

The MOX Adventure

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Overview of Presentation

- > **U. S. MOX Fuel Project – Background**
 - **Characteristics of MOX Fuel**
 - **MOX Fuel at Duke Energy**
 - **MOX Fuel and NMMSS**

Surplus Weapons Materials

- **Cold War legacy - nuclear weapons material (plutonium) in both the U.S. and Russia**
- **1994 National Academy of Sciences Report**
- **1994 and 1998 joint Clinton-Yeltsin commitments on nonproliferation**
 - **Secure nuclear materials in Russia**
 - **Dispose of surplus fissionable material in Russia and the U.S.**

U.S. Plutonium Disposition Program

- **The Department of Energy (DOE) has responsibility for storage and disposition surplus weapons plutonium**
- **Plan is to convert plutonium into MOX fuel and use the fuel in nuclear power reactors**
- **DOE is working with a team of companies (including Duke Energy) to accomplish that plan**
- **Duke Energy role**
 - **Prepare McGuire and Catawba Nuclear Stations to use MOX fuel**
 - **Load MOX fuel into reactors when it becomes available**

Overview of Presentation

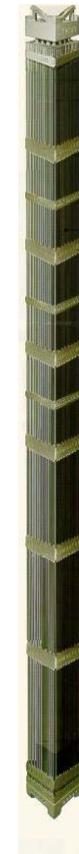
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MOX Fuel - General

- **MOX fuel pellets**
 - Blend of ~5% PuO₂ with ~95% depleted UO₂
 - Like LEU fuel pellets, MOX fuel pellets are primarily uranium
- **Fission power comes primarily from plutonium (Pu²³⁹) instead of uranium (U²³⁵)**
- **Other than the material of the fuel pellets, MOX and uranium fuel assemblies are essentially identical**
- **Duke will use a mixture of MOX fuel assemblies and conventional uranium fuel assemblies in its reactors**

MOX Fuel Assembly

- **AREVA NP design**
- **Very similar to fuel already used at McGuire and Catawba**
- **MOX fuel pellets (~5% plutonium)**



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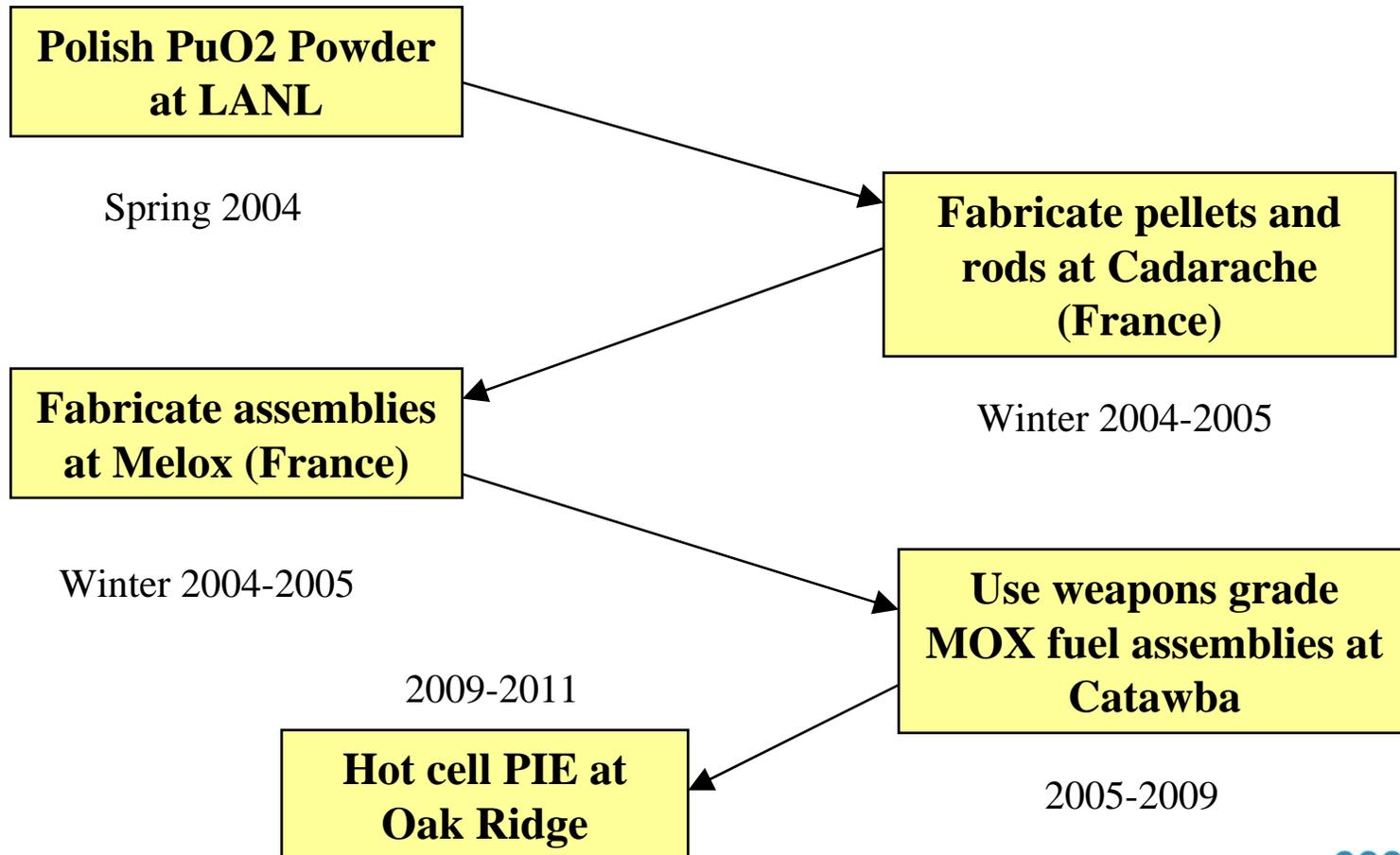
Key Duke Power Milestones

- **Contract awarded March 22, 1999**
- **Inserted MOX fuel Lead Test Assemblies (LTAs): Catawba, Spring 2005**
- **Complete three cycles of MOX fuel LTA use at Catawba: Fall 2009**
- **Initiate large-scale MOX fuel use: 2015?**
- **25 tonnes plutonium loaded into cores: 2028?**

MOX Fuel LTA Program

- **Using four MOX fuel assemblies in Catawba unit 1**
- **Demonstrate fuel performance in prototypical conditions**
- **Support licensing of large-scale MOX fuel use**
 - **Up to 40 assemblies per batch**

Lead Assembly Program



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Reporting to NMMSS as Shipper

- **First import received --- Duke Energy responsible for shipper's 741**
- **Major differences:**
 - **RIS For Account**
 - **RIS To Account**
 - **Project Number**
 - **Material Type codes – IAEA codes (Import/Export)**
 - **Government-owned material**

Shipper's 741

| | | | | |
|----------------|-------------------------|---------------------|--------------|-----------------|
| RFFFXND | 1 A A104 AUA AUA | | | 03152005 |
| RFFFXND | 1 A A201 NJ13GE | 1R50000000GD | 309 G | |
| RFFFXND | 1 A A501 | 44600 | 2530 | 100 |
| RFFFXND | 1 A A202 NJ13GE | 1R50000000GP | 309 G | |
| RFFFXND | 1 A A502 | 2038400 | 57390 | 1920600 |
| RFFFXND | 1 A A203 NJ13GG | 1R50000000GD | 309 G | |
| RFFFXND | 1 A A503 | 44600 | 2530 | 100 |
| RFFFXND | 1 A A204 NJ13GG | 1R50000000GP | 309 G | |
| RFFFXND | 1 A A504 | 2035600 | 58480 | 1915800 |
| RFFFXND | 1 A A3 GEN-LIC | | | |
| RFFFXND | 1 A A701D | 89200 | 33 | |
| RFFFXND | 1 A A702P | 4074000 | 33 | |

Shipper's 741

(continued)

| | | | | | |
|---------|------------------|--------------|-----|-------|----------|
| RFFFXND | 2 A A104 AUA AUA | | | | 03152005 |
| RFFFXND | 2 A A201 NJ13GF | 1R50000000GD | 309 | G | |
| RFFFXND | 2 A A501 | 44600 | | 2530 | 100 |
| RFFFXND | 2 A A202 NJ13GF | 1R50000000GP | 309 | G | |
| RFFFXND | 2 A A502 | 2039800 | | 58080 | 1920500 |
| RFFFXND | 2 A A203 NJ13GH | 1R50000000GD | 309 | G | |
| RFFFXND | 2 A A503 | 44500 | | 2530 | 100 |
| RFFFXND | 2 A A204 NJ13GH | 1R50000000GP | 309 | G | |
| RFFFXND | 2 A A504 | 2033200 | | 58703 | 1913100 |
| RFFFXND | 2 A A3 GEN-LIC | | | | |
| RFFFXND | 2 A A701D | 89100 | | 33 | |
| RFFFXND | 2 A A702P | 4073000 | | 33 | |

Reporting to NMMSS as Receiver

- **Project Number changed when received at Catawba Nuclear Station**
- **Material Type codes reverted back to U.S. Codes (Domestic Transfers)**
- **Material still government-owned (G owner code)**

Receiver's 741

| | | | | | |
|----------------|------------------------|----------------|-------------------------|--------------|-----------------|
| RFFFXND | 1 A B104 | | | | 04252005 |
| RFFFXND | 1 A B201 NJ13GE | | 1ANN600101010309 | G | |
| RFFFXND | 1 A B501 | | 44600 | 2530 | 100 |
| RFFFXND | 1 A B202 NJ13GE | | 1ANN600101050309 | G | |
| RFFFXND | 1 A B502 | | 2038400 | 57390 | 1920600 |
| RFFFXND | 1 A B203 NJ13GG | | 1ANN600101010309 | G | |
| RFFFXND | 1 A B503 | | 44600 | 2530 | 100 |
| RFFFXND | 1 A B204 NJ13GG | | 1ANN600101050309 | G | |
| RFFFXND | 1 A B504 | | 2035600 | 58480 | 1915800 |
| RFFFXND | 1 A B70110 | 89200 | 33 | | |
| RFFFXND | 1 A B70250 | 4074000 | 33 | | |

Receiver's 741

(continued)

| | | | | | |
|----------------|------------------------|----------------|-------------------------|--------------|-----------------|
| RFFFXND | 2 A B104 | | | | 04272005 |
| RFFFXND | 2 A B201 NJ13GF | | 1ANN600101010309 | G | |
| RFFFXND | 2 A B501 | | 44600 | 2530 | 100 |
| RFFFXND | 2 A B202 NJ13GF | | 1ANN600101050309 | G | |
| RFFFXND | 2 A B502 | | 2039800 | 58080 | 1920500 |
| RFFFXND | 2 A B203 NJ13GH | | 1ANN600101010309 | G | |
| RFFFXND | 2 A B503 | | 44500 | 2530 | 100 |
| RFFFXND | 2 A B204 NJ13GH | | 1ANN600101050309 | G | |
| RFFFXND | 2 A B504 | | 2033200 | 58703 | 1913100 |
| RFFFXND | 2 A B70110 | 89100 | 33 | | |
| RFFFXND | 2 A B70250 | 4073000 | 33 | | |

From G owner code to J owner code

- **Shipped as government-owned: G owner code**
- **Received as government-owned: G owner code**
- **When reactor started up, the 4 MOX LTAs became privately-owned: J owner code**
- **Inventory change type codes 54 (Shipments – Miscellaneous) and 34 (Receipts – Miscellaneous) were used to make the change to (privately-owned) as an A M transaction**
- **No project number**

741 for change in Owner Code – G to J

| | | | | |
|---------|-------------------|------------------|-------|----------|
| XND XND | 41 A M116 | | | 06082005 |
| XND XND | 41 A M20154NJ13GE | 1ANN600101010309 | G | |
| XND XND | 41 A M50154 | 44600 | 2530 | 100 |
| XND XND | 41 A M20254NJ13GE | 1ANN600101050309 | G | |
| XND XND | 41 A M50254 | 2038400 | 57390 | 1920600 |
| XND XND | 41 A M20354NJ13GF | 1ANN600101010309 | G | |
| XND XND | 41 A M50354 | 44600 | 2530 | 100 |
| XND XND | 41 A M20454NJ13GF | 1ANN600101050309 | G | |
| XND XND | 41 A M50454 | 2039800 | 58080 | 1920500 |
| XND XND | 41 A M20554NJ13GG | 1ANN600101010309 | G | |
| XND XND | 41 A M50554 | 44600 | 2530 | 100 |
| XND XND | 41 A M20654NJ13GG | 1ANN600101050309 | G | |
| XND XND | 41 A M50654 | 2035600 | 58480 | 1915800 |
| XND XND | 41 A M20754NJ13GH | 1ANN600101010309 | G | |
| XND XND | 41 A M50754 | 44500 | 2530 | 100 |
| XND XND | 41 A M20854NJ13GH | 1ANN600101050309 | G | |
| XND XND | 41 A M50854 | 2033200 | 58703 | 1913100 |

741 for change in Owner Code – G to J (continued)

| | | | | | | |
|---------|-------------------|---------|----|---------|-------|---------|
| XND XND | 41 A M20934NJ13GE | | 1 | 10309 J | | |
| XND XND | 41 A M50934 | | | 44600 | 2530 | 100 |
| XND XND | 41 A M21034NJ13GE | | 1 | 50309 J | | |
| XND XND | 41 A M51034 | | | 2038400 | 57390 | 1920600 |
| XND XND | 41 A M21134NJ13GF | | 1 | 10309 J | | |
| XND XND | 41 A M51134 | | | 44600 | 2530 | 100 |
| XND XND | 41 A M21234NJ13GF | | 1 | 50309 J | | |
| XND XND | 41 A M51234 | | | 2039800 | 58080 | 1920500 |
| XND XND | 41 A M21334NJ13GG | | 1 | 10309 J | | |
| XND XND | 41 A M51334 | | | 44600 | 2530 | 100 |
| XND XND | 41 A M21434NJ13GG | | 1 | 50309 J | | |
| XND XND | 41 A M51434 | | | 2035600 | 58480 | 1915800 |
| XND XND | 41 A M21534NJ13GH | | 1 | 10309 J | | |
| XND XND | 41 A M51534 | | | 44500 | 2530 | 100 |
| XND XND | 41 A M21634NJ13GH | | 1 | 50309 J | | |
| XND XND | 41 A M51634 | | | 2033200 | 58703 | 1913100 |
| XND XND | 41 A M70110 | 178300 | 33 | | | |
| XND XND | 41 A M70250 | 8147000 | 33 | | | |

Additional Information

- **DCS website (internet)**
 - <http://www.dcsmox.com>
- **DOE, NRC and other websites (internet)**
 - Access via links from DCS internet website

THE END

**COMMENTS
OR
QUESTIONS**