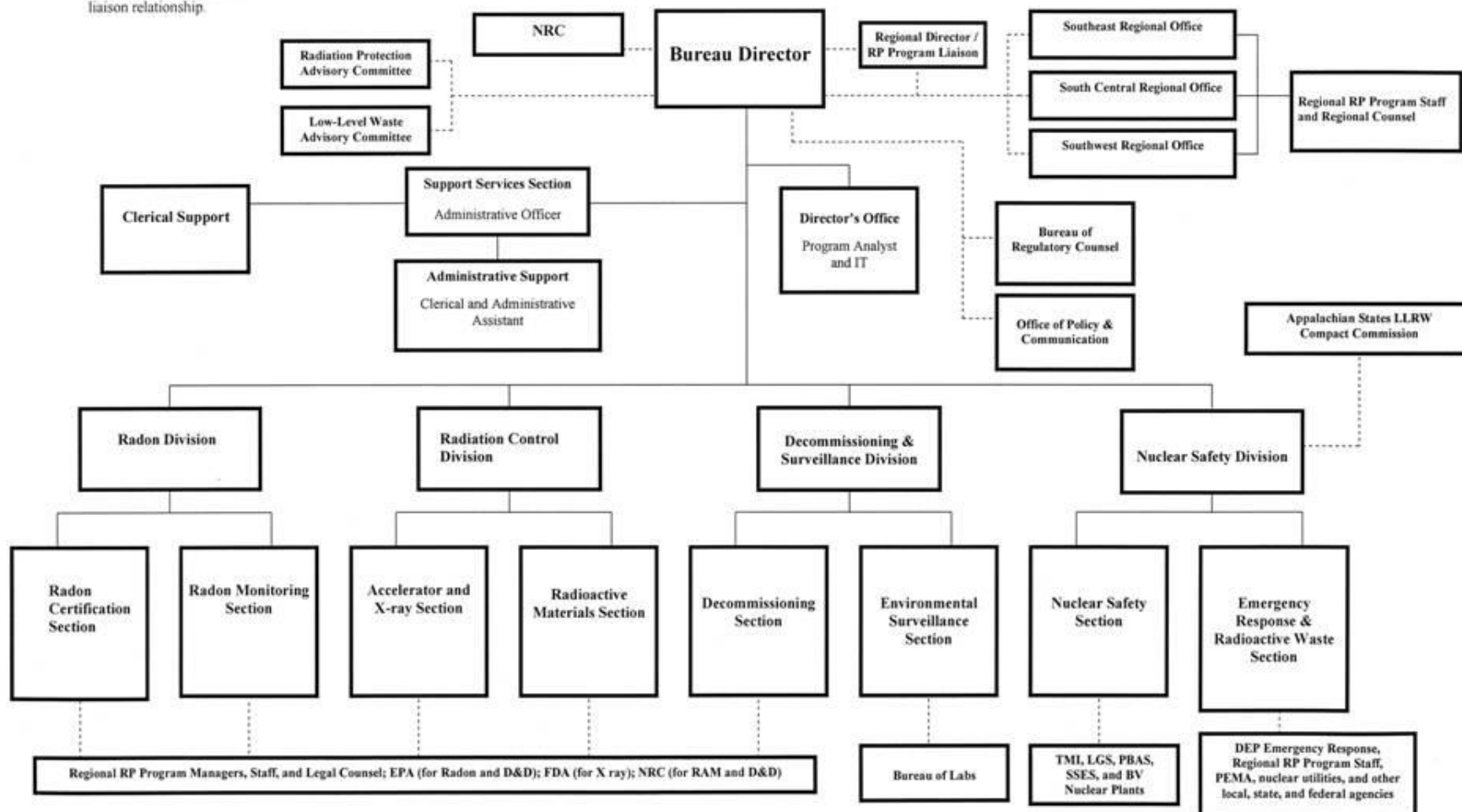
Clean-up Standards

- **PA Radiation Protection Act**
- **PA DEP BRP Regulations**
- **NRC Regulations and Guidance**
- **EPA 'Superfund' Standards**
- **DOE Orders and Standards**
- **HPS ANSI Standard**
- **MARSSIM**
- **NRC Soil Screening Criteria**
- **25 mrem/yr**
- **5 and 15 pCi/g for Ra-226**

DEP – Bureau of RP

BUREAU RADIATION PROTECTION

NOTE: A dotted line ----- represents a major matrix liaison relationship.



D&D in PA

PA D&D Background

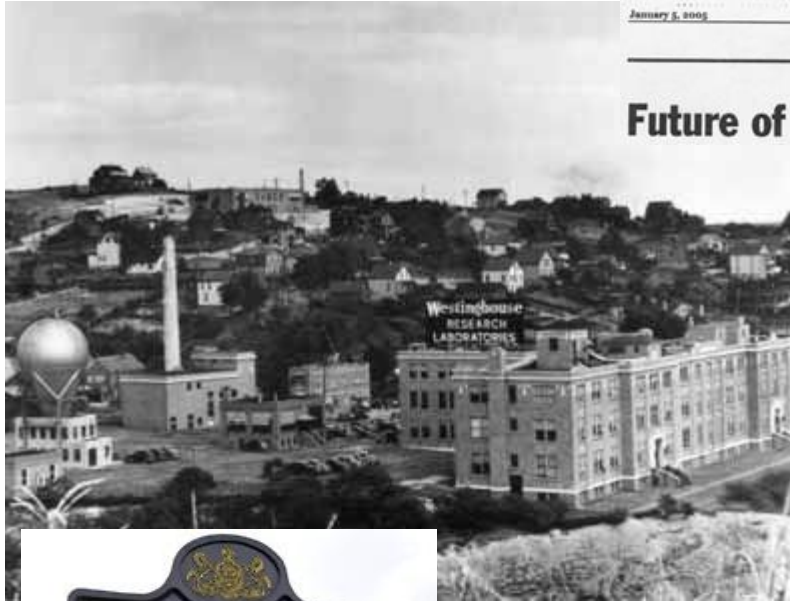
- Pennsylvania industry has historically used radioactive materials and generated waste in a wide variety of applications.
- Some of these early activities have resulted in sites with contaminated equipment, structures and buildings or sites with large volumes of contaminated soil, waste, slags, and often contaminated groundwater.

Major PA D&D Site Groupings

- **Navy Nuclear, Accelerators & Fuel Fabrication Sites**
- **NRC / PA Site Decommissioning Management Plan (SDMP) Sites; now “Complex Sites”**
- **Research and Power Reactors**
- **The Uranium Mill Tailings Radiation Control Act (UMTRCA) Sites**
- **Formerly Utilized Site Remedial Action Plan (FUSRAP) Sites**
- **Radium Decommissioning Sites**
- **Unlicensed STPs Requiring Decontamination**

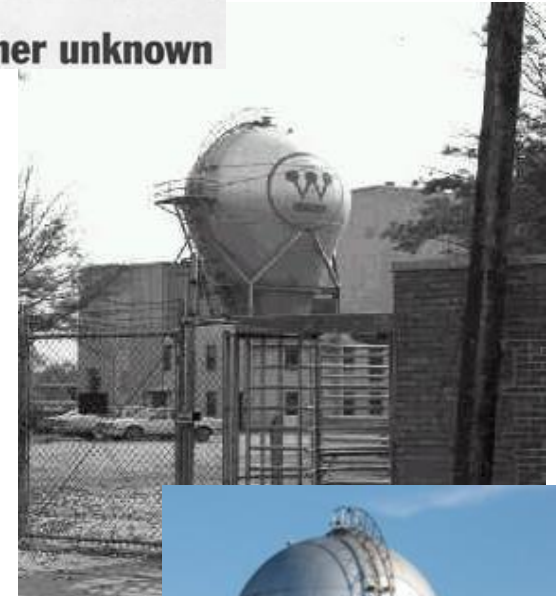
D&D in PA

Westinghouse Research Lab - Forest Hills



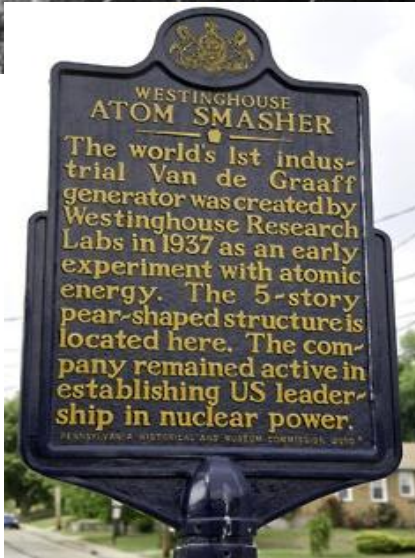
< c1937

c1985 >



c2005 >

< c2008

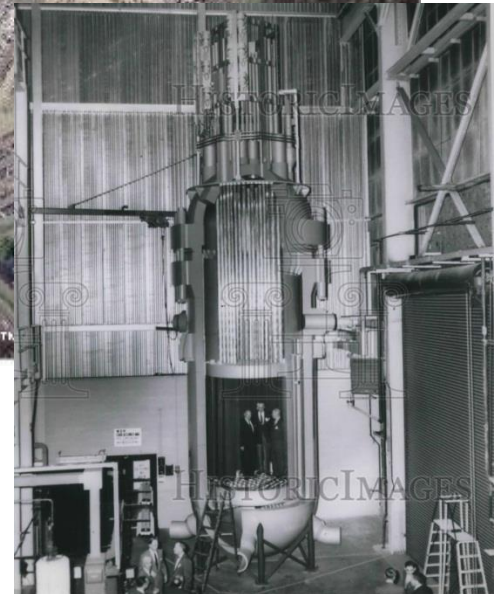


D&D in PA

Bettis Atomic Laboratory

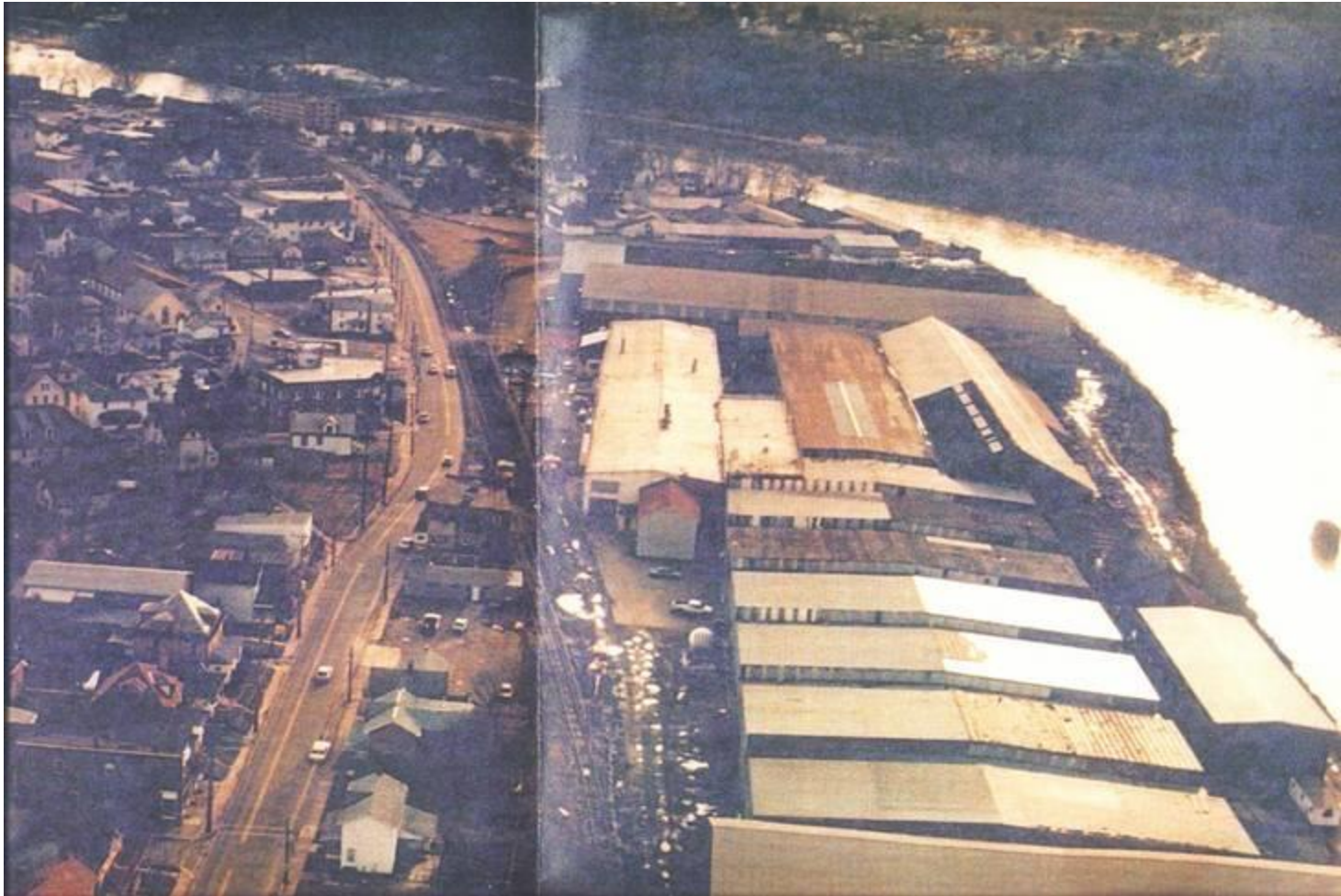


Reactor
development



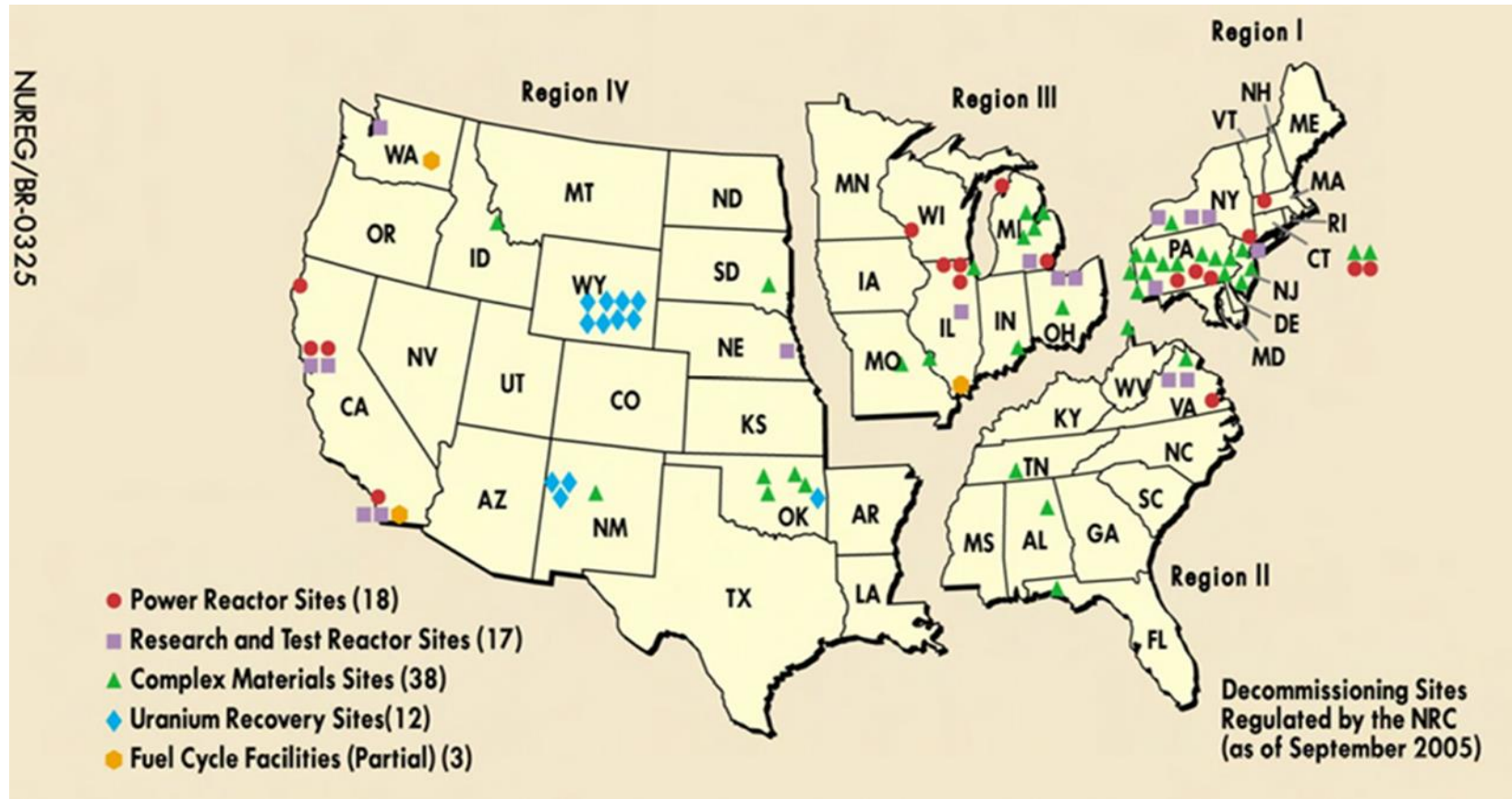
D&D in PA

Apollo, PA - NUMEC Fuel Fab. Facility, circa 1975



D&D in PA

“Complex” D&D / SDMP Sites in PA



D&D in PA

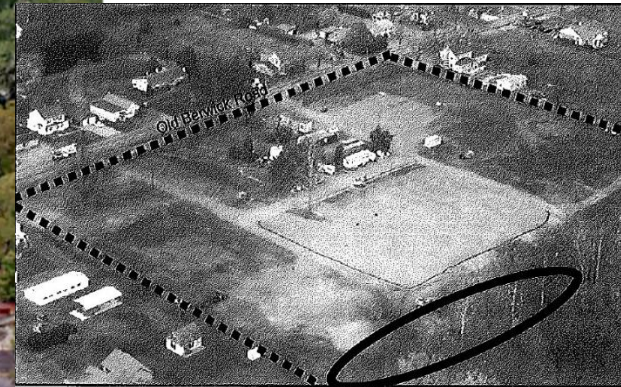
“Complex” D&D / SDMP Sites in PA

- Safety Light Corp*
- B&W SLDA
- B&W Parks Township*
- B&W Apollo*
- Molycorp York*
- Molycorp
Washington*
- Budd Company*
- Pesses/Metcoa *
- Whittaker Corp
- Quehanna*
- Waltz Mill
- Schott Glass*
- Cabot Boyertown*,
Revere*, Reading*

(* Removed from SDMP list)

D&D in PA

SLC / US Radium Site



D&D in PA

Parks Township & SLDA Sites



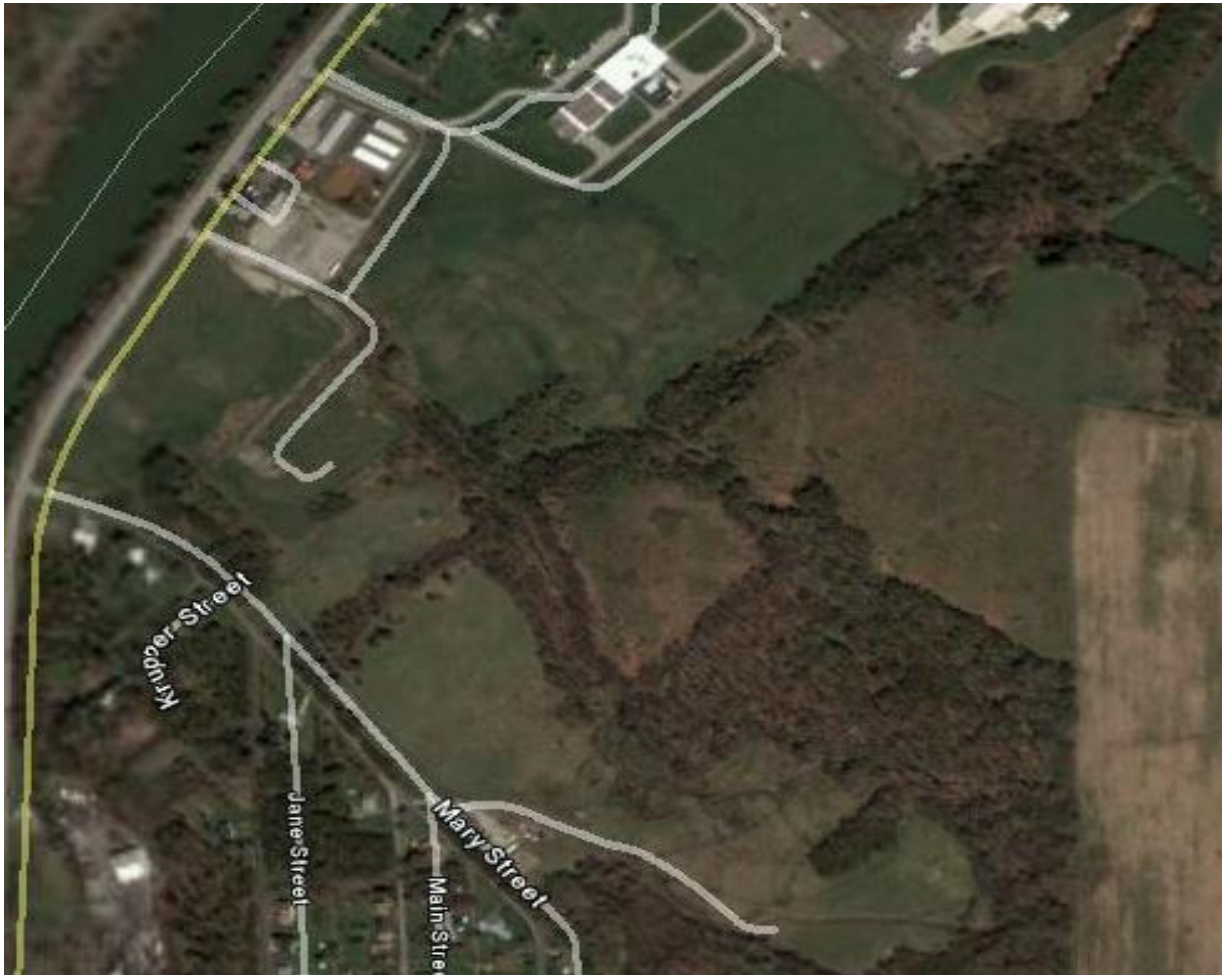
**NUMEC's President
Z. Shapiro**

*Unaccounted
for EU?*



D&D in PA

SLDA - Decommissioning Site



**10 trenches
with Pu, EU,
FPs, etc.**

- **FUSRAP**
- **Army Corp.**
- **NRC**
- **BWXT**
- **ARCO**
- **PA DEP**

D&D in PA

MolyCorp Decommissioning Sites – Rare Earth Metals Recovery



^ Washington (c1990)



^ Revere

^ York



^ Washington (c1999)

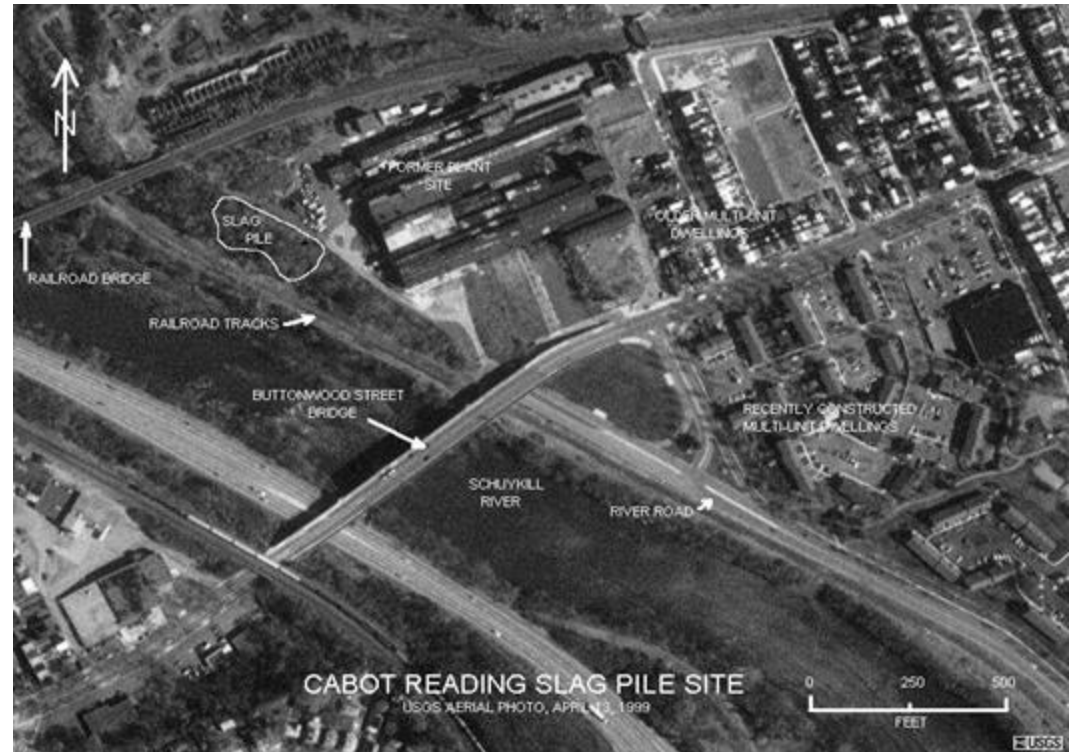
D&D in PA

Cabot Decommissioning Site



< Before

Reading, PA



< After (2008)

Decommissioning Sites

Whittaker Slag Pile



D&D in PA

TENORM Site

Remacor



**Had a few
large metal
fires!**

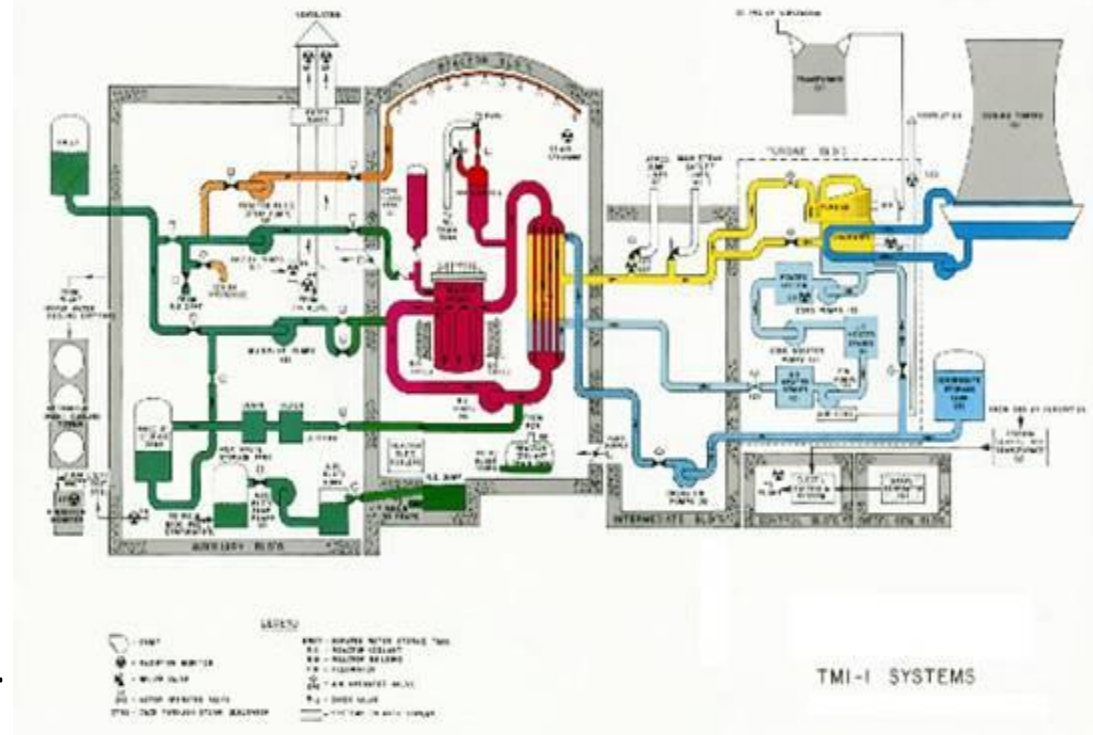


- Mg metal fines
- No RAM license
- TENORM

D&D in PA

Reactor Decommissioning

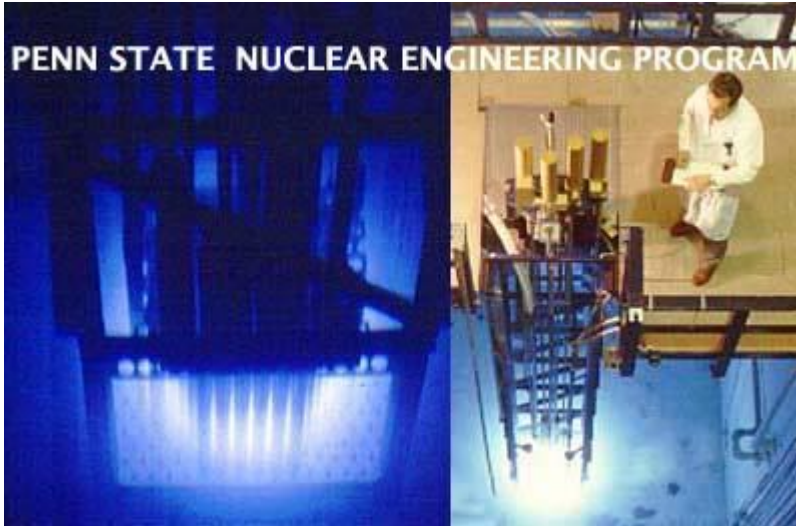
- In the Commonwealth:
 - Research & power reactors
 - Shippingport Rx
 - Saxton Rx
 - TMI Unit 2
 - Peach Bottom Unit 1



^ TMI Unit 1

Only Research Reactor in PA

Penn State RR, Lic.No. R2



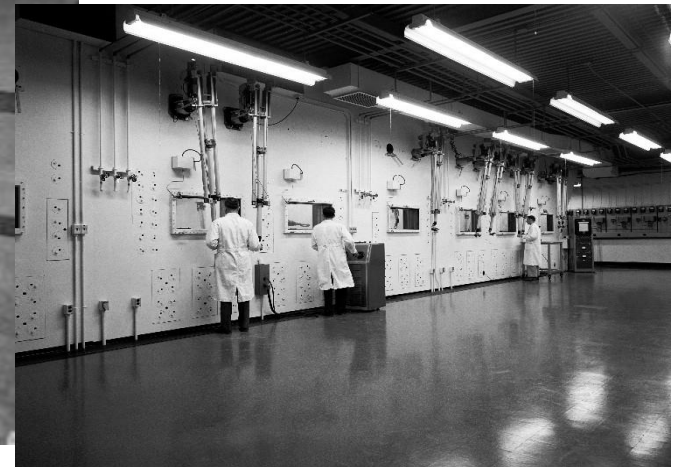
Waltz Mill TR-2 and Support Buildings



D&D in PA

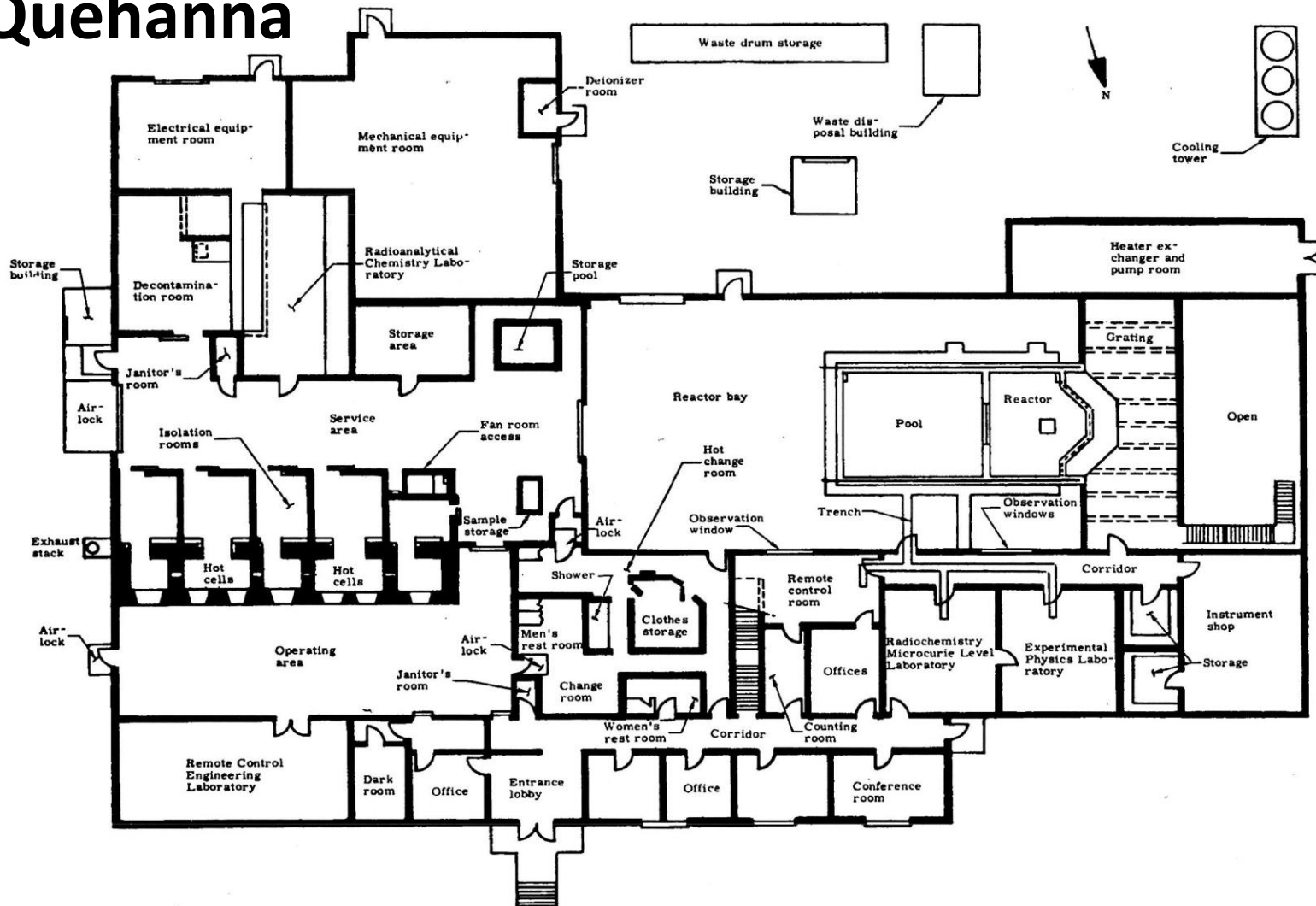
Quehanna Research Reactor & Hot Cells

c1960



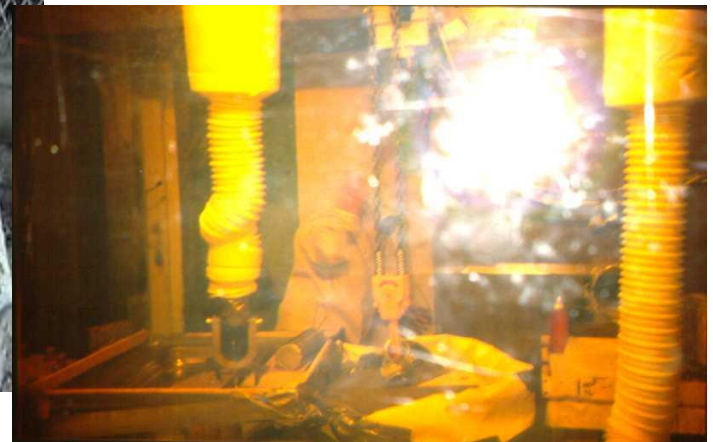
D&D in PA

Quehanna



D&D in PA

Quehanna Research Reactor



D&D in PA

Quehanna Hot Cell No. 4



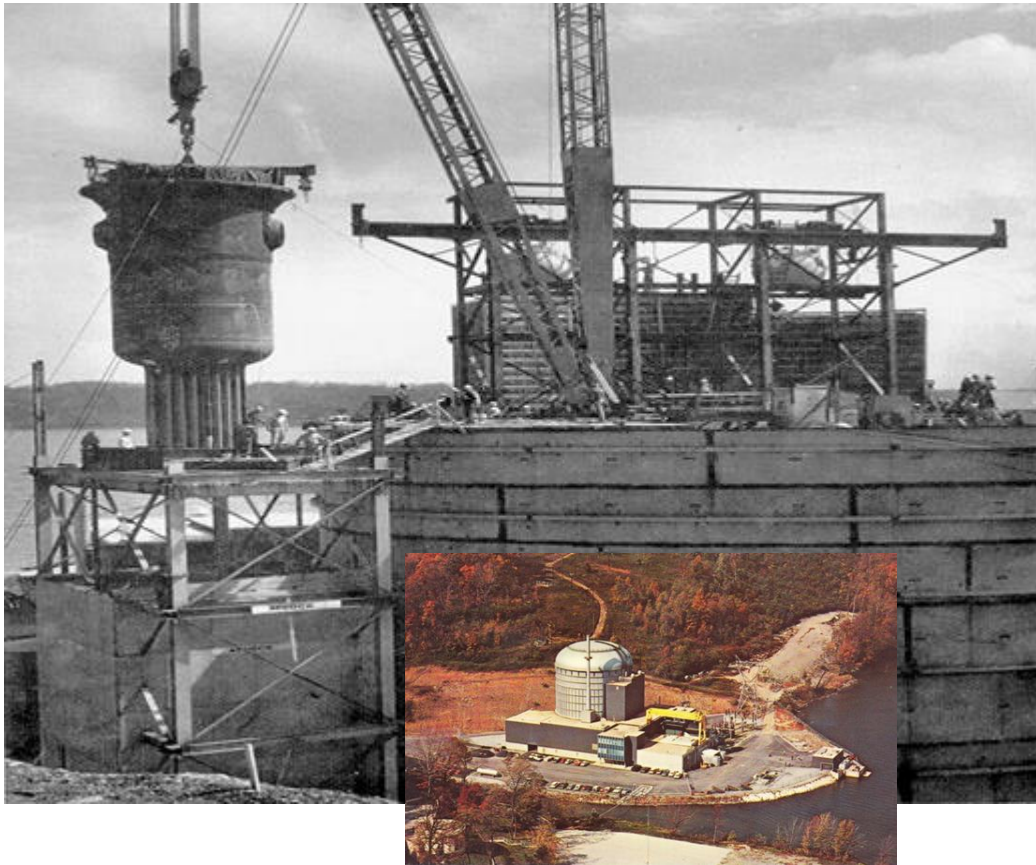
D&D in PA

Quehanna Hot Cell No. 4



D&D in PA

Gas-cooled Power Reactor (de-fueled / in “SAFSTOR”)



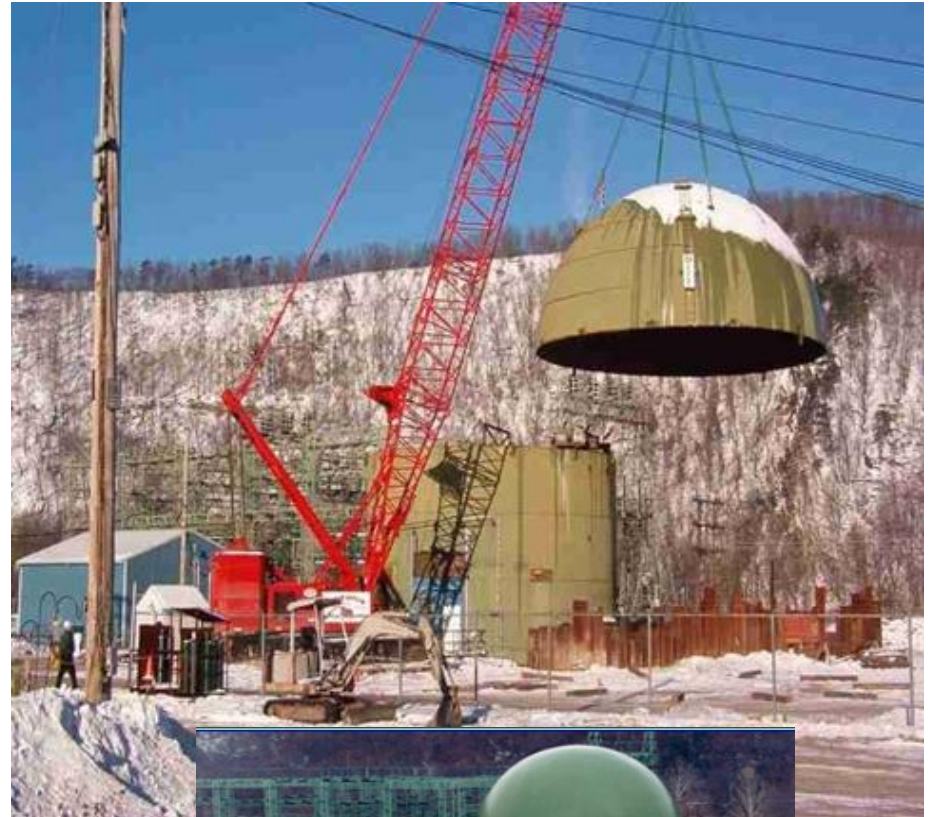
Peach Bottom Unit 1



< Reactor vessel loading
in March 1964

D&D in PA

Saxton Experimental NPP

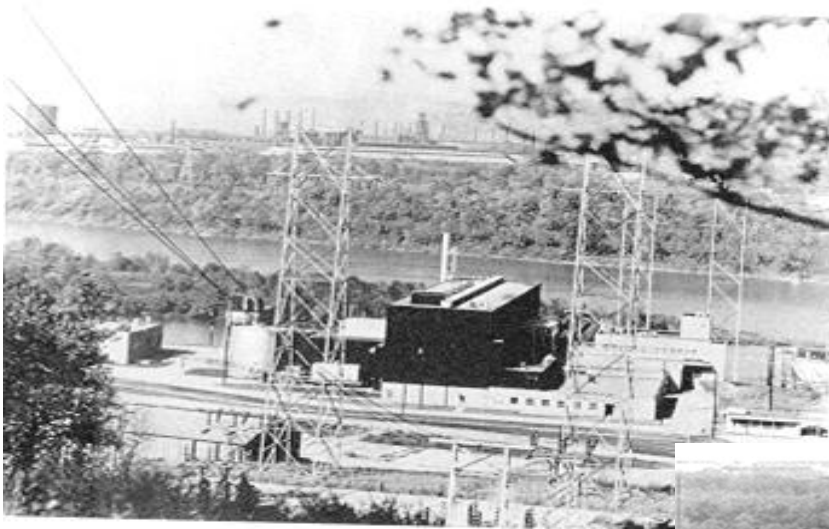


D&D in PA

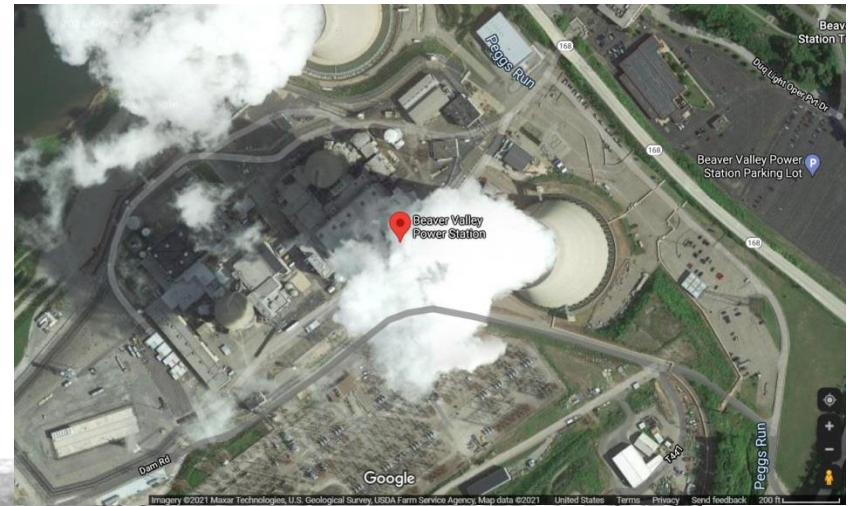
Saxton Facility (c1975)



Shippingport Atomic Power Station



Shippingport Atomic Power Station

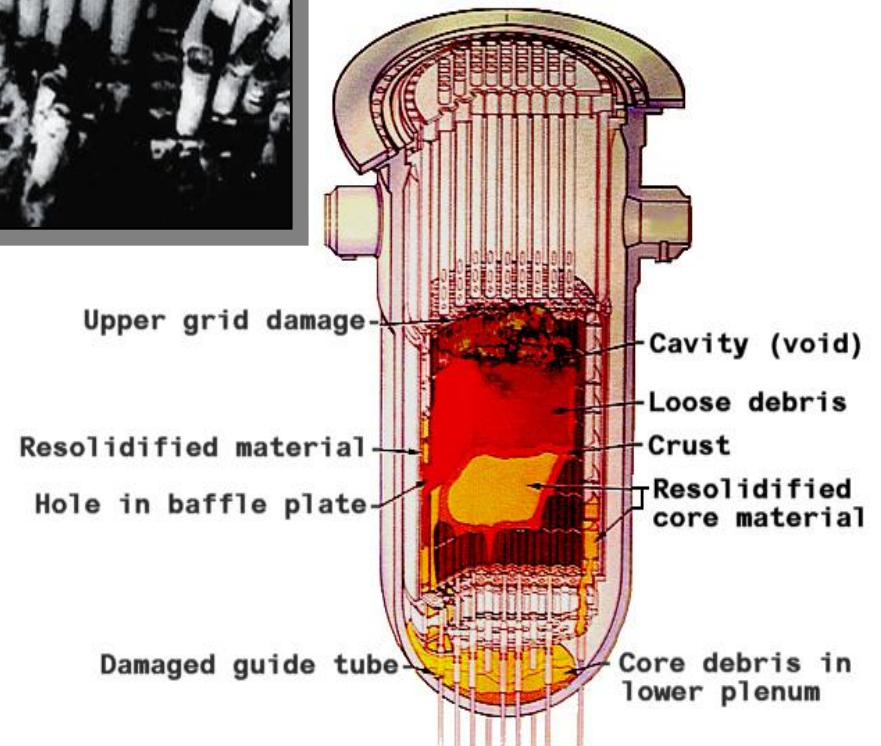
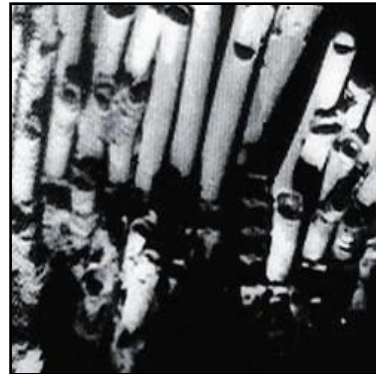
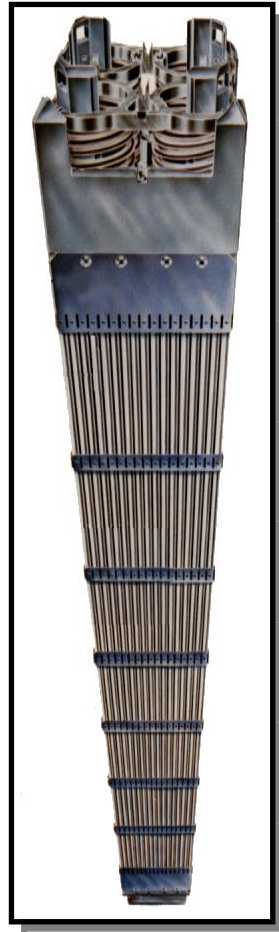
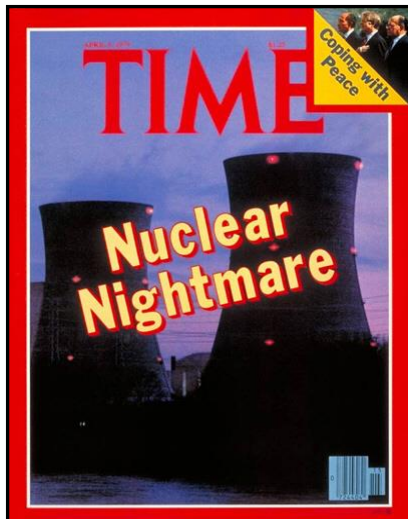
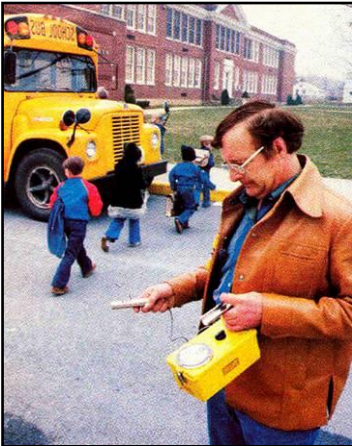


Shippingport Site Today

Three Mile Island Nuclear Power Station

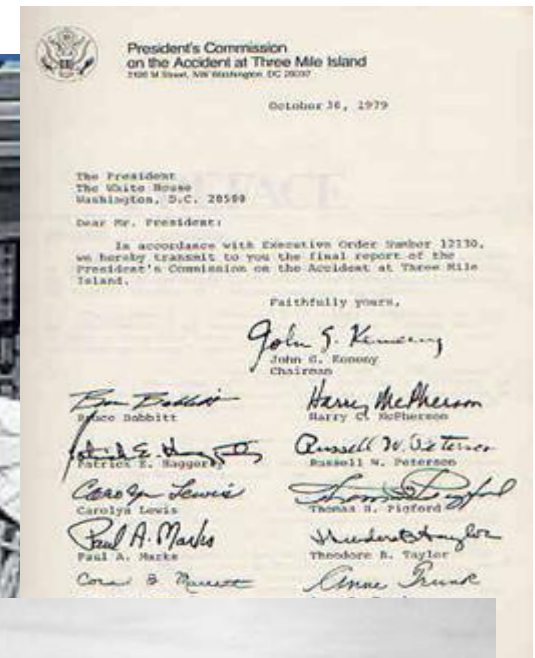


1979 TMI Unit-2 Accident



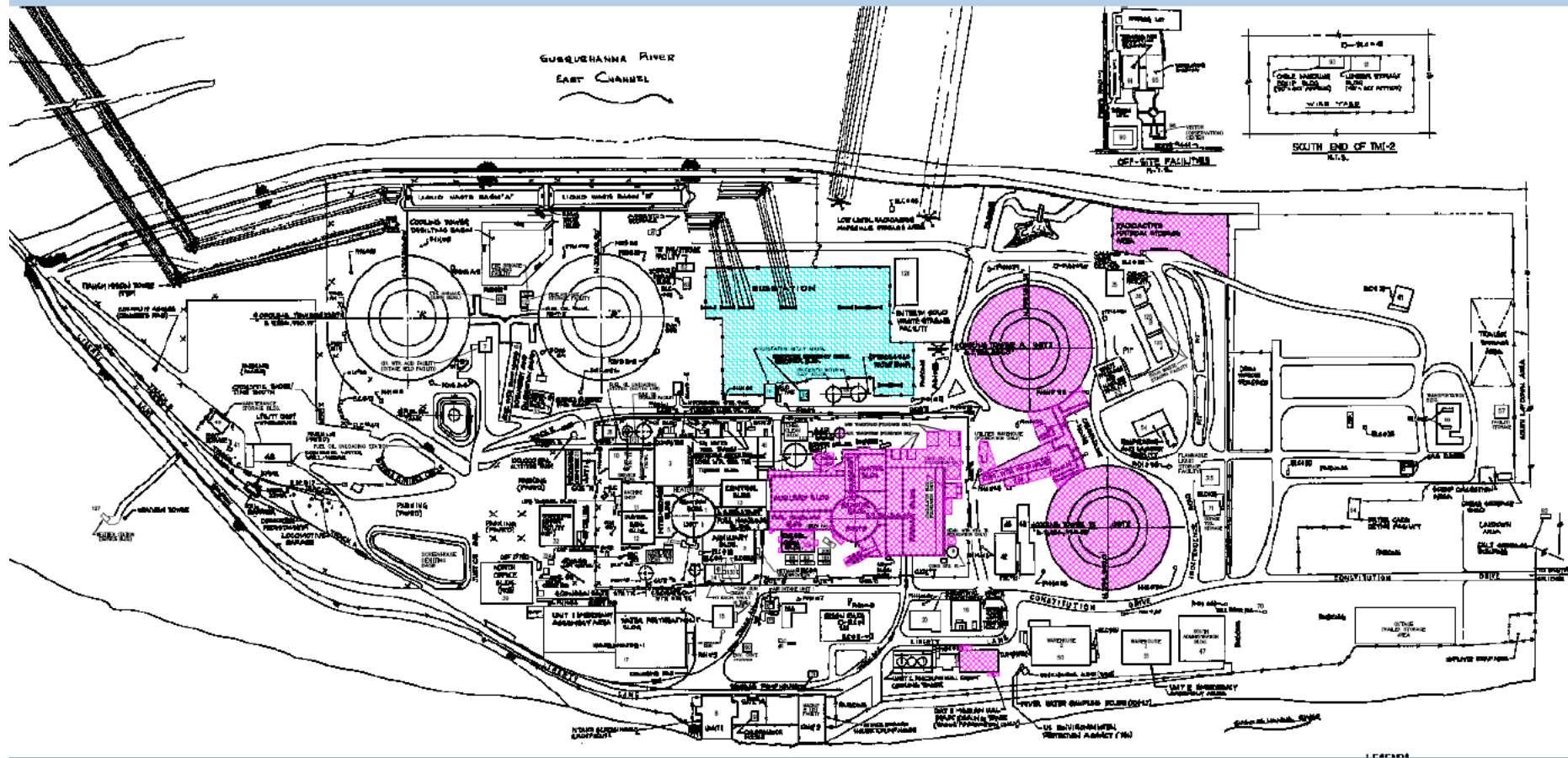
D&D in PA

1979 TMI Unit-2



D&D in PA

2021 TMI Unit-2



One island, two owners and licensees



UNIT 2 PROPERTY AND IMPROVEMENTS
UNIT 1 FACILITIES USED BY FIRST ENERGY
MAIN SUBSTATION EASEMENT AREA

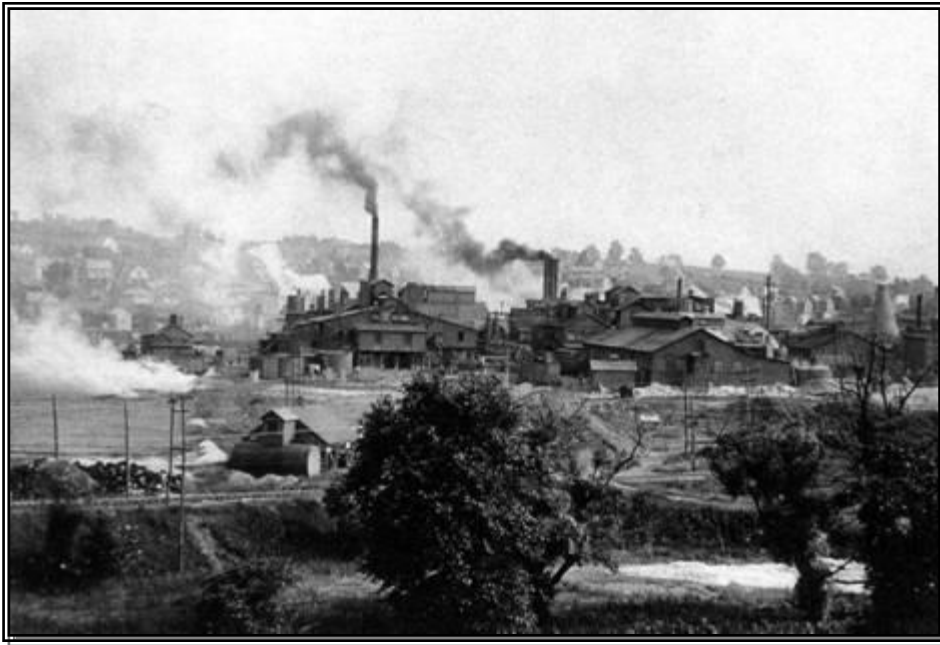
D&D in PA

Uranium Mill Tailings Radiation Control Act (UMTRCA), Old Radium-226 Processing, and Other Sites

- Canonsburg disposal cell
- Burrell disposal cell (Blairsville, PA)
- Flannery Building (Parkvale Bank)
- Sellersville
- Lansdowne
- Austin Avenue
- Others Radium sites

D&D in PA

Standard Chemical - Ra Production



**Canonsburg Facility
c1915**

Marie Curie's visit in May 1921



D&D in PA

Flannery Building Radium Production



D&D in PA

Flannery Bldg. Radium Production

PA issued a NARM Lic. D&D
License in (1999)

June 1960 >



Canonsburg Site



^ Before Remediation



^ After Remediation

Canonsburg Disposal Cell

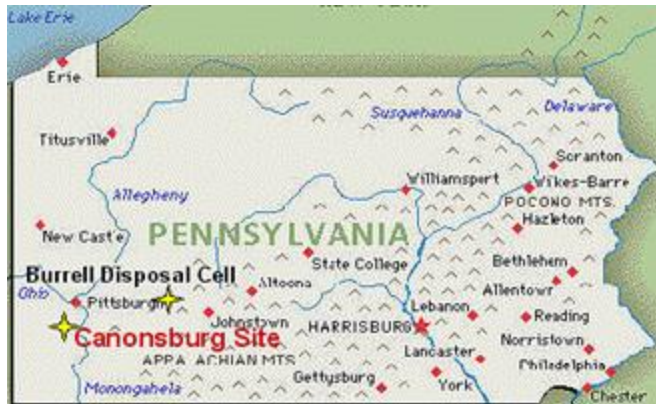
Today



D&D in PA

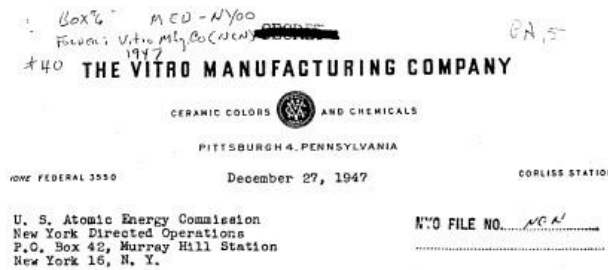
PA's Two UMTRCA Sites

Std. Chem. / Vitro



- Canonsburg

- Burrell



1982 film >



c1940 uranium was used
for the CP-1 Pile in Chicago



D&D in PA

Keystone Metal Reduction Company

Apr., 1921 *THE JOURNAL OF INDUSTRIAL AND ENGINEERING CHEMISTRY*

367

INDUSTRIAL NOTES

Three men were injured by an explosion which wrecked the building occupied by the **Keystone Metal Reduction Company**, **Cheswick, Pa.**, on **March 5, 1921**. The plant is one of the three **radium**-producing plants in the United States and turns out about one gram of **radium** a year, valued at \$120,000. The explosion was caused by the blowing up of an autoclave. The loss is estimated at \$10,000.

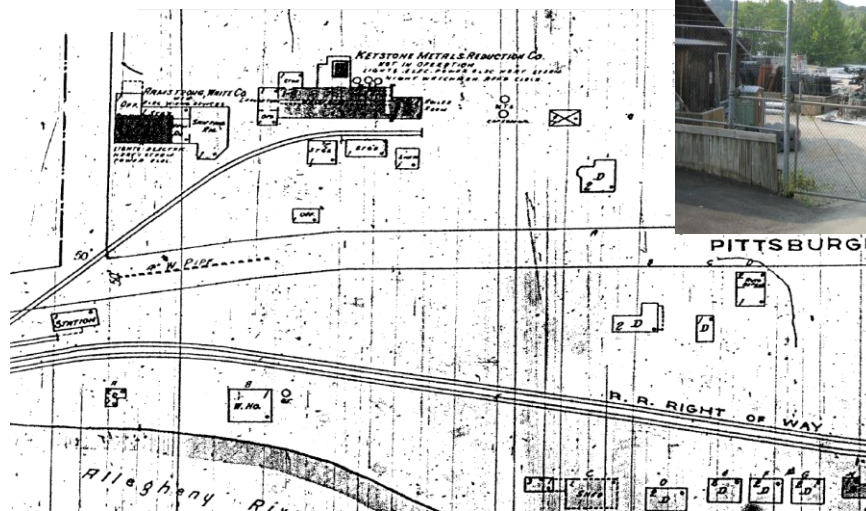
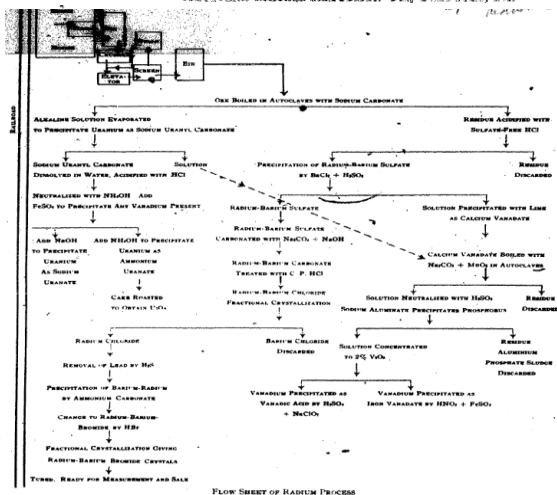
November, 1923

INDUSTRIAL AND ENGINEERING CHEMISTRY

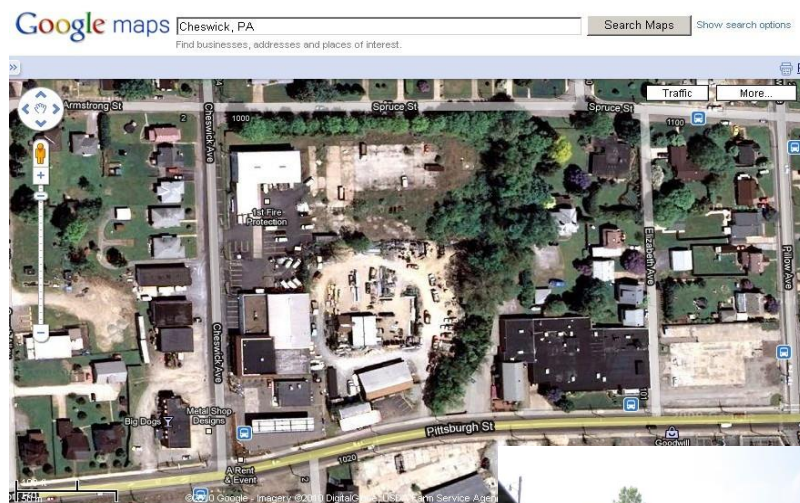
Extraction and Recovery of Radium, Vanadium, and Uranium from Carnotite'

By K. B. Thews and F. J. Heinle

KEYSTONE METALS REDUCTION CO., CHESWICK, PA.



c1920 Radium Production



Formerly Utilized Site Remedial Action Plan (FUSRAP) Sites

- This DOE program was shifted to Army Corps of Engineers by Congress in 1999 a 'Water' Bill
- Aliquippa Forge Site
 - In 1940's used for a uranium-rolling operation
 - DOE started cleanup in 1988, completed 1994
 - Waste shipped to Hanford, Washington
- C.H. Schnoor
 - Provided uranium metal fabrication services for Manhattan Project in the 1940's
 - DOE began and completed cleanup in 1994
- Superbolt facility (former Superior Steel)?

Radium Sites Requiring Decontamination

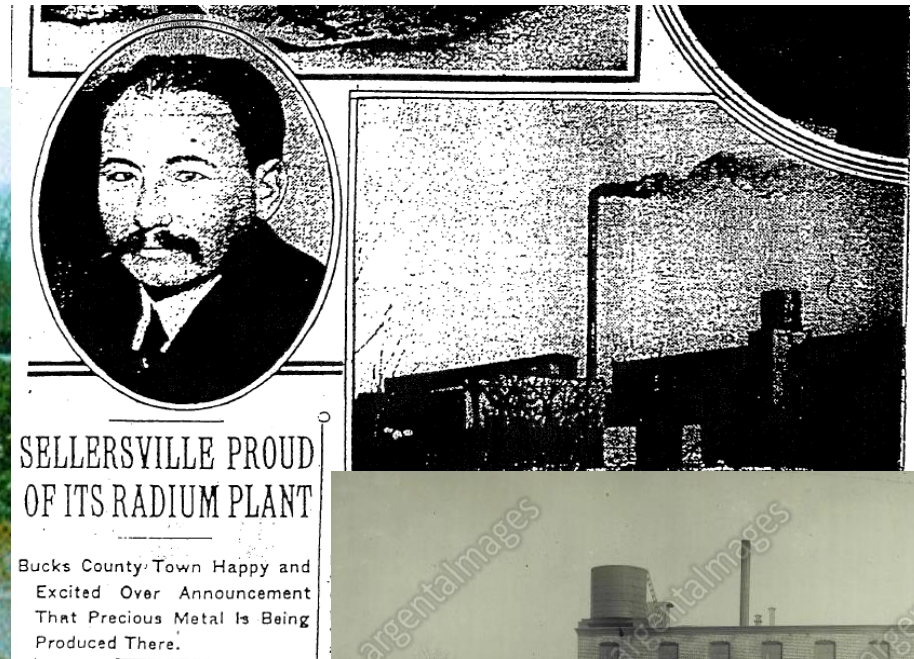
- Radium Company of America
- Lansdowne and Austin Ave.
- Keystone Instruments
- Karnish facilities
- Stube Inc. storage facilities

D&D in PA

Radium Corp. of America – Radium Production 1913-1916

Sellersville ~\$6M
HSCA LF Clean-up

Dr. Siegfried Kohn, Austrian Chemist



Radium Corp. of America facility c1914 >



D&D in PA

Lansdowne and Austin Ave. (NPL) Sites c1990

PHS Radium Decon Film c1965



< Univ. Professor – Dr. Dicran Kabakjian



W. L. Cummings
Facility / Site

Radium
Production c1920



Pennsylvania's Radium Sites

Keystone Instruments

Radium Aircraft Gauges



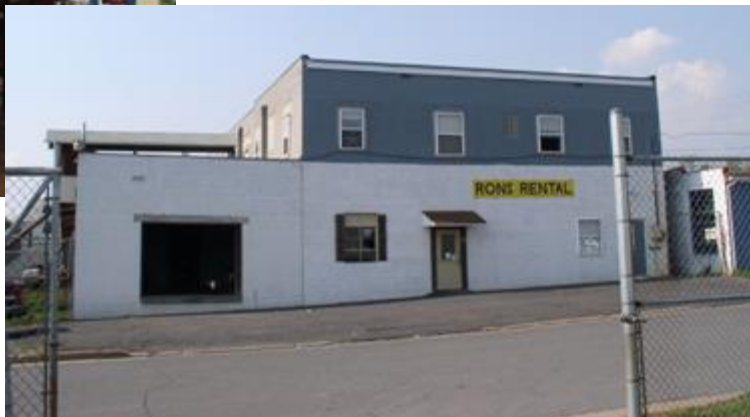
Air Parts of L.H. Radium Aircraft Gauges



Pennsylvania's Radium Sites

Karnish Sites (HSCA)

Former Radium Aircraft Gauge
Operations



D&D in PA

Pennsylvania's Radium Sites

Strube, Inc.

Radium Aircraft Gauges

8 Sites!!



D&D in PA

Orphan Medical Ra-226 Sources

<http://www.wpxi.com/news/news/local/scrap-contaminated-radioactive-material-shipped-be/nqX2t/>

accessed 2-26-2016

Posted: 1:19 p.m. Thursday, Feb. 25, 2016

Scrap contaminated with radioactive material shipped from Beaver Falls facility



Sewage Treatment Plants Requiring Decontamination

- Kiski Valley Water Pollution Control Authority (KVWPCA)
- Royersford Wastewater Treatment Facility (RWTF)
- Oil & Gas Wastewater Treatment Facility

STP Decommissioning Sites

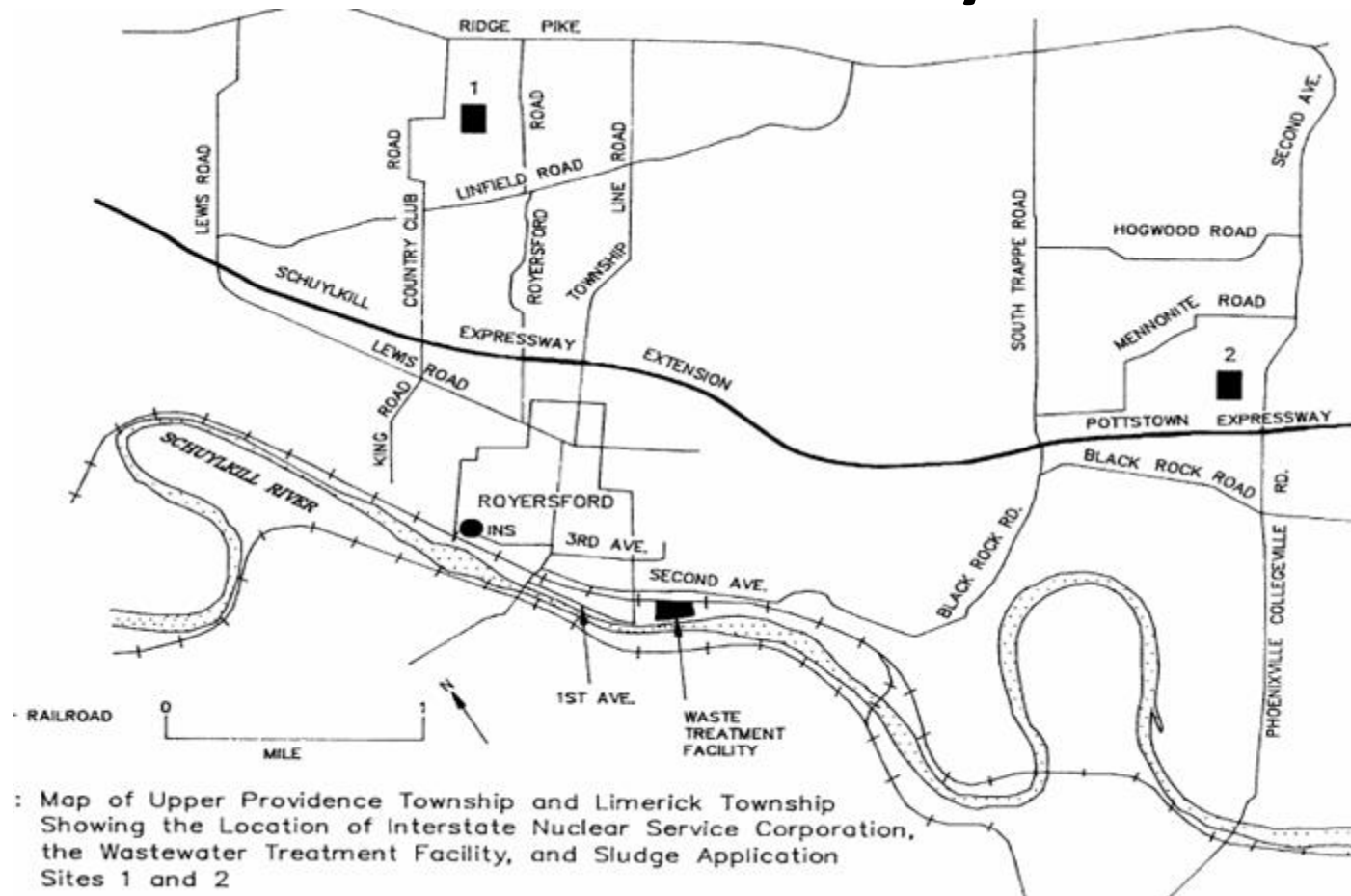
Royersford STP



D&D in PA

Impacted Sludge Application Sites

Royersford STP



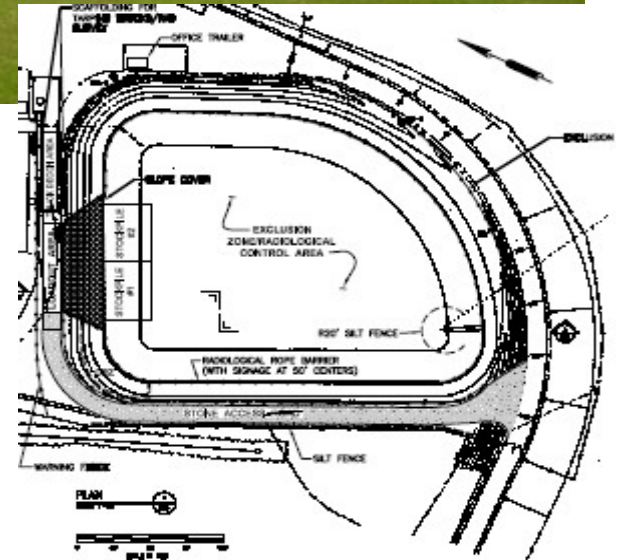
D&D in PA

STP - Kiski Ash Lagoon – Enriched U



Ash with up to 900 pCi/g EU

**Shipped in 2006
to a RCRA C in TX**



D&D in PA

Oil & Gas Wastewater Treatment

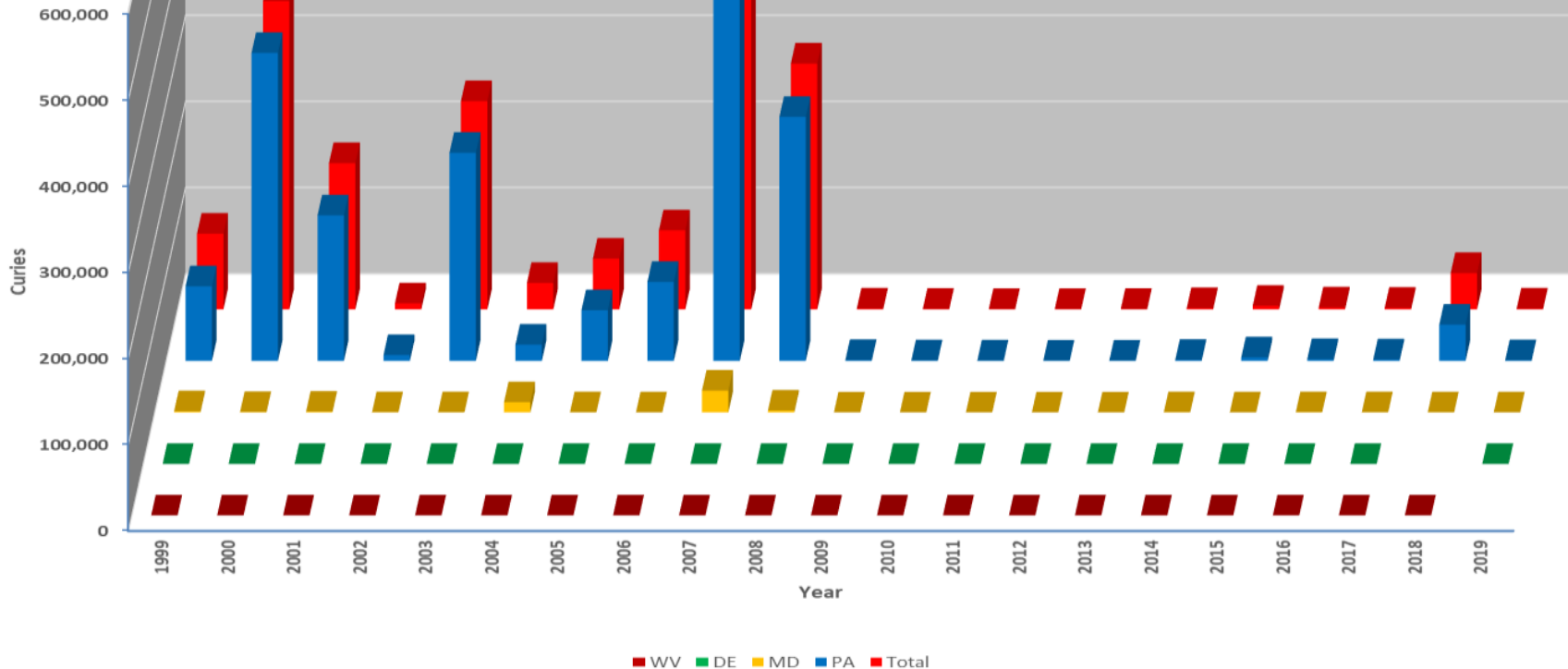


D&D in PA



Appalachian Compact States Disposed LLRW Activity 1999 - 2019

Radioactive Waste Disposal (curies)

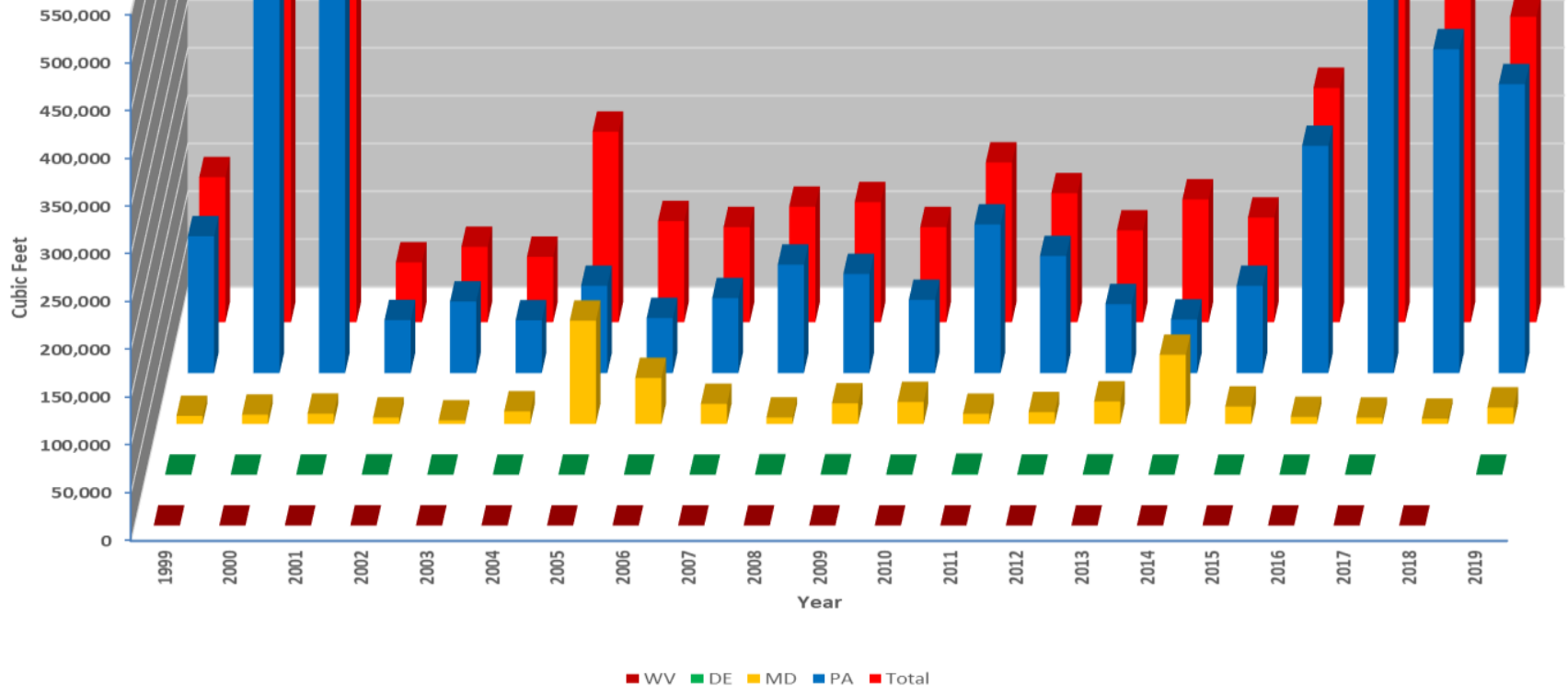


D&D in PA



Appalachian Compact States Disposed LLRW Volume 1999 - 2019

Radioactive Waste Disposal (ft³)



Conclusions

- PA has a wealth of experience in a wide variety of decommissioning projects
- PA has decommissioning experience as a licensee as well as being a regulator
- Pennsylvania has worked closely with NRC, EPA, other federal agencies, and licensees on D&D projects

Comments and Concerns

- Some regulatory inconsistencies noted in the past between NRC Headquarters and Regions
- NRC's License Termination Rule offers flexibility to licensees, but is more challenging for state regulators
- Large discrepancies between characterization and actual conditions may result in a very challenging decommissioning project
- Use of limited exposure scenarios to achieve 'unrestricted release' (e.g., industrial, trespasser)
- A 'resident farm' scenario is preferred for an 'unrestricted release'



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Radiation Protection

Department of Environmental Protection Bureau of Radiation Protection (BRP)

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Acknowledgements:

All the DEP & BRP staff that work on these sites!

Thank you.

Questions?