

# Governor's Nuclear Advisory Council MOX Progress Update

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Shaw AREVA MOX Services, LLC



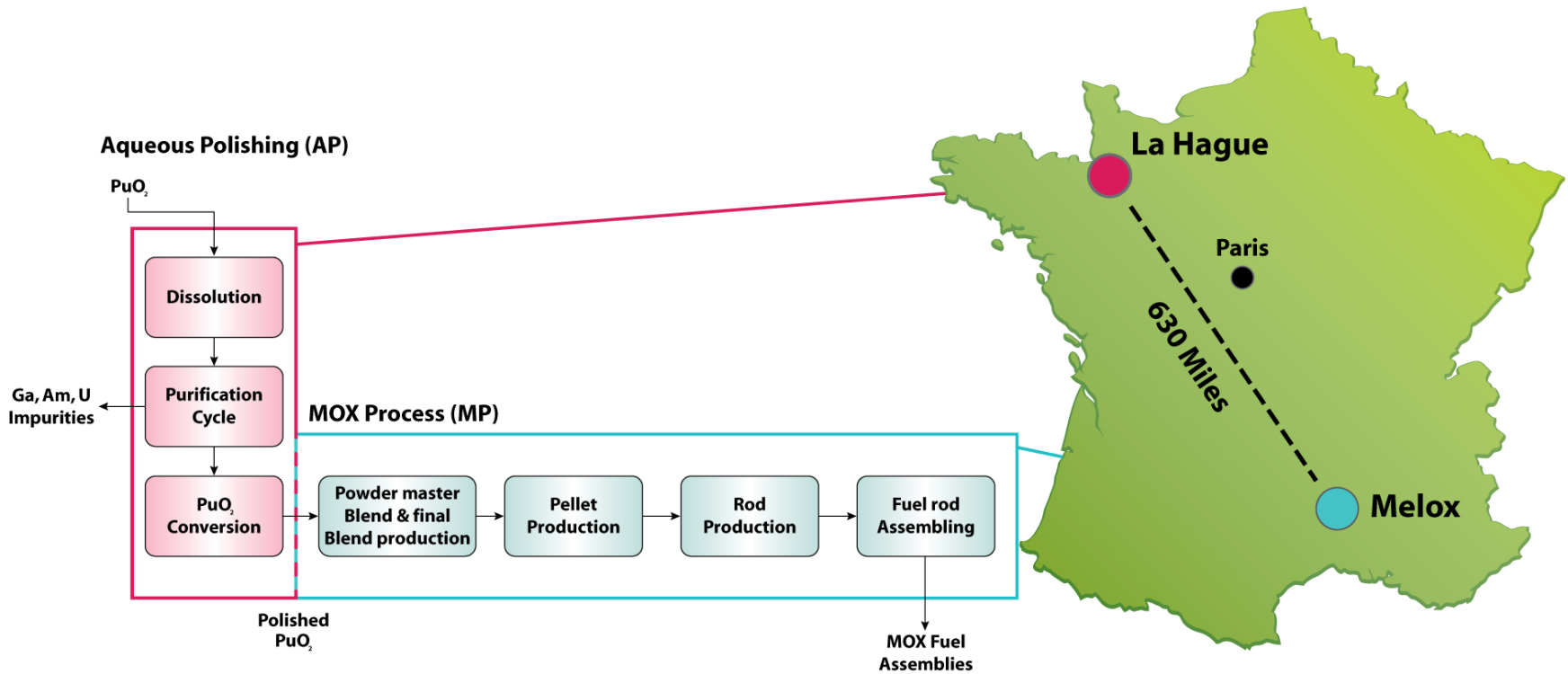
# Non-proliferation Program

- **Mission**

- Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF)
  - Produce mixed oxide fuel elements for irradiation in commercial nuclear power plants
- Pit Disassembly and Conversion Process (PDC)
  - Disassemble nuclear weapon pits, remove impurities and convert the metal into oxide for MFFF process
- Waste Solidification Building (WSB)
  - Receive high and low activity liquid waste streams from MFFF and PDC

- **68 metric tons of surplus plutonium, sufficient for approximately 17,000 nuclear weapons**
- **Satisfies the non-proliferation agreement between the United States and the Russian Federation**

# Reference Facilities



# History of MOX Fuel Usage

- **In the U.S., MOX fuel has been used in several demonstration projects (San Onofre, Ginna PWRs, Dresden, Quad Cities and Big Rock Point)**
  - The MOX fuel performed acceptably and similar to the co-resident uranium fuel

*“In the U.S., there was substantial development work on MOX fuel technology in the 1960s and 1970s. That work culminated in a series of MOX fuel demonstration programs at five reactors: the San Onofre and Ginna PWRs and the Dresden, Quad Cities, and Big Rock Point BWRs. In each program, lead test assemblies were used to study the performance of MOX fuel rods. After several operating cycles, the MOX fuel had performed acceptably and similar to the co-resident uranium fuel.”*

Hylko, James M. (2012, November 29). MOX Fuel Fabrication Facility: Turning Swords into Plowshares. *POWER Magazine*.

- **Other countries have used MOX fuel successfully for nearly 40 years and there is substantial data that this fuel type operates acceptably (France, Belgium, Switzerland and Germany)**

# History of MOX Fuel Usage

- **In 2005, four MOX fuel assemblies were manufactured using the MELOX/MFFF process and these were tested successfully at the Catawba Power Station**

*“Nondestructive and destructive hot cell examinations of five fuel rods verified that the MOX fuel behaved as predicted on the basis of experience with uranium dioxide fuel and MOX fuel with recycled RG plutonium.”*

Hylko, James M. (2012, November 29). MOX Fuel Fabrication Facility: Turning Swords into Plowshares. *POWER Magazine*.

- **Future Lead Test Assemblies status for both BWR and PWR**
  - Future testing not needed, MOX is well established and mature technology
  - Weapons Grade MOX and Reactor Grade MOX behave similarly and predictably
  - We have enough data from European testing and usage
  - Has been used for 40 years in more than 30 commercial reactors worldwide
  - NRC will ultimately decide if additional testing is needed



# History of MOX Fuel Usage

- **Burying it vs. MOX**
  - Russian Representatives were very clear that their preferred method of plutonium disposition was MOX
    - After the study of more than 40 options, the MOX disposition procedure was selected by both sides and the international agreement was signed
    - We must keep our international obligations.
  - Bipartisan support by the past three Presidential administrations
  - If the plutonium is merely buried, terrorists can dig it up and retrieve the plutonium
- **We are making the world a safer place**
  - The U.S. and Russia were responding to concerns about nuclear weapon material falling into the wrong hands when both countries signed the international agreement committing each side to disposing of 34 metric tons of plutonium
  - Earlier this year, after the President's Nuclear Summit, the MOX facility was used as an example by the White House in sharing best practices for nuclear security in new facility design
  - We are building the MOX facility with safety, security and quality as our highest priorities

# Fuel Sales Contract Update

- **Final contract between AREVA NP and NNSA is in final negotiations**
  - Expect to finalize in early CY2013
  - AREVA currently supplies nuclear fuel to approximately one-third of the U.S. operating fleet which will allow the use of MOX fuel in approximately 40 reactors
- **TVA has signed an MOU and has expressed interest in using MOX fuel**
  - Supplemental Environmental Impact Statement reviews are on-going and expected to be complete in 2013
- **Four additional utilities have expressed interest once the fuel contract is finalized**
  - MOX fuel will offer a competitive price advantage compared to standard nuclear fuel and natural gas/fossil power generation
- **Initial MOX demand appears strong**

# Safety & Environmental Performance

- **Worker Safety Performance**

- 13 million consecutive safe work hours without a lost workday accident
- Currently pursuing OSHA Voluntary Protection Program (VPP) certification

- **Environmental Stewardship**

- No environmental permit violations since start of construction (50 active permits)
- South Carolina Department of Health & Environmental Control (SCDHEC) awarded membership to MOX for the South Carolina Environmental Excellence Program
- Administration Building is 1st at SRS to be LEED Gold certified
  - Working on certification for two additional buildings
  - Administration Building MOX Conservation Garden features federal endangered smooth purple coneflower
- AMERESCO biomass plant providing electricity to MFFF via the Pu Disposition electrical substation



# Accomplishments

- **NRC Regulation**

- Safety Evaluation Report issued in December 2010 with no open issues
- 2010 and 2011 Summary Report indicated MFFF construction met requirements
  - No areas needing improvement

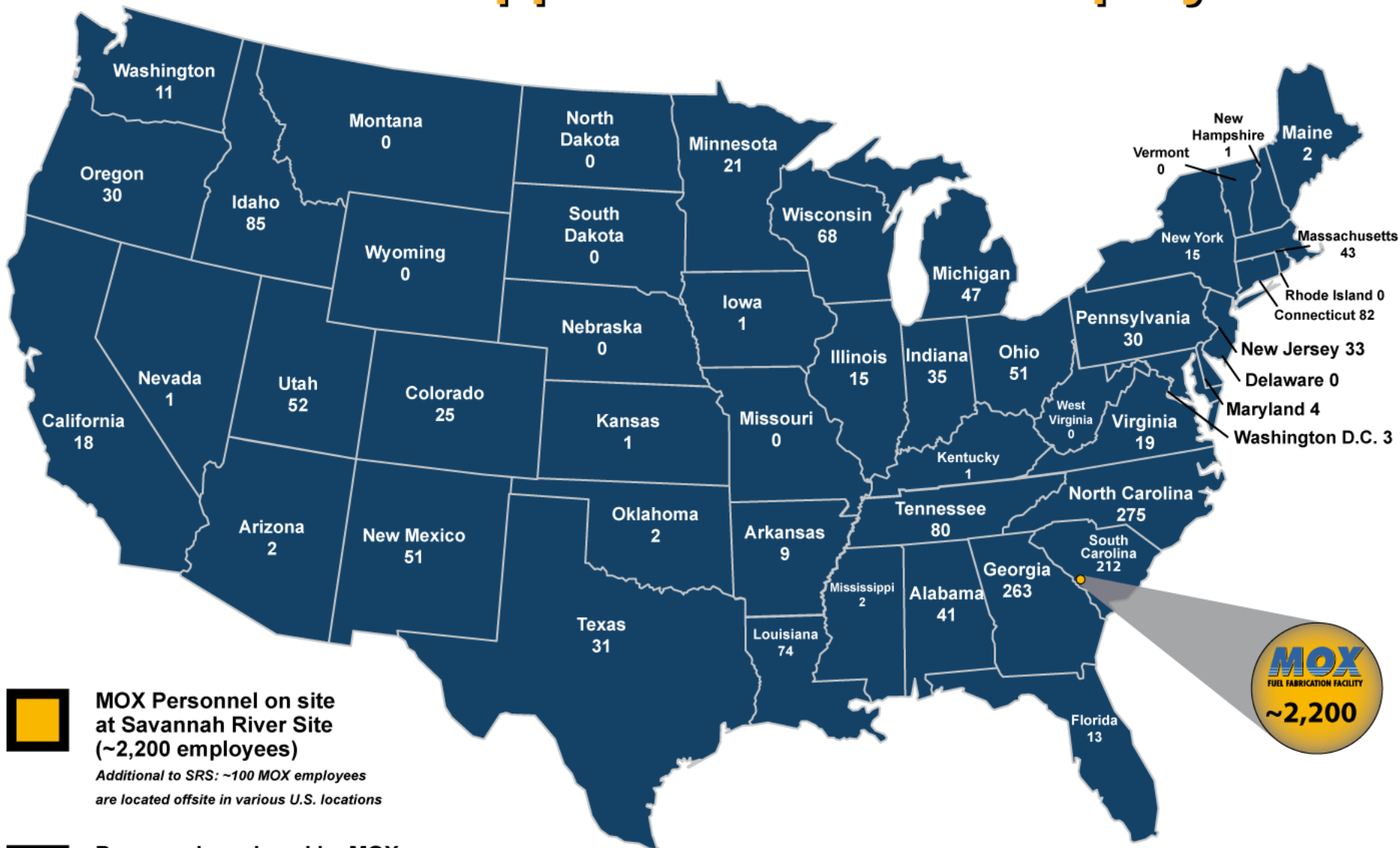
- **Support to Small Business**

- >9,600 small business contracts awarded to date
- Total value: >\$860 Million

- **Contracts Awarded by Type**

- \$137,452,081 - Small Disadvantaged Business
- \$174,992,365 - Women-Owned Small Business
- \$ 49,500,421 - HUBZone Small Business
- \$101,069,259 - Veteran-owned Small Business
- \$ 6,611,218 - Service-Disabled Veteran-Owned Small Business

# Total Impact of MOX Project & Supplier/Contractor Employment



**MOX Personnel on site at Savannah River Site (~2,200 employees)**

*Additional to SRS: ~100 MOX employees are located offsite in various U.S. locations*



**Personnel employed by MOX Suppliers (~1750 employees)**

**MOX**  
FUEL FABRICATION FACILITY  
**~2,200**

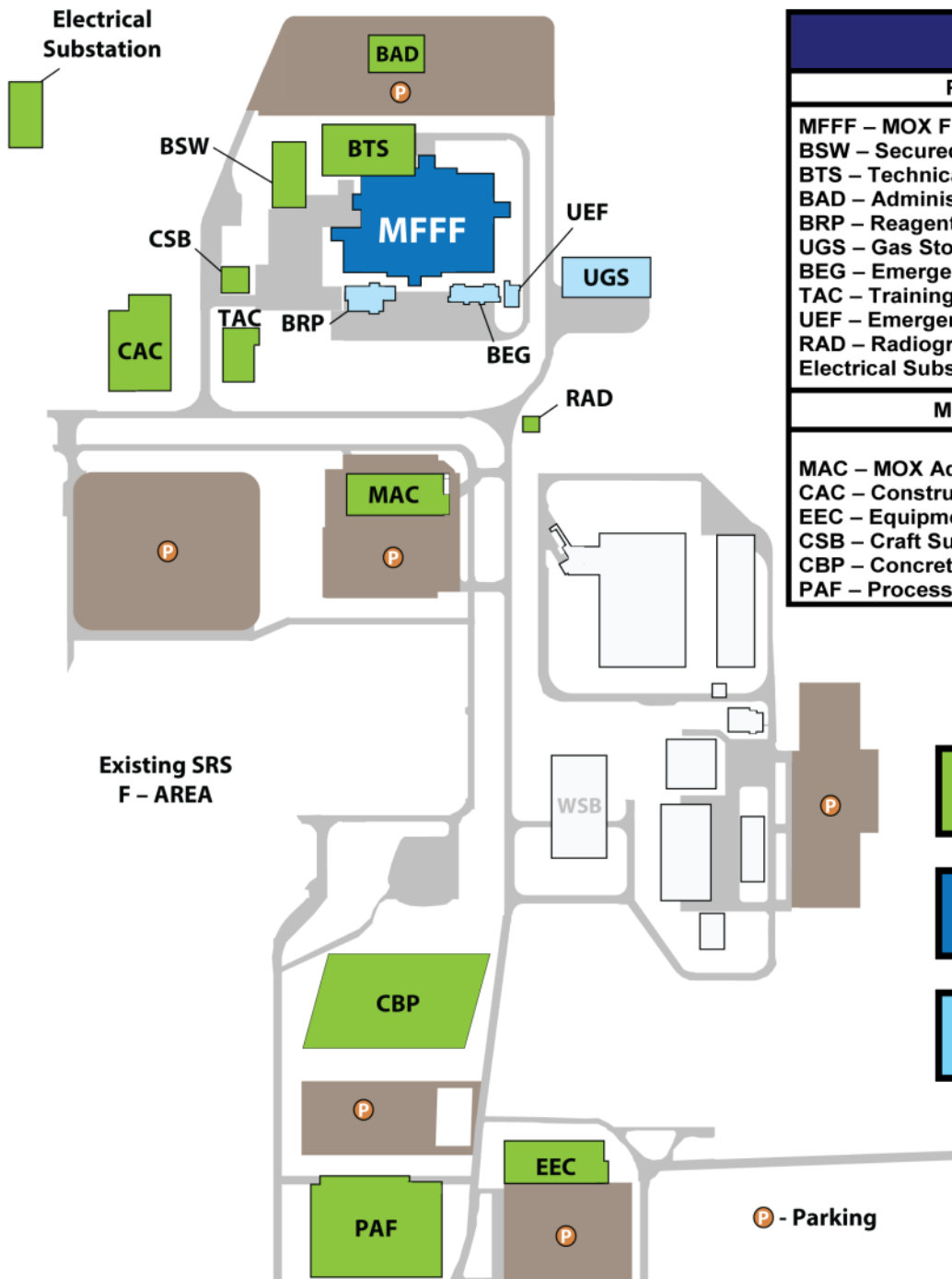
**~4,100 total jobs impacting America**

# Material Quantities Installed

<b>Structural Concrete</b>	<b>&gt;132,500 cubic yards</b>
<b>Non-Structural Concrete</b>	<b>51,369 cubic yards</b>
<b>Rebar</b>	<b>&gt;21,200 tons (&gt;42,400,000 lbs.)</b>
<b>Process Pipe to be installed</b>	<b>~411,000 ft.</b>
<b>Tanks</b>	<b>66 of 73</b>
<b>Electrical Cable to be installed</b>	<b>~6 million ft.</b>
<b>Process Systems to be installed</b>	<b>294</b>

# Design Capacity

- **The facility will be able to produce up to 70,000 fuel pellets per day**
- **The facility is being redesigned to produce both Pressure Water Reactor (PWR) and Boiling Water Reactor (BWR) fuel assemblies**
- **Approximately 151 PWR fuel assemblies can be produced annually**
  - Utilizing 70 metric tons of heavy metal
- **The facility will contain 7 Control Rooms**



Facility	Construction		Status
	Start	Complete	
<b>Permanent Buildings</b>			
MFFF – MOX Fuel Fabrication Facility	Sep 2007	2016	Construction
BSW – Secured Warehouse Building	Jan 2009	Dec 2009	Complete
BTS – Technical Support Building	2010	2012	Complete
BAD – Administration	Jun 2008	Jun 2009	Complete
BRP – Reagent Processing Building	2015	2015	Planning
UGS – Gas Storage Area	2015	2015	Planning
BEG – Emergency Diesel Generator Building	2015	2015	Planning
TAC – Training Administration Complex	Jun 2007	Jan 2008	Complete
UEF – Emergency Diesel Storage	2015	2015	Planning
RAD – Radiography Building	July 2008	July 2008	Complete
Electrical Substation	Feb 2009	2010	Complete
<b>MOX Site Infrastructure</b>			
MAC – MOX Administration Complex	Dec 2006	Mar 2007	Complete
CAC – Construction Administration Complex	May 2007	Aug 2007	Complete
EEC – Equipment Engineering Complex	Sep 2007	Nov 2007	Complete
CSB – Craft Support Building	Mar 2008	May 2008	Complete
CBP – Concrete Batch Plant	Apr 2007	July 2007	Complete
PAF – Process Unit Assembly Building	Apr 2008	Sep 2008	Complete

 **Complete**

 **Construction Ongoing**

 **Planned**

 - Parking

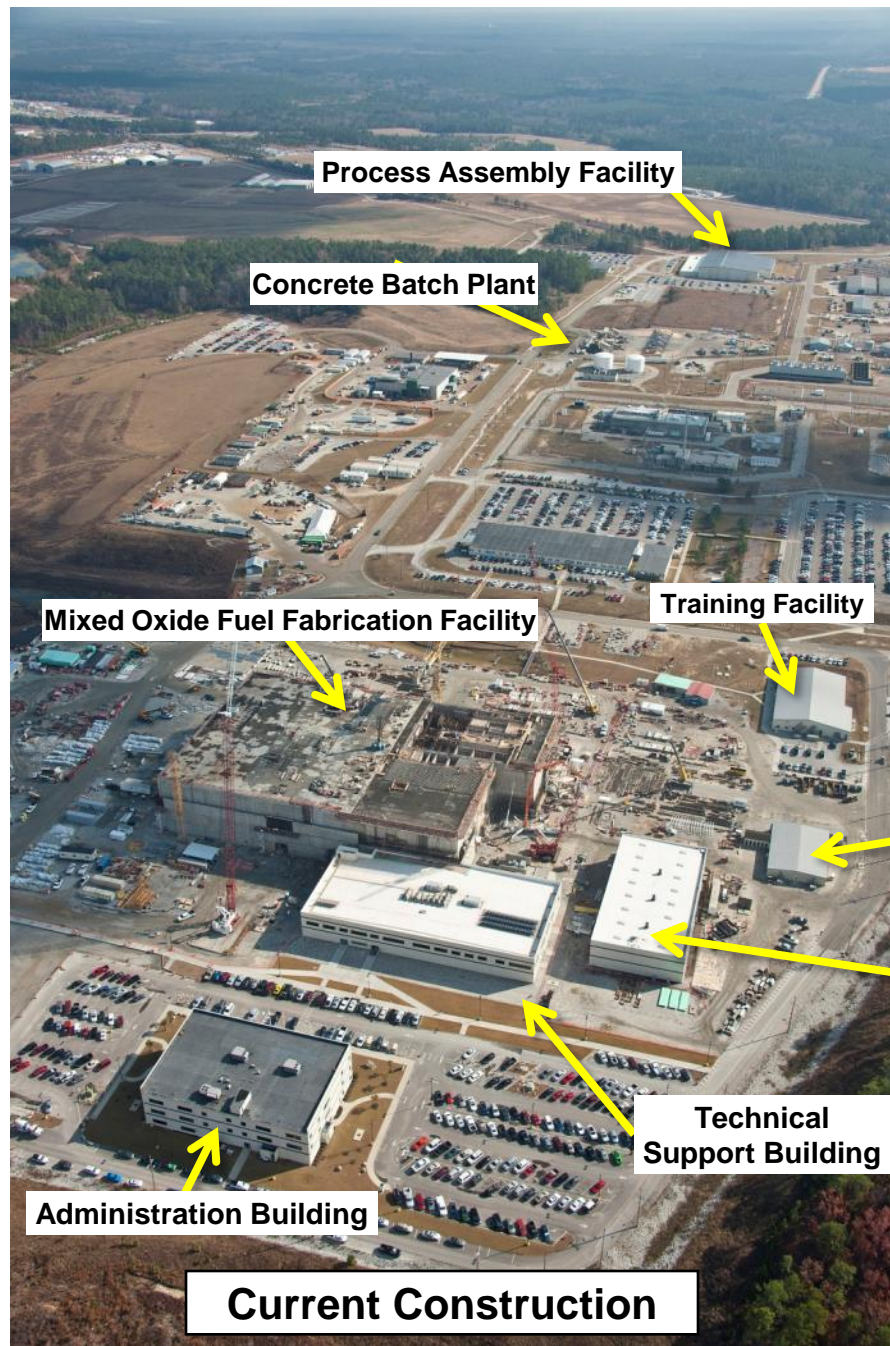
# August 2007



Start of Construction



**December  
2012**



# Technical Support Building





# Active Gallery Modules



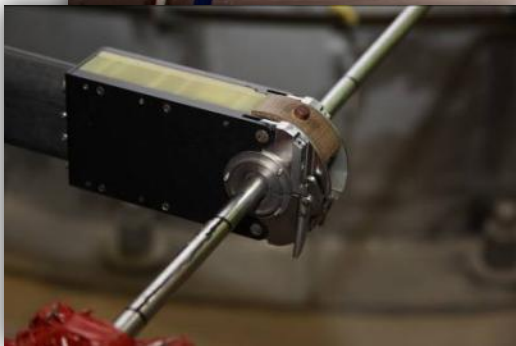


# Formwork / Rebar Installation





# Process Piping



# HVAC Components

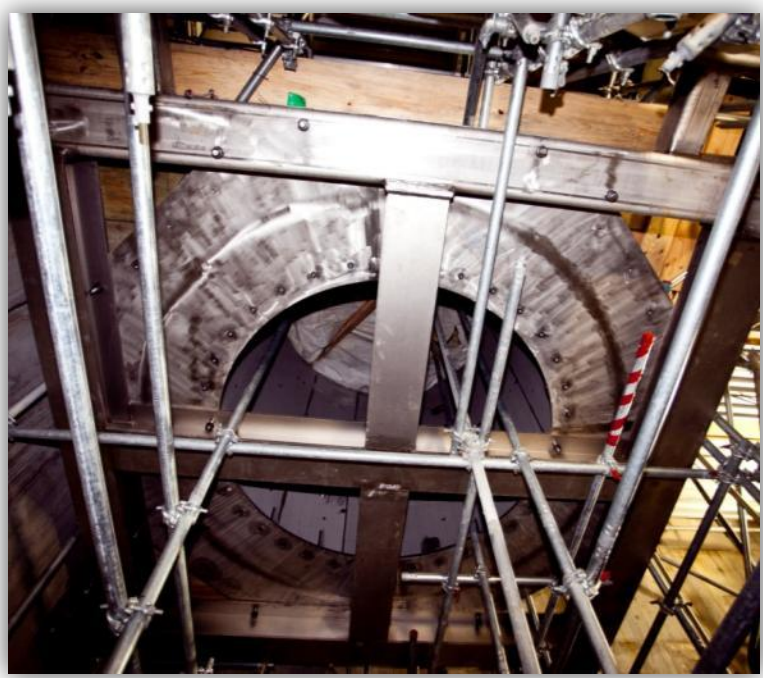
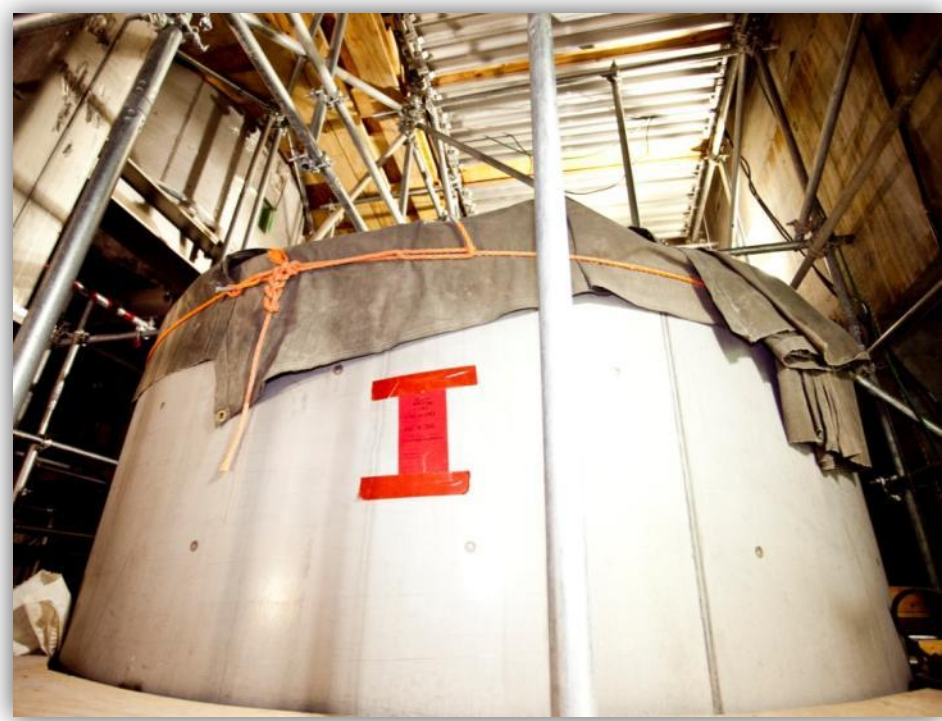




# Control Room Installation



# Tanks in the MFFF





# Mechanical Installation



# Transformer Pad Installation





# HVAC Filter Housings



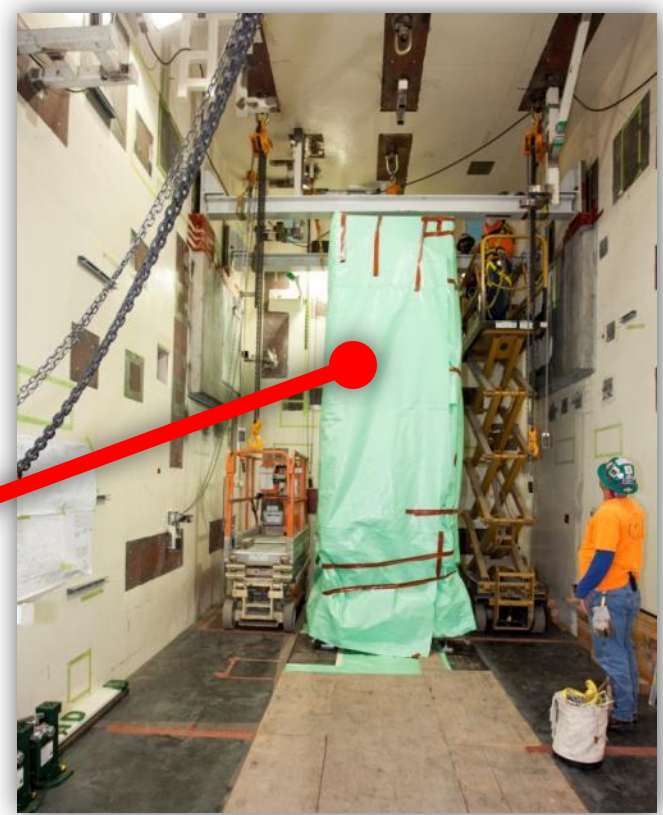
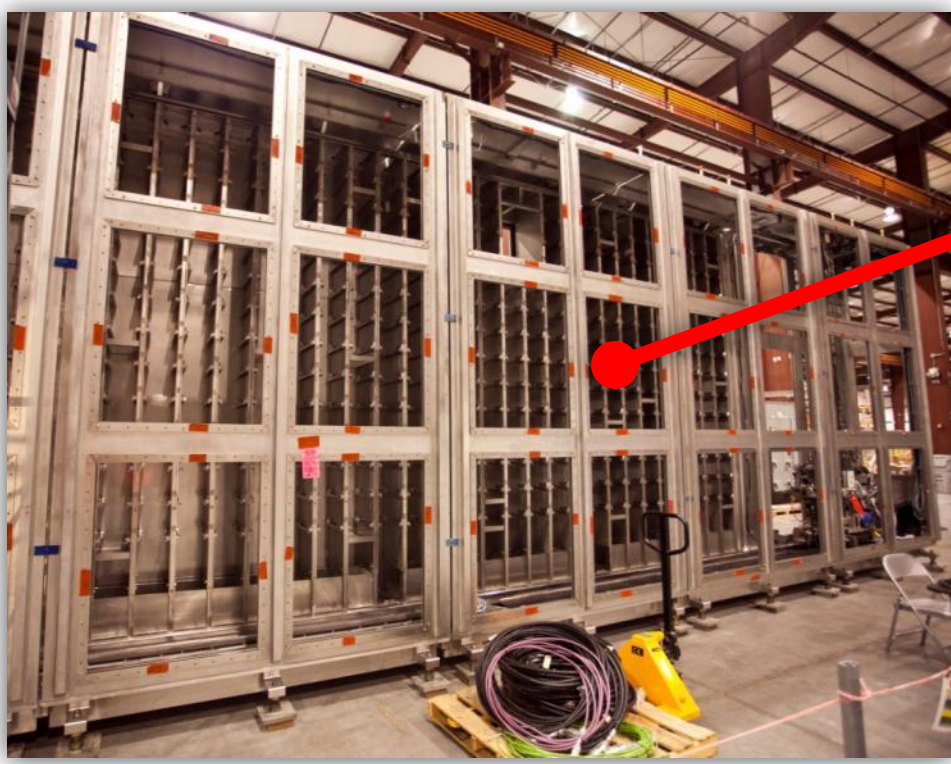
# Process Assembly Facility





# Process Unit Equipment and Gloveboxes

PSI Scrap Pellet Storage  
being installed in MFFF

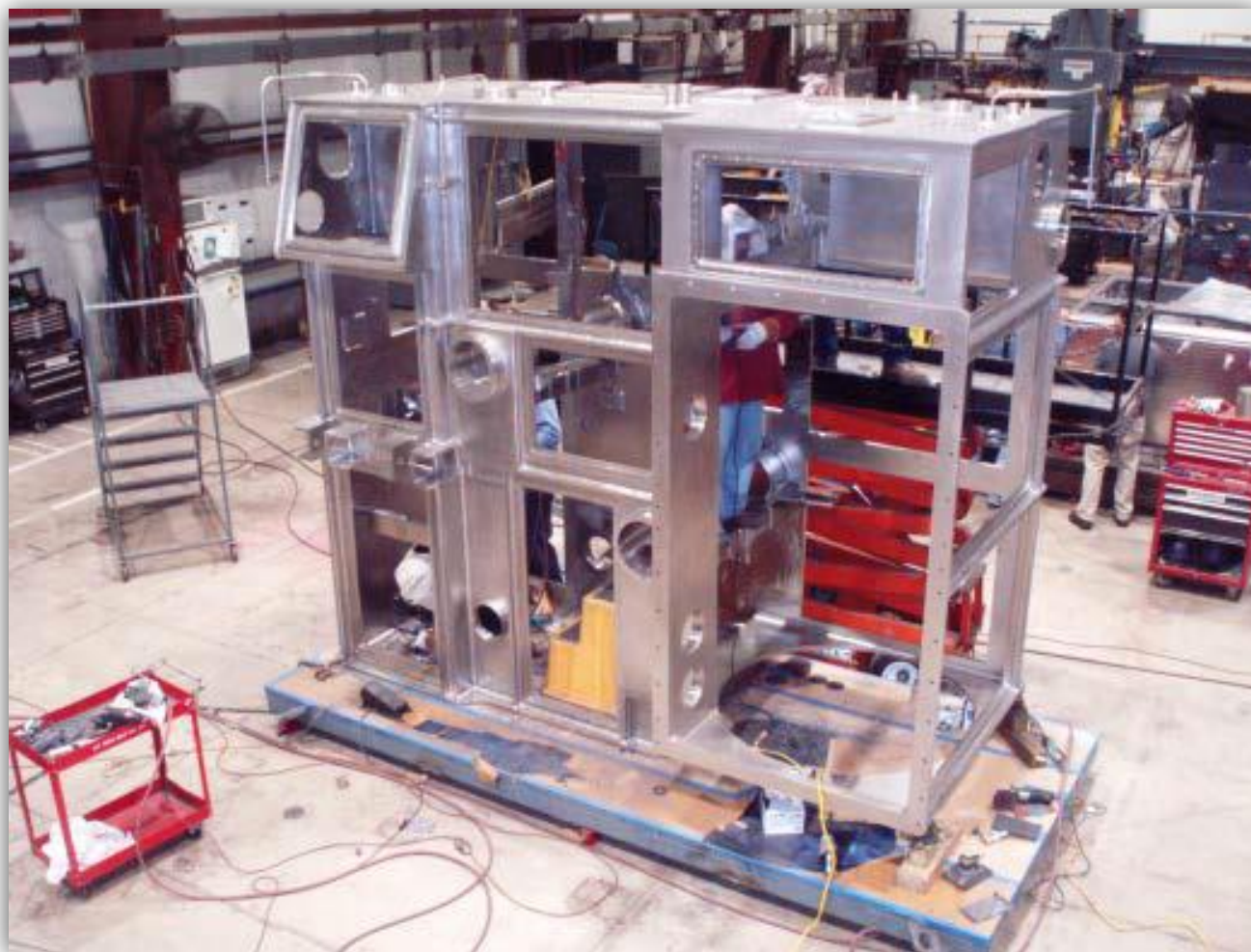




# Pellet Press



# Pellet Press (Continued)





# Automatic Liquid Sampling



# Sintering Furnace



# De-canning





# Pre-polishing/Milling

