

***Briefing to the NRC  
Commissioners***

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***Defense Nuclear Nonproliferation  
Office of Fissile Materials Disposition***

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# **Presentation Outline**

- **Program objectives**
- **U.S. off-specification highly enriched uranium disposition**
- **Update on Bilateral Plutonium Disposition Agreement**
- **U.S. plutonium disposition**

# **Program Objectives**

- **Dispose of 174 metric tons of surplus U.S. highly enriched uranium**
- **Dispose of 50 metric tons of surplus U.S. plutonium**
- **Work with Russia to dispose of their surplus plutonium**

# **NRC Involvement in Fissile Materials Disposition**

- **Highly enriched uranium**
  - **Use of off-specification highly enriched uranium (HEU) in Tennessee Valley Authority (TVA) reactors**
- **Plutonium**
  - **MOX fuel fabrication, qualification, utilization, packaging, and transportation**

# **NRC Involvement (cont.)**

- **International**
  - **Interagency IAEA collaboration for facilities under international safeguards**
  - **Participation in Regulatory Working Group established under 1998 Scientific and Technical Cooperation Agreement with Russia**

# **Off-Specification HEU Blend Down**

- **DOE and TVA are nearing completion of an Interagency Agreement to blend down 34 MT of off-specification HEU to low enriched uranium for use as fuel in TVA reactors**
  - **Process some of the material at Savannah River prior to transfer to TVA vendors for fuel fabrication; transfer remainder directly to TVA vendors**
  - **Requires new solution transportation containers**

# **Bilateral Plutonium Disposition Agreement**

- **United States and Russia to each irreversibly transform 34 metric tons of excess weapons plutonium into forms unusable for weapons**
  - **Formally announced by President Clinton and President Putin at the June 4, 2000 Moscow Summit**
  - **Signed by Vice President Gore and Prime Minister Kasyanov -- *effective September 1, 2000***

# **Bilateral Plutonium Disposition Agreement**

## **Key Provisions**

- **Each country to dispose of 34 metric tons (MT) of weapon-grade plutonium**
  - **Irradiation as MOX fuel in reactors**
  - **Immobilization with high-level radioactive waste**

	<b><u>U.S.</u></b>	<b><u>Russia</u></b>
<b>MOX</b>	<b>25.6 MT</b>	<b>34 MT</b>
<b>Immobilization</b>	<b>8.4 MT</b>	<b>----</b>



# **Bilateral Plutonium Disposition Agreement**

## **Key Provisions (cont.)**

- **U.S.-Russian disposition to proceed in rough parallel**
  - **Begin operation of industrial-scale facilities in 2007**
  - **Initial disposition rate of 2 MT/year**
  - **Develop plan to double disposition rate within one year of signing**
- **Bilateral monitoring and inspection procedures to be developed by December 2002 -- *Agreement for international inspection to follow***

# **Bilateral Plutonium Disposition Agreement**

## **Key Provisions (cont.)**

- **Prohibits separation of plutonium in spent MOX fuel until all 34 metric tons have been disposed -- *Any subsequent (Russian) reprocessing of irradiated MOX fuel subject to mutually agreed monitoring measures***
- **Immobilized plutonium may never be separated**

# **Bilateral Plutonium Disposition Agreement**

## **Key Provisions (cont.)**

- **U.S. to provide near-term financial assistance; additional multilateral financial assistance to be developed within one year of signing**
- **Additional plutonium may be added in the future -- *need not be reciprocal***

# **U.S. Plutonium Disposition Strategy**

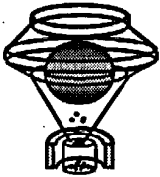
- **DOE to implement two technologies  
(*hybrid strategy*)**
  - **Immobilization -- *Immobilize surplus plutonium with ceramic material surrounded by vitrified high level radioactive waste***
  - **MOX/Reactors -- *Burn surplus plutonium as mixed oxide (MOX) fuel in existing, domestic, commercial reactors***

# Spent Fuel Standard

- **Both technologies meet the “Spent Fuel Standard” -- *Surplus plutonium is made as inaccessible and unattractive for retrieval and weapons use as the residual plutonium in spent fuel from commercial reactors***

# **Key U.S. Plutonium Disposition Facilities**

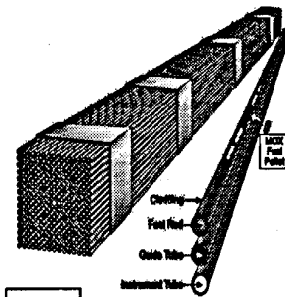
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Advanced Recovery and Integrated  
Extraction System (ARIES)

## **Pit Disassembly & Conversion Facility**

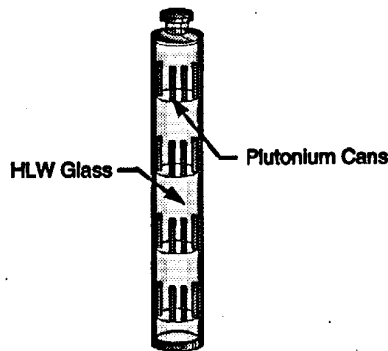
**Disassemble plutonium “pits” and convert  
the resulting metal to an oxide powder**



MOX Fuel Assembly

## **MOX Fuel Fabrication Facility**

**Fabricate plutonium oxide powder  
into mixed oxide fuel and fresh fuel  
assemblies**



Can-in-Canister

## **Plutonium Immobilization Facility**

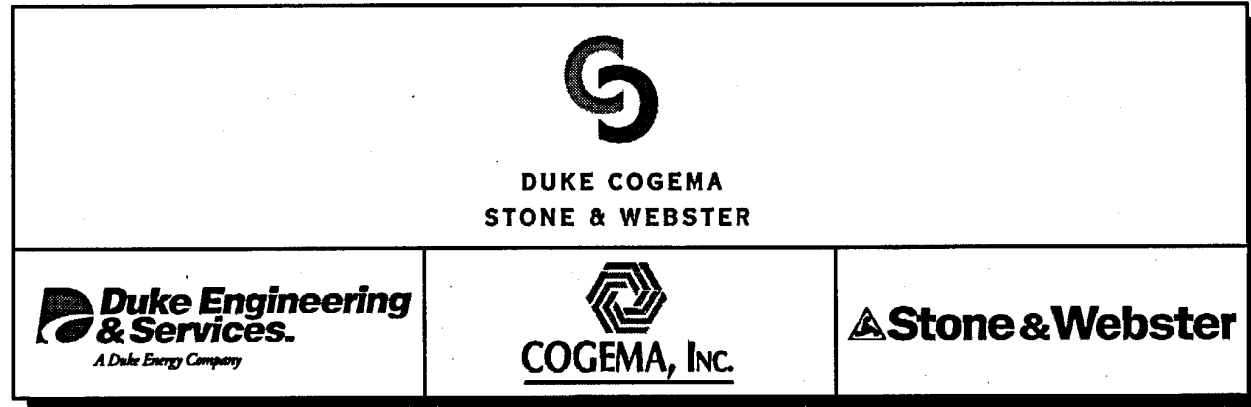
**Convert “non-pit” plutonium to  
plutonium oxide, mix with ceramic  
material, array in canister, surround  
with molten high level waste**

# MOX Prime Contract

- **Fuel qualification: Qualify MOX fuel for use in PWRs**
- **Fuel fabrication: Design, license, construct and operate a MOX Fuel Fabrication Facility (MOX FFF)**
- **Fuel packaging: Package fresh MOX fuel for transport from MOX Fuel Fabrication Facility to reactors**
- **Fuel irradiation: Irradiate fuel to the spent fuel standard with partial MOX cores**

# Duke, Cogema, Stone & Webster (DCS), LLC

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## • MAJOR SUBCONTRACTORS

**Duke Power; Irradiation services**  
**FCF; Fuel design services**  
**NFS; Security related services**  
**Cogema; European MOX experience**



# **MOX Fuel Fabrication Facility**

- **Non-reactor nuclear facility -- 320,000 sq. ft. and conventional structures -- 120,000 sq. ft.**
- **Hardened space comprising three interconnected areas:**
  - **Shipping and receiving**
  - **Aqueous purification (polishing)**
  - **Fuel fabrication**
- **Incorporates operational French technologies -- modified to meet NRC licensing requirements**
- **All plutonium processing in gloveboxes**

# Lead Assemblies

- **Lead assemblies are required by reactor operator for confirmation of MOX fuel design**
- **Two fabrication alternatives under consideration:**
  - **Fabrication in Europe using prototypic processes and equipment**
  - **Fabrication in the MOX Fuel Fabrication Facility**

# Irradiation Services

**Four Duke Energy-operated PWRs will be used to irradiate MOX fuel -- *two McGuire plants, two Catawba plants***

- Will meet 2 MT/yr goal (bilateral agreement)**
- Will disposition 25 MT of plutonium by 2019**
- Will irradiate MOX fuel for 2 cycles**
- Spent fuel to be stored on-site pending geologic disposal (similar to LEU fuel)**

# **MOX Facility to be NRC Regulated**

**FY 1999 Defense Authorization Act  
(Public Law 105-261) -- SEC. 3134.  
*Licensing of Certain Mixed Oxide Fuel  
Fabrication and Irradiation Facilities***

- **Requires any person constructing or operating a new or operating an existing facility to fabricate mixed oxide (MOX) fuel for use in a commercial nuclear reactor to be subject to NRC licensing**

# **Submittals to NRC**

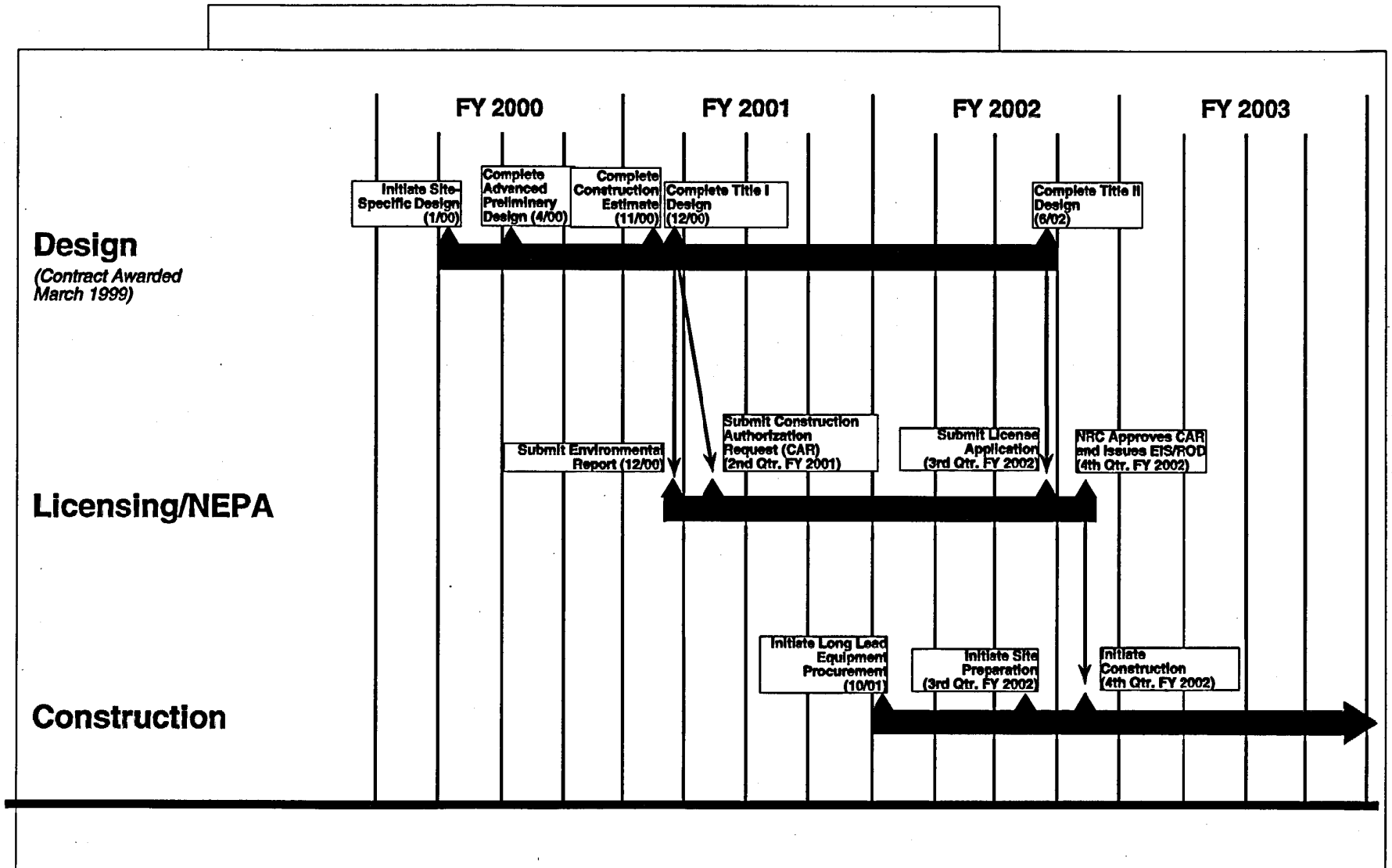
**Mixed Oxide  
Fuel Fabrication  
Facility**

**Environmental Report  
--to be submitted by  
DCS in Dec for NRC's  
EIS development**

**Construction  
Authorization Request  
--to be submitted by  
DCS in early-CY 01**

**Facility License  
Application--to be  
submitted in mid-CY  
02**

# MOX Facility Schedule



# **Submittals to NRC**

**Fuel qualification  
and irradiation**

**Topical reports for  
MOX fuel design  
and performance**

**Application for  
reactor license  
amendments for MOX  
fuel and, possibly, a  
separate amendment  
for inserting lead  
test assemblies**

**Fuel packaging  
& transportation**

**Request for issuance  
of a Certificate of  
Compliance**

# MOX Issues

- **MOX Fuel Fabrication Facility is first facility to be licensed under new 10 CFR 70 rule**
- **New performance requirement for worker exposure during MOX Fuel Fabrication Facility accidents will require DCS, DOE, and NRC to agree on how performance is demonstrated**
- **Process for determining fuel qualification needs**



# **NRC/DOE Interfaces**

- **Conclude a Memorandum of Understanding on security approach**
- **DOE/NRC need to maintain continuing dialogue to support this National Security Program**