International Isotopes Inc

We make **CLEAN** power **CLEANER**

Depleted Uranium De-Conversion and Fluorine Extraction Processing Facility

INIS

Company Information

Company Overview

- International Isotopes ("INIS") is headquartered in Idaho Falls, Idaho
- Incorporated in 1995, IPO in 1996
- The Company's core business consists of six segments:
  - Nuclear Medicine Standards
  - Cobalt Products
  - Radiochemical Products
  - Fluorine Products
  - Radiological Services
  - Transportation

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Introduction and Highlights

INIS Developing First Commercial Depleted Uranium De-Conversion Facility

Will Produce High Value Fluoride Products During De-Conversion

Provides a “Green” Recycling and Energy Savings in Manufacturing

Site Selection Complete & NRC License Application Under Review

First De-Conversion Agreement in Place with Urenco USA

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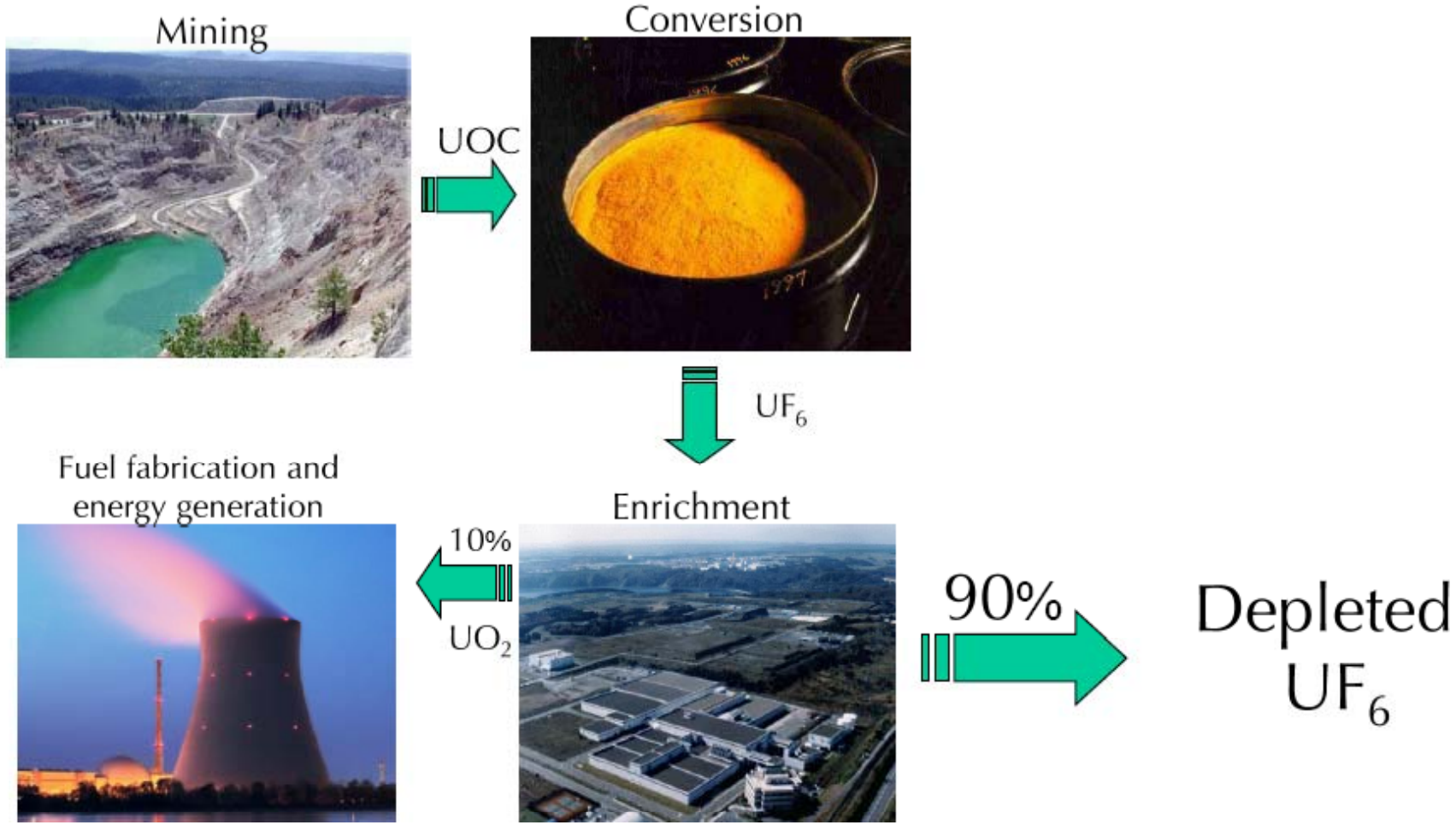
Role within nuclear fuel cycle

- The nuclear fuel cycle: mining, conversion, enrichment and fuel fabrication.
- INIS is involved with treating depleted UF_6 (DUF_6) from enrichment.



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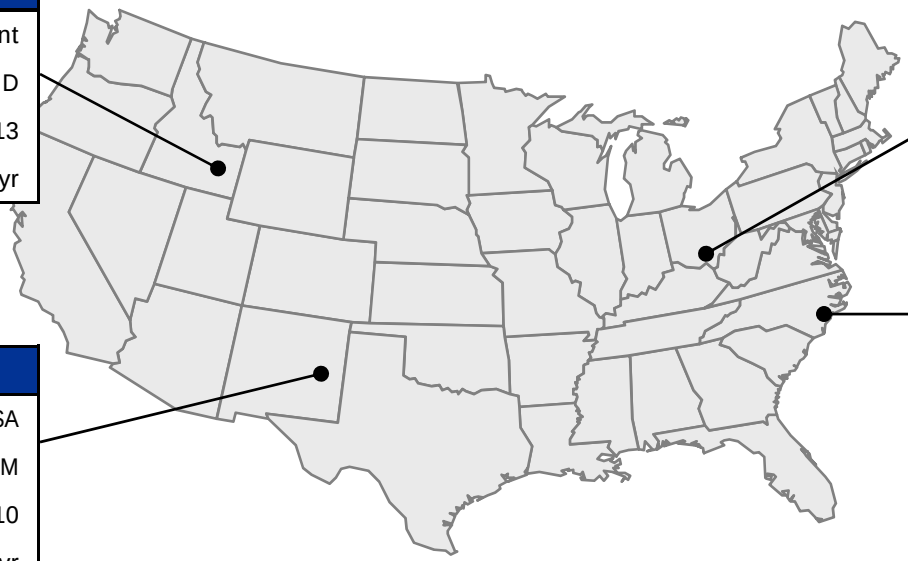
Uranium Enrichment in the U.S.

- Major effort underway in the U.S. to install uranium enrichment capacity
  - Historically, 90% of U.S. enriched uranium has been sourced from Russia
  - "Megatons to Megawatts" expires in 2013
- Four new enrichment facilities are in various stages of construction, production, or expansion
  - Estimated $12 billion in spending

Areva	
Facility:	Eagle-Rock Enrichment
Location:	Idaho Falls, ID
Start-up:	2013
Capacity:	3.0 million SWU/yr

USEC	
Facility:	American Centrifuge Plant
Location:	Piketon, OH
Start-up:	2014
Capacity:	3.0 million SWU/yr



General Electric	
Facility:	SILEX
Location:	Wilmington, NC
Start-up:	2014
Capacity:	3.5 million SWU/yr

URENCO USA	
Facility:	URENCO, USA
Location:	Eunice, NM
Start-up:	2010
Capacity:	6.0 million SWU/yr

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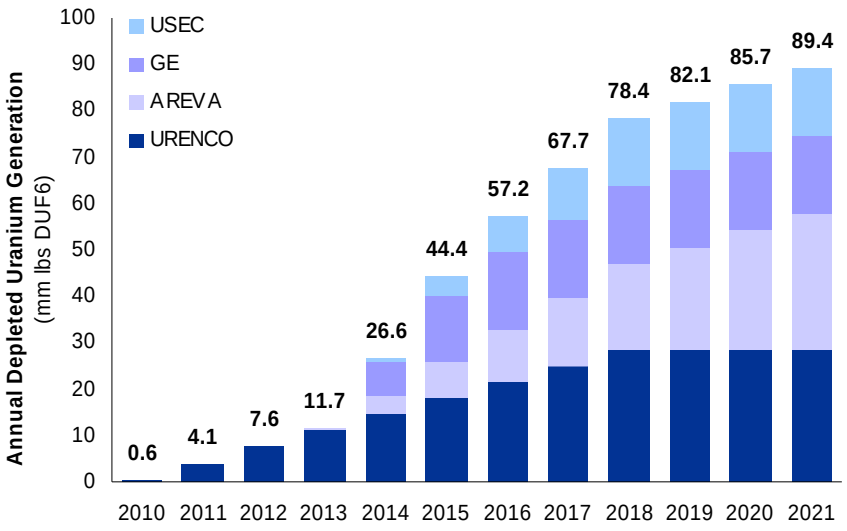
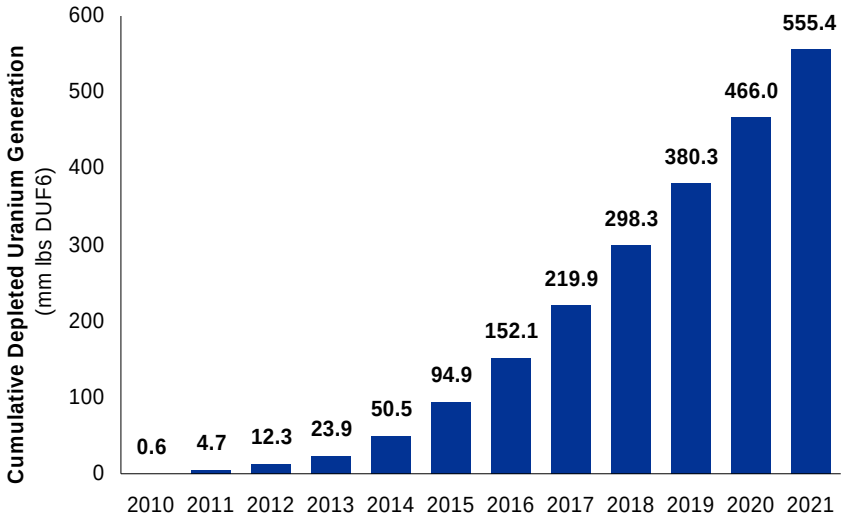
Depleted Uranium Generation

- Enrichment companies have announced capacity of >15 million SWU per annum
  - U.S. enrichment companies are expected to generate over 80 million pounds of DUF_6 annually
- In addition, the DOE has a stockpile of >1.5 billion pounds DUF_6
  - Established over a 40 year period, primarily related to U.S. military efforts

Annual DUF_6 Generation in U.S.



Cumulative DUF_6 Generation in U.S.



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Depleted Uranium Already Stockpiled

- **Historic controls for DUF_6 - Storage**
- **De-Conversion – no economic incentives**

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INIS' Unique Alternative

- INIS holds patents on a process to produce high-purity industrial gases from depleted uranium thereby increasing the economic benefit of de-conversion

- Depleted UF_6 is readily transportable by a current division of INIS that holds the required license, increasing the scalability of the proposed plant

- INIS can be operational in time for anticipated production, significantly reducing financial assurance bonding requirements

- Enrichment companies that sign de-conversion services agreements with INIS can realize the following benefits:
  - ☑ Eliminates capital cost of constructing de-conversion facility
  - ☑ Reduces financial assurance obligations for storage
  - ☑ Provides stability to waste management costs (Compared to DOE Estimates)
  - ☑ Addresses environmental concerns with long term storage

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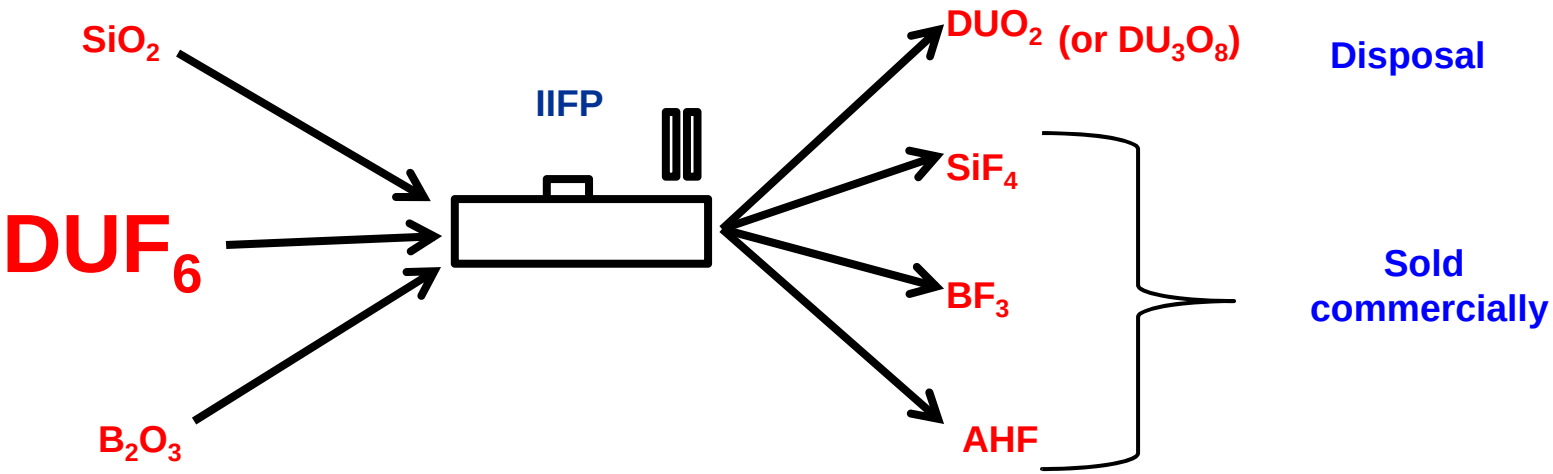
Our Commercial Process

Receipt: DUF_6 from enrichment facilities

Processing: Chemical De-conversion of DUF_6



Step 1 - De-Conversion

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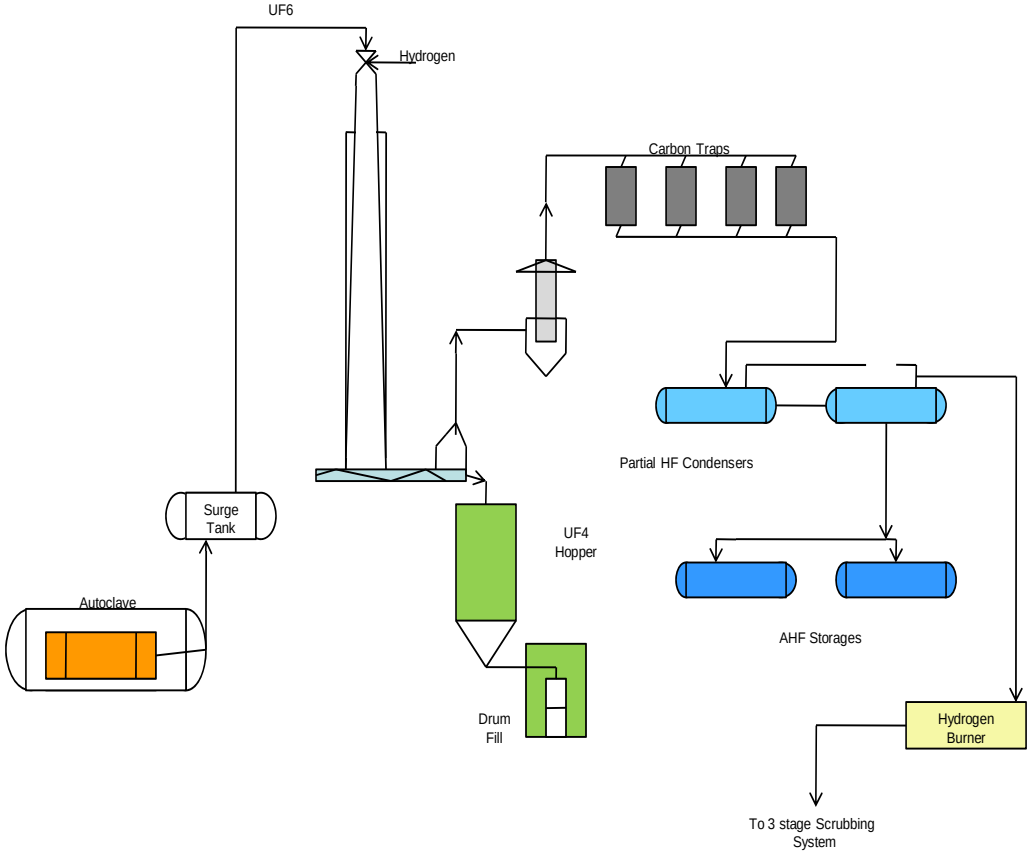
- INIS acquired assets of the only complete de-conversion plant in the U.S. in 2008
  - Most key components can be re-used
  - Will relocate equipment

UF6 to UF4 Process Flow



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Step 2 - Fluorine Extraction Process (FEP)

- The Fluorine Extraction Process (FEP) is a simple, one step reaction process between two granular solid materials
  - Depleted uranium tetrafluoride (DUF_4) and a metal oxide are heated in a reaction chamber to the appropriate temperature
  - Fluoride gas separates from uranium and combines with gaseous metal oxide
- Various ultra-pure, uranium-free, fluoride gases are produced while uranium remains in solid-state
- Exclusive U.S. Patent Technology held by INIS enhances commercial viability of de-conversion

Example Reaction - SiF_4 Production

$$UF_4\ (solid) + SiO_2\ (solid) \xrightarrow{Heat} UO_2\ (solid) + SiF_4\ (gas)$$

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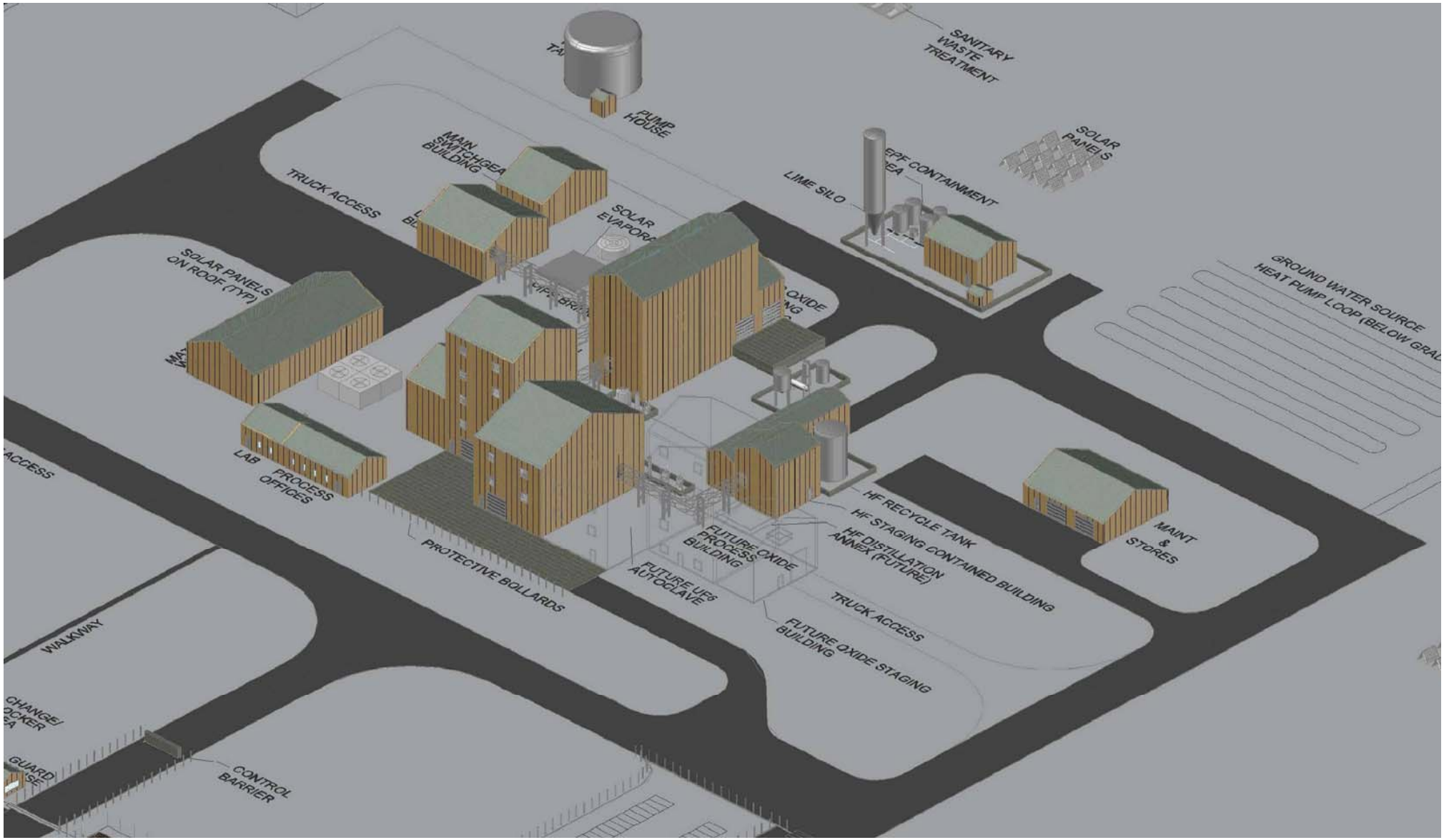
Illustrative Plant Layout



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Site Selection - Hobbs, NM

- Site Selection Criteria
  - Extensive review process
  - Broad regulatory, political, environmental considerations
- Public Acceptance
  - Over 40 meetings held
  - No negative reaction, no intervention
  - Successful outcome of NRC public meetings in the license process

Air Emissions

- **Air Emissions**
  - **Uranium – Estimated Dose Modeling = 5.11 mrem per year at 40 acre fence line**
  - **Fluorine – Estimated Release Modeling = 13.8 lb per year HF**

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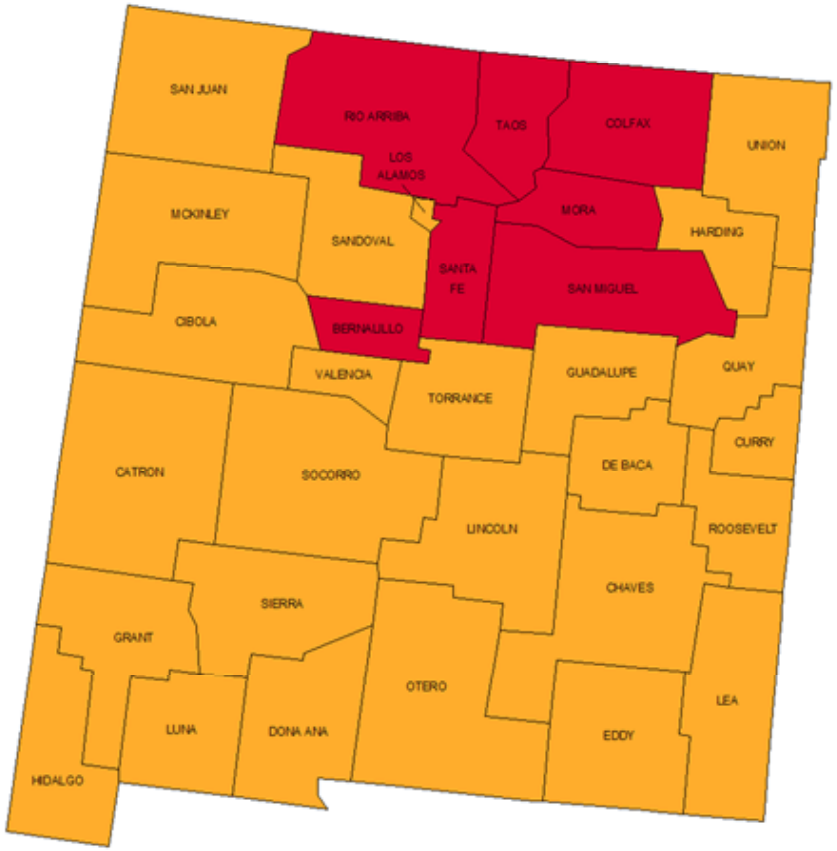
Radon Levels - New Mexico



	Zone 1 counties have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter) **(red zones)**	**Highest Potential**
	Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L **(orange zones)**	**Moderate Potential**
	Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L **(yellow zones)**	**Low Potential**

The North Central region (Albuquerque/ Santa Fe area) exhibits an average annual absorbed dose about 75 mrad

Southeastern corner of the State (Carlsbad area) measures annual average absorbed dose of about 30 mrad

Source - NCRP, 1987a

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Point Source and Fugitive HF Release – New Mexico

Facility	TRI – 2006 (lb)	TRI – 2007 (lb)
Four Corners Steam Electric Station	90,090	86,090
Giant Refining Co.(1)	58	30
INTEL Corp.	3,465	2,206
Navajo Refining Co.	347	347
San Juan Generating Station	58,000	67,000
Tri-State Generation & Transmission – Escalante Station	10,600	13,600
Total:	162,560	169,273
	IIFP Calculated:	**14 lb/year**
(1) Name Change to Western Refining Southwest Inc. for 2007		
US EPA Toxic Release Inventory		

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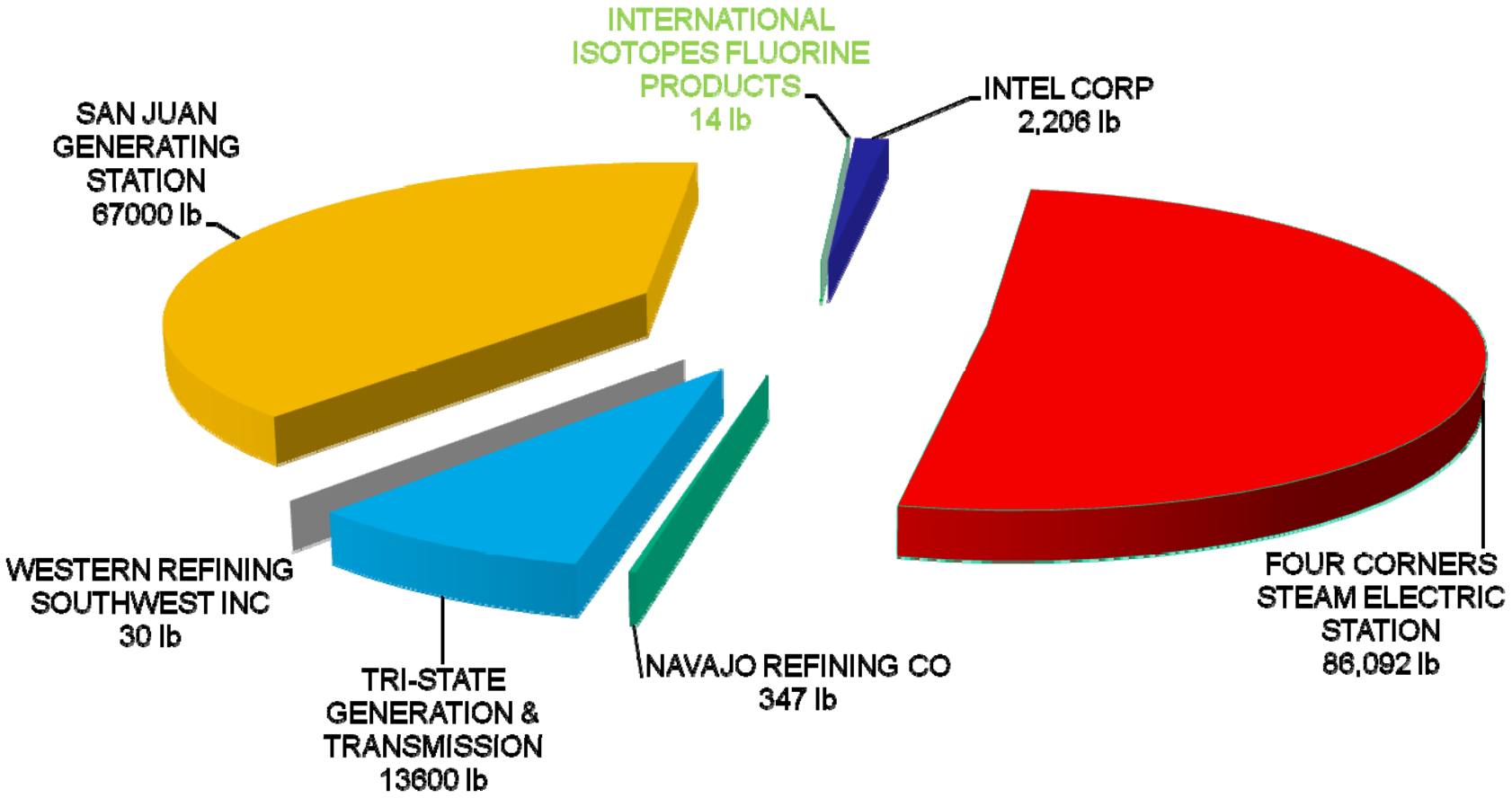
HF Emissions in New Mexico in 2007



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Water Usage & Ground Water Protection

- **Water Usage**
  - **Minimized thru process water recycling – estimate less than 10,000 gallon per day.**

- **Ground Water Protection**
  - **<u>Zero Discharge</u> of Process Waters**
  - **Storm water basins designed for 100 year rain fall**

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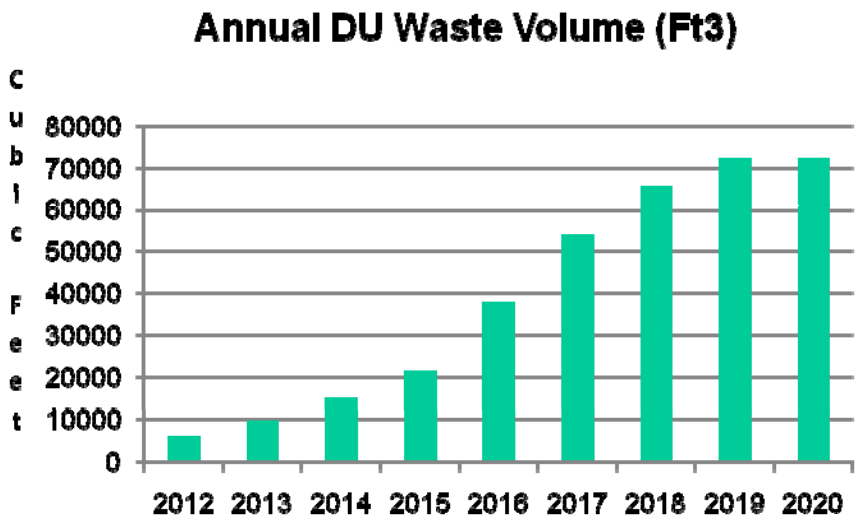
Depleted Uranium Oxide Waste Disposal

- Depleted uranium oxides are chemically stable
- Uranium waste is shipped to licensed disposal site(s)
  - Utah – Energy Solutions
  - Texas – WCS ?



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Waste Compact Considerations

- **DUF6 Import : Declaratory Order "Not a waste provided…"**

- **Waste Exporting**
  - **Request Annual Authorization**

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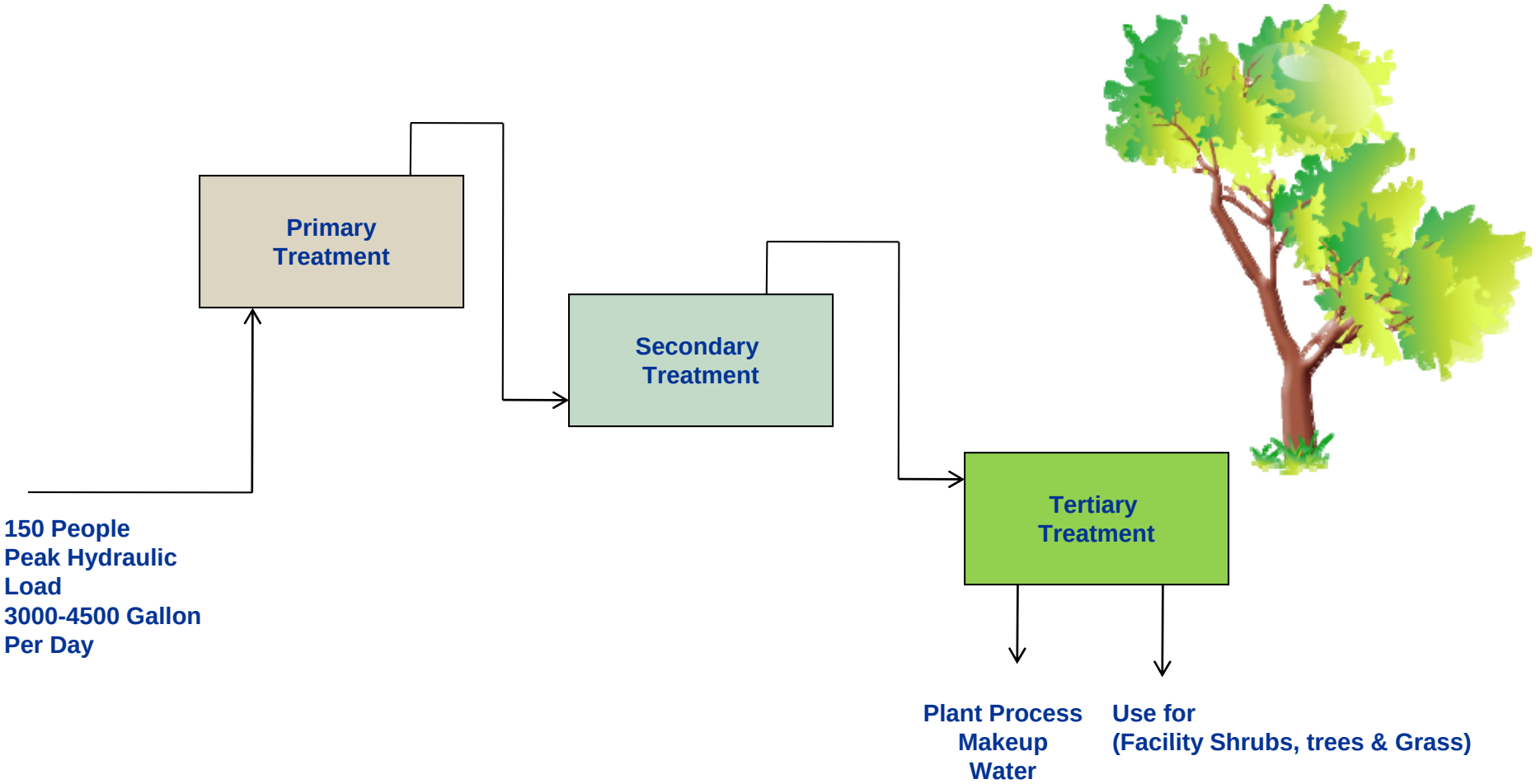
Sanitary Waste Water Treatment Flow Diagram



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Proposed Project Timeline

Issue Request For Proposal (RFP) for Design and Build Contractor	**Complete**
Select Design and Build Contractor	**December 2010**
Expected Receipt of NRC License	**Q3/Q4 2011**
Commence Construction of the De-Conversion/FEP Plant	**Early 2012**
Begin Operations	**Q4 2012**
Achieve Full Commercial Scale Operations	**Q1 2013**

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Summary Conclusions

Project is important to the Nuclear Industry as it Fills a “Void” in the Nuclear Fuel Cycle

Environmental Considerations will be given high priority

Proactive communications and public relations are key corporate considerations