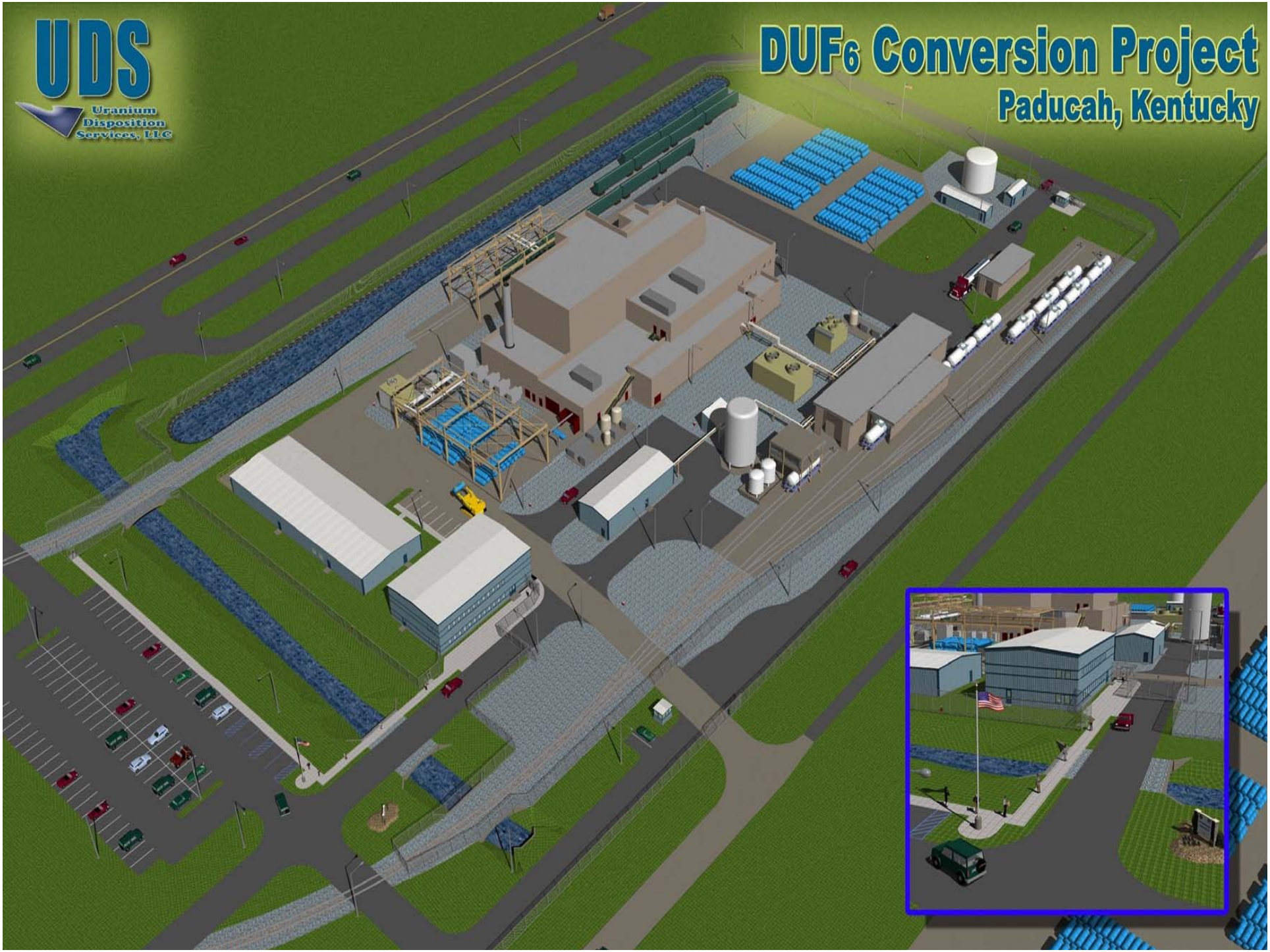
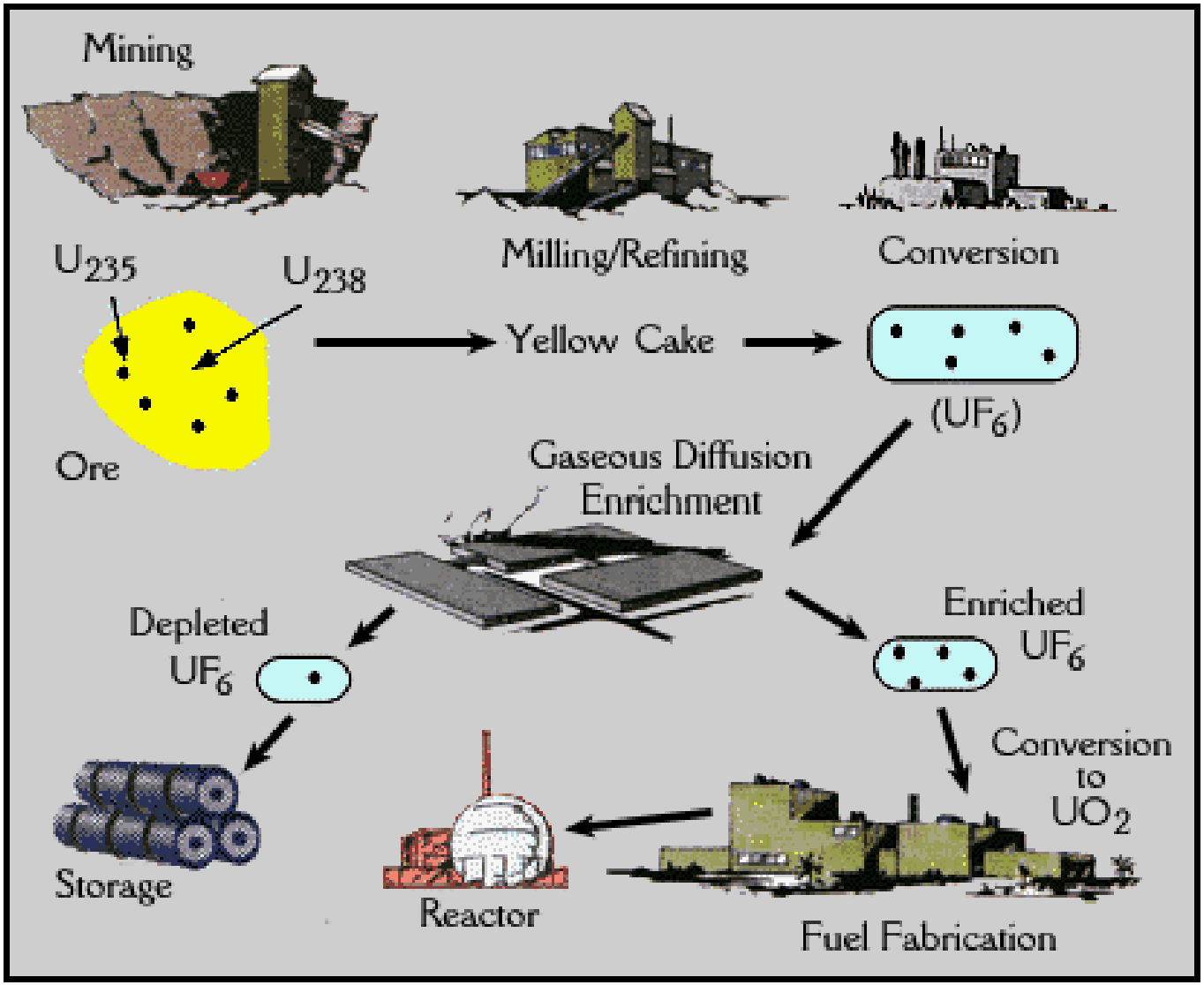

UDS
Uranium Disposition Services, LLC
DUF6 Conversion Project
Paducah, Kentucky

Agenda

I. Introduction
II. Brief History of DUF6
III. UDS Project – Background
IV. DUF6 Conversion
V. Cylinder Work Flow
VI. HF Purity
VII. Full Production – Schedule Forward

Mark B. Mattheiss

Nuclear Fuel Cycle



- Uranium occurs in nature as an oxide
- Converted to UF6 to be enriched
  - Enriched has > 0.7% U-235:
  - Depleted has < 0.7% U-235
- Enriched U is converted back to oxide for reactor fuel
- Depleted U has been stored as UF6 since it was produced

Purpose of Conversion Facility

- Convert the Department of Energy's (DOE) existing depleted uranium hexafluoride (DUF6) inventory to a more stable form, uranium oxide, for beneficial use/reuse and/or disposal.

This project addresses the DOE Depleted Uranium Hexafluoride Inventory

Location	Total Cylinders*	Total Depleted UF_6 (metric tons)
Paducah, Kentucky	37,000	450,000
Portsmouth, Ohio	16,000	200,000
Oak Ridge, Tennessee	4,800	50,000
Total	57,800	700,000

* This project also manages cylinders containing LEU and NU

DUF_6 Conversion

- Based on a proven technology in use in Richland, Washington and Lingen, Germany
- Designed to process the current inventory of depleted UF_6 material in 25 years.
- Two-step chemical reaction
  - Steam and DUF6 produce uranyl fluoride and HF acid

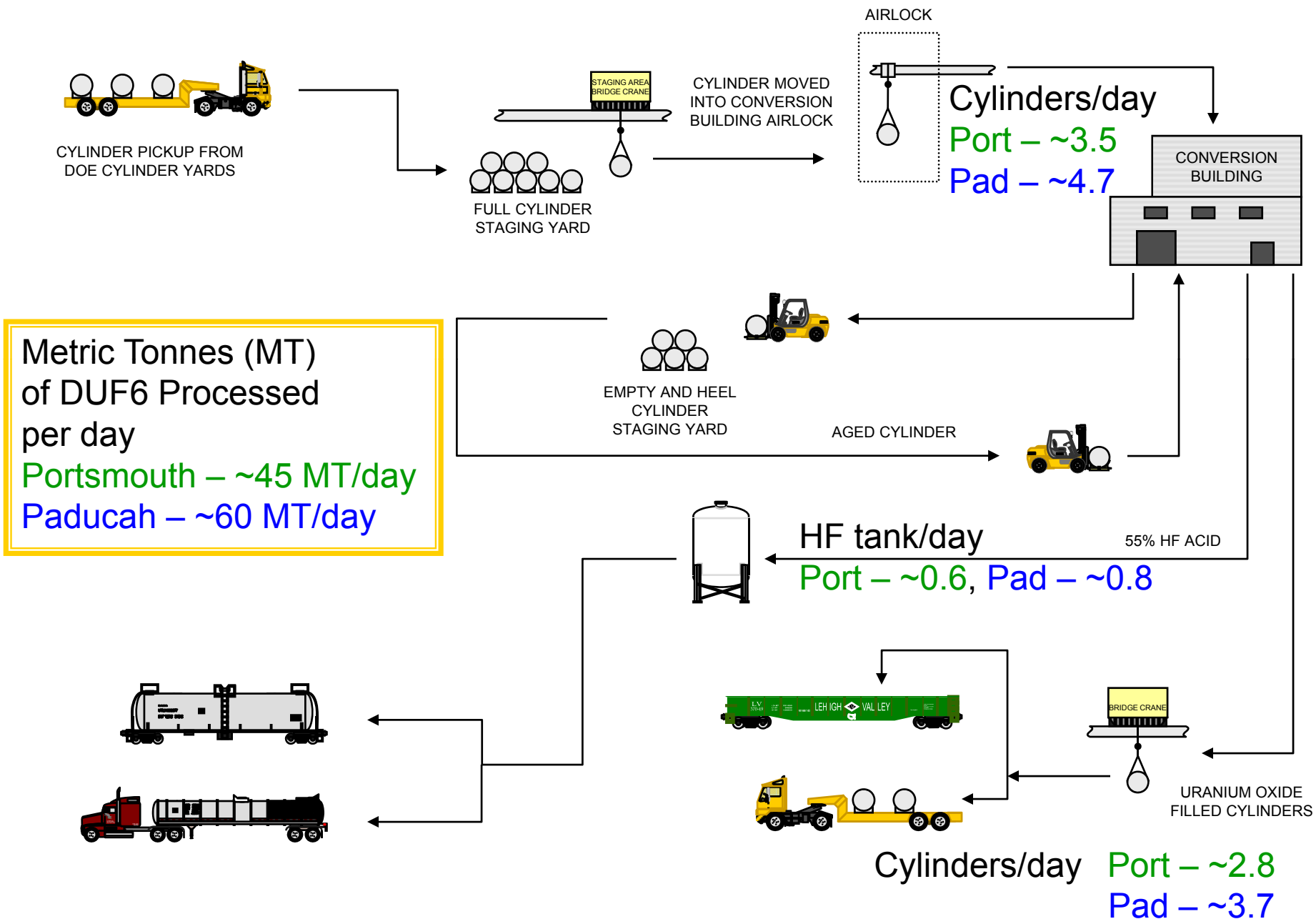
$$UF_6 + 2H_2O \rightarrow UO_2F_2 + 4HF$$

  - Uranyl fluoride is densified and defluorinated with hydrogen and steam producing uranium oxide

$$2UO_2F_2 + H_2 + H_2O \rightarrow 2UO_X + 4HF$$

- The Uranium oxide will be processed for disposal unless a re-use is found
- The aqueous HF acid will be sold to a commercial supplier for industrial use

Cylinder and By-Product Work Flow



Uranium concentration in natural materials

Material	U Concentration, pCi/g
Hydrofluoric Acid from DUF_6 Conversion	<2.6 (3 pCi/mL)
Soils [a]	0.24 - 5.8
Shale [b]	2.2
Beach Sand [b]	2.2
All Rock [b]	0.41 - 3.3
Phosphate fertilizer (P_2O_5) [c]	220

[a] T. E. Myrick, et. al, , ORNL/TM-7343, Nov. 1981.
[b] National Research Council, *Evaluation of Guidelines for Exposures to Technologically Enhanced NORM*, 1999.
[c] World Information Service on Energy, Uranium Project.

Transportation - Aqueous HF

- Shipments will be a combination of both truck and rail
- Each truck shipment will contain approximately 4000 gallons
  - Maximum of 14 shipments each week
- Each railcar shipment will contain approximately 18,000 gallons
  - Maximum of 3 railcars each week

Looking Forward

- **Upcoming Milestone Dates:**

- **April 2010**
  - **Management Self Assessment (MSA)**
- **June 7, 2010**
  - **Contractor Operational Readiness Review (CORR)**
- **July 6, 2010**
  - **Department of Energy Operational Readiness Review (DORR)**
- **August 23,2010**
  - **Authorization to Introduce DUF6**