



Accountability  
Performance  
Accuracy

The Nuclear Materials Management Safeguards System

# NMMSS

# 2016

Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA

## Nuclear Material Accounting at the Gaseous Diffusion Plant

Karen McCulloch  
*BWXT*



**NMMSS**

**2016**

# Topical Areas

Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA



NNSA



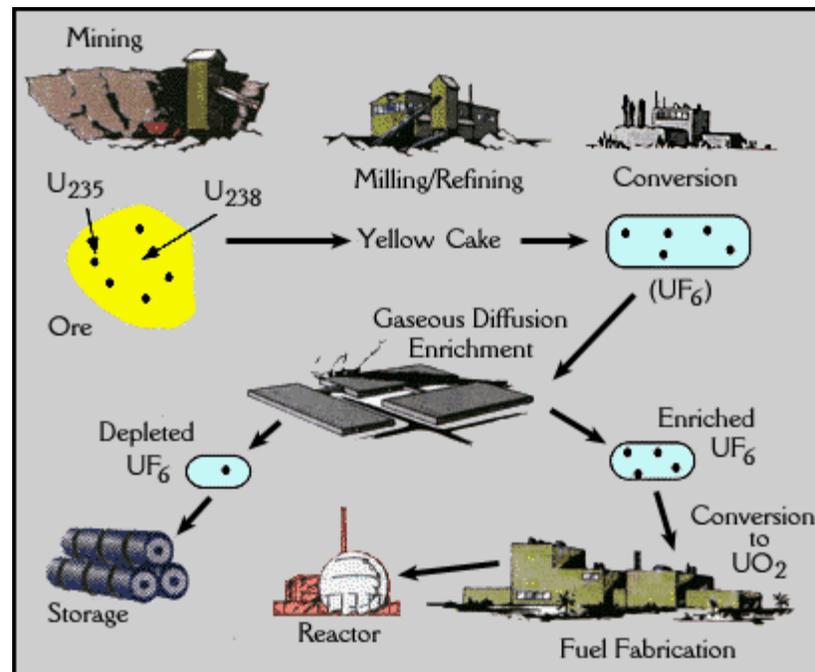
- Gaseous Diffusion Plants in the United States
- History
- Similarities
- Differences
- GDP Accounting
- Asset or Waste
- Cold and Dark



# Gaseous Diffusion Plants in the United States

- Gaseous Diffusion Plants (GDP) in the United States

- K-25 (ETTP)
- Paducah GDP
- Portsmouth GDP



- All GDPs are currently in various stages of D&D.

NMMSS

2016

# Endangered List?

Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA



NASA



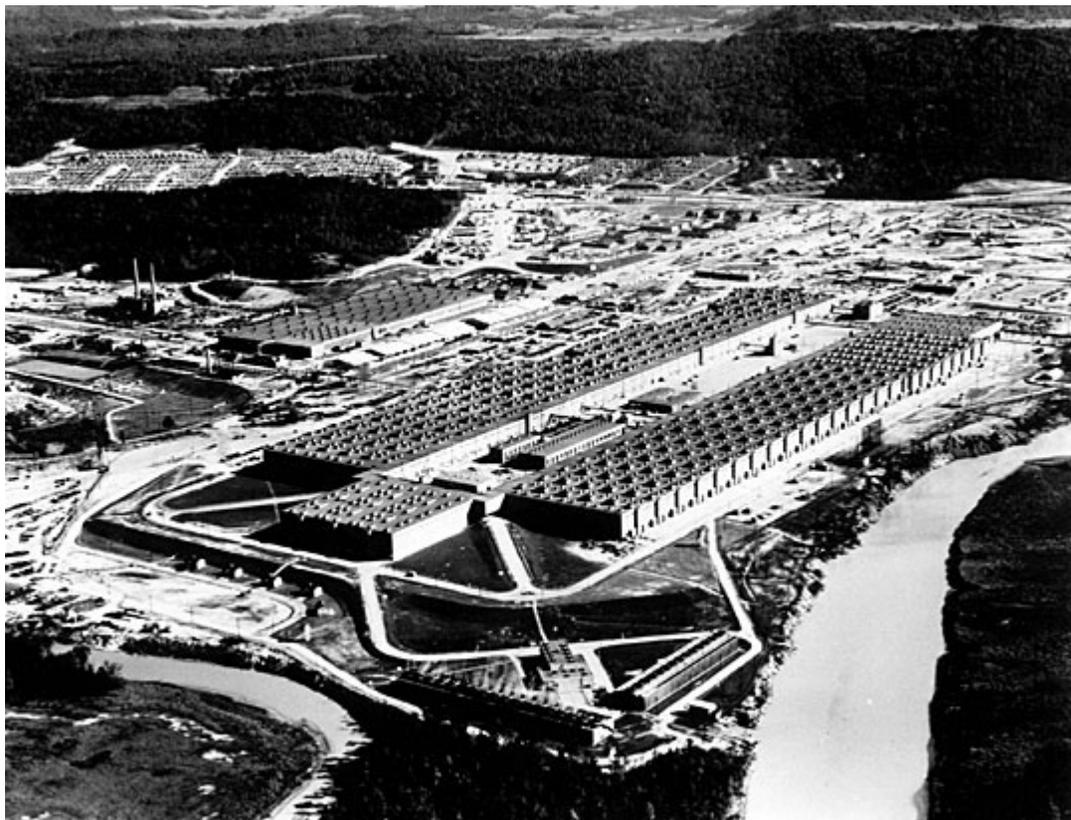
NMMSS

2016

# K-25 Gaseous Diffusion Plant

Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA



# K-25 GDP (a.k.a. ETTP)



- The K-25 Gaseous Diffusion Plant (GDP) began construction in June 1943 to supply enriched uranium for nuclear weapons production.
- The code name "K-25" was a combination of the "K" from the Kellogg Corporation, the initial contractors of the plant, and "25," a World War II-era code designation for uranium-235.
- K-25 used primarily for the production of highly-enriched uranium for nuclear weapons until 1964.
- From 1959 to 1969, focus shifted to the production of commercial-grade, low-enriched uranium.
- In 1985, the enrichment process was placed on standby.
- In 1987, the process was stopped permanently.
- Demolition began December 2008. K-27 to be completed ECY 2016.



**NMMSS**

**2016**

**Annual Users Training Meeting**

May 9-12, 2016 | New Orleans, LA



NNSA



# Paducah Gaseous Diffusion Plant



- The Paducah Gaseous Diffusion Plant (PGDP) began operations in 1952 to produce low assay ( $\leq 2\%$ ) enriched uranium for use as commercial nuclear reactor fuel.
- In 1993 uranium enrichment operations were turned over to the United States Enrichment Corporation (USEC) as a result of the Energy Policy Act of 1992.
- From 1993 to 2013, the United States Enrichment Corporation (USEC) leased plant facilities to conduct gaseous diffusion operations (e.g.,  $\leq \sim 5\%$ ).
- In October 2014, USEC returned the facilities to the DOE Environmental Management (EM) program for cleanup and disposition.

**NMMSS**

**2016**

**Annual Users Training Meeting**

May 9-12, 2016 | New Orleans, LA



NNSA



# Portsmouth Gaseous Diffusion Plant



- The Portsmouth GDP was constructed in 1952 with a mission to increase the national production of enriched uranium and maintain the nation's superiority in the development and use of nuclear energy.
- From 1993 to 2011, the United States Enrichment Corporation (USEC) leased plant facilities to conduct gaseous diffusion operations.
- In 2001, enrichment activities were transferred to the Paducah Gaseous Diffusion Plant in Paducah, Kentucky and Portsmouth began to operate in “Cold-Standby” condition. In “Cold-Standby”, the Portsmouth plant was kept in a ready condition in which operations could be resumed in a period of 18-24 months if the need arose.
- In 2006, the plant transitioned from “Cold Standby” to “Cold Shutdown” to prepare for the eventual decontamination and decommissioning cleanup project.
- In 2011, USEC transitioned contractual obligation for the GDP to DOE’s contractor for decontamination and decommissioning (D&D).
- The plant is owned by the Department of Energy (DOE), which oversees environmental cleanup activities at the site, including environmental remediation, waste management, depleted uranium conversion and D&D.



- Legacy systems were replaced with Local Area Nuclear Material Accountability Software (LANMAS) at all GDPs.
- Transition from private to government sector
- All NMC&A work performed by primary contractor:
  - FBP, BWCS, ACP at PORTS
  - FFS, BWCS at PGDP
- Infrastructure and IT Support
  - Portsmouth Mission Alliance/Swift & Staley Infrastructure Team
    - North Wind Solutions, LLC – Joint Venture Member
    - Swift & Staley Inc. – Joint Venture Member
    - Wastren Advantage, Inc. – Major Subcontractor
- NMMSS Reporting and Reconciliation



**NMMSS**

**2016**

# Differences

Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA



NASA



- Organizational structure
  - Engineers/Accountants
- Resources
  - Intellectual Capital
    - ~ 351/12
    - 50/2
- Enrichment Levels
- Budget



**NMMSS**

**2016**

**Annual Users Training Meeting**

May 9-12, 2016 | New Orleans, LA



NNSA



# Organizational Change Management

- Organizational Change Management
  - More than 50 years of operation, multiple generations of employees
  - Transition from uranium enrichment to green fields
  - Safety culture
  - New tools/technology for same business
  - Everything is waste?



# Organizational Balance

- Manage balance between Waste Management Organization and NMC&A regulatory requirements.



- Waste Acceptance Criteria (WAC)/DOE regulations
- Mission objectives

# Portsmouth Site Composition

- Portsmouth Site Composition

- Fluor-BWXT Portsmouth

- Decontamination & Decommissioning*  
As the Department of Energy (DOE) cleanup contractor, Fluor-BWXT is responsible for the D&D of 415 facilities and structures that supported uranium enrichment operations at the Portsmouth GDP for more than 50 years.

- BWXT DUF6 Conversion Services

- DUF6*  
The DOE has constructed Depleted Uranium Hexafluoride Conversion Facilities at both PORTS and the Paducah Gaseous Diffusion Plant in Ohio. These facilities convert depleted uranium hexafluoride, such as power plant waste, into the more stable form of uranium oxide powder. This conversion will allow the uranium to be disposed of and will produce hydrofluoric acid that has commercial industrial value. As of 2012, both conversion facilities were operational.

- American Centrifuge Plant

- American Centrifuge Plant*  
The United States Enrichment Corporation's – now known as Centrus Energy Corp. - American Centrifuge Plant provided research, development and demonstration at PORTS. Construction of the American Centrifuge Plant began in May 2007 and the final milestone was set for December 2013. DOE ended the contract September 30, 2015.



- Fluor-BWXT Portsmouth
  - Barter Project funds ~70% of budget
    - SWU prices on secondary market
    - Quantity allowed
    - Sampling, Inventory, Offsite shipment activities
- BWXT DUF6 Conversion Services
  - Conversion of DUF6 tails produced by GDP operations to nominal  $U_3O_8$ 
    - GBC – GBCH transactions where GBCH has termination of safeguards
    - Manage GBCH inventory separate from accountability system
    - Report any shipments/receipts
- American Centrifuge Plant
  - Submission of annual Physical Inventory (NDA by FBP, weights by ACP)
  - No operational activities other than NOLs, Shipments, Receipts



- MT 89 – Uranium in Cascade
- Determination of Legacy Holdup
  - Cascade Historical Data by FY since 1955
- Separation of Depleted/Enriched Values
  - NDA values to determine ratio of depleted to enriched material
- Reduction of Legacy Holdup
  - 3 Paths
    - Equipment (Cut and Cap)
    - Recovered Containerized Material
    - On-Site Waste Disposal Cell (OSWDC)

- Cut and Cap Project
- On-site moves/741s
- “V” and “H” holding RIS
  - Reconciliation of “V” and “H” RIS
    - Original Intent
    - Reconciliation? DOE 2009
    - NMMSS balances
- OSWDF
  - Separate “V” RIS
  - 741s by truck, day, month

- Barter Project
  - Budgetary Considerations
  - Marketing/International/Regulatory Alignment
- Waste Management Organization
  - Waste Streams
    - NNSA (~ 144 MTU in FY 2015)
    - ~ 6,000 containers representing ~400,000 in net lbs.
    - EnergySolutions
- FBP/BWCS Coordination Meetings



## FY2015

- Receipts
  - 347 with 577 items
- Shipments
  - 292 with 352 items
- Discards
  - 755 with 6,939 items
- Total 1,394 with 7,868 items

## FY2016

- Receipts
  - 113 with 198 items
- Shipments
  - 183 with 198 items
- Discards
  - 298 with 1,173 item
- Total 594 with 1,569 items

