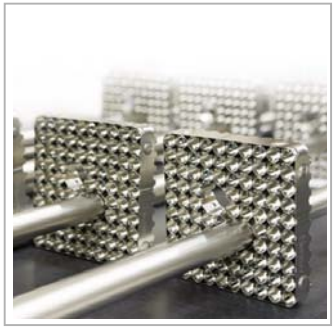
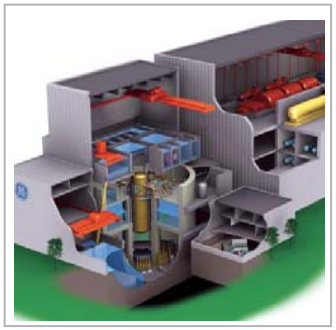
GE
Infrastructure

Nuclear Energy



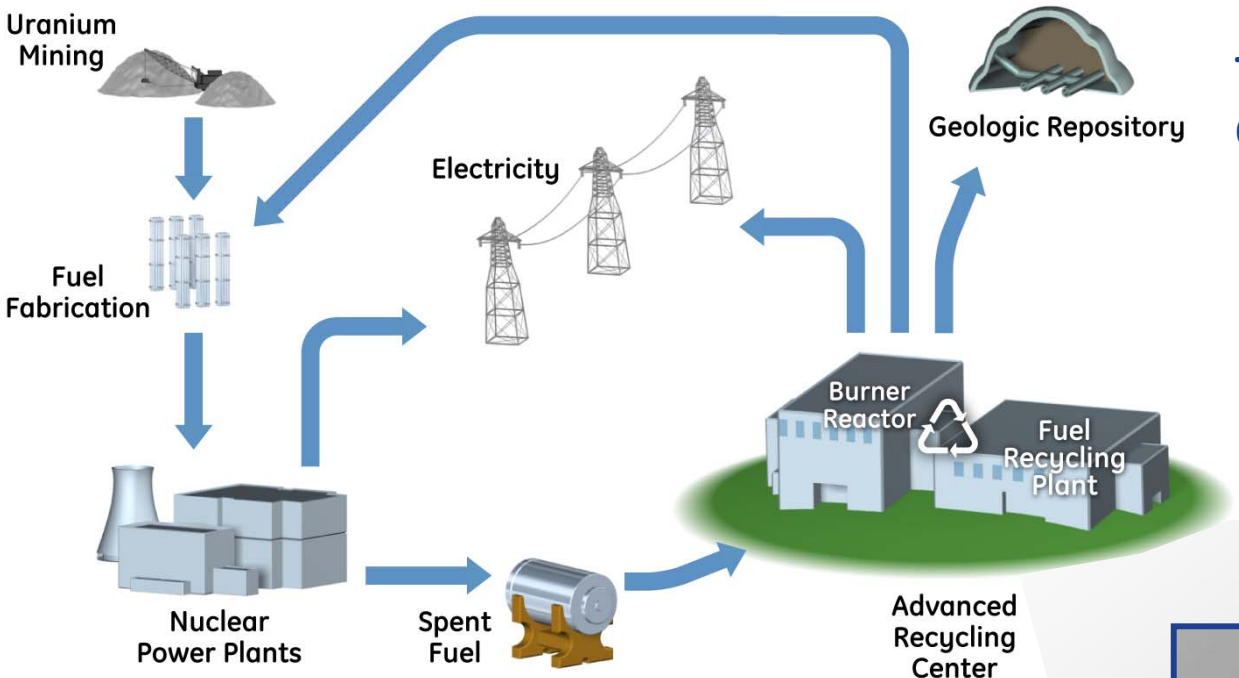



Proposed Path to Deploy GNEP's CFTC

Earl Saito Ph.D.

imagination at work

Advanced Recycling Center (ARC)



The Advanced Recycling Center…

- Integrated ABR (PRISM) and CFTC (ER)
- Separates LWR SNF
- Fabricates ABR TRU fuel
- Converts TRU to SL isotopes
- Produces electricity & other products

Fuel Recycling Plant

Advantages…

- Available technology
- Safe and economic
- Closes the fuel cycle
- Modular and scalable
- Proliferation resistant
- Previous USG R&D investment

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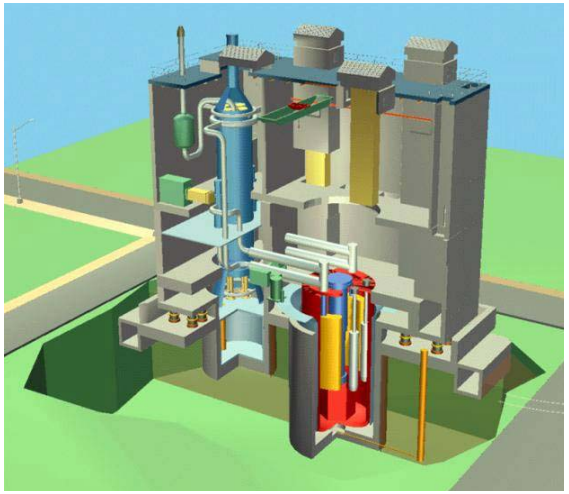
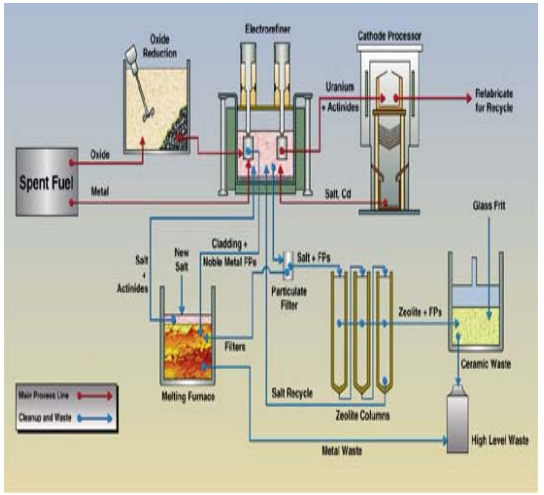
ARC Technology Solution

PRISM



+ 840 MWth & 311 MWe
+ Na cooled fast reactor
+ Passive safety
+ Modular/scalable
+ Factory built
+ Flexible fuel cycle (broad input composition)
+ Metal or oxide fuel (metal pref.)
+ Extensive component testing

Electro Refining

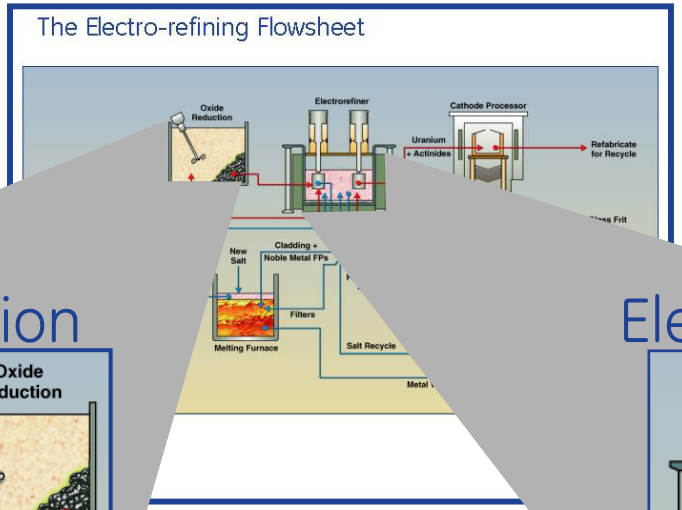


+ Modular/scalable
+ Sized to support ABR
+ Proliferation resistant
+ Continuous or batch process
+ Extensive testing in the U.S., Russia, Japan, and Korea
+ Low environmental impact

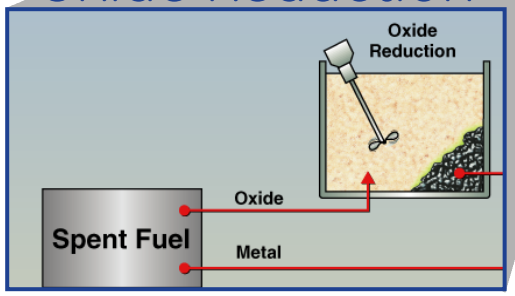
Electro-refining: The Best for Proliferation Resistance

	Weapon Grade Pu	Reactor Grade Pu	Electro-refining
Production	Low burnup PUREX	High burnup PUREX	✓ Fast reactor Pyroprocess
Composition	Pure Pu 94% Pu-239	Pure Pu 65% Pu-fissile	✓ Pu + MA + U 50% Pu-fissile
Thermal power (w/kg)	2 – 3	5 – 10	✓ 80 – 100
Spontaneous neutrons (n/s/g)	60	200	✓ 300,000
Gamma radiation (r/hr at ½ m)	0.2	0.2	✓ 200

The Electro-refiner: The Cornerstone Technology

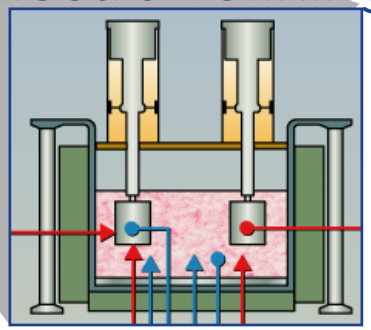


Oxide Reduction

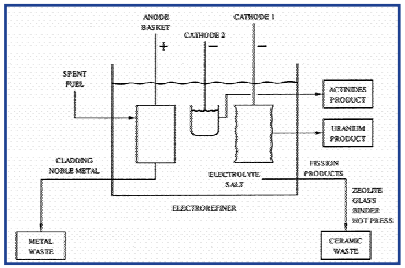


- Originally, ALMR proposed chemical reduction of oxide fuel
- Electro-chemical reduction developed based on EBRII fuel processing experience

Electro-refining



- One step separation of uranium and actinides
- Output suitable for robust waste forms



Both processes use the **electro-refiner**

The Electrolytic Oxide Reduction Process

Innovative electro-chemical process to convert oxide SNF to metal developed ANL

- Anode process produces oxygen gas which is swept from the cell:

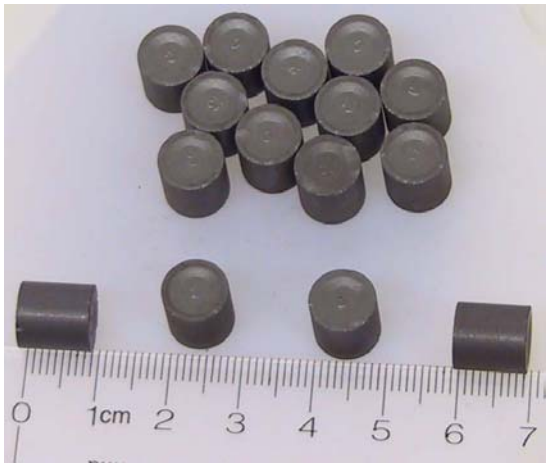
$$2\ O^{2-} = O_2\ (g) + 4\ e^-$$

- Cathode process yields metallic product suitable for electro-refining

$$MO_X\ (s) + 2xe^- = M\ (s) + x\ O^{2-}$$

- LiCl @650°C solvent

Useful for converting oxide SNF from an ABR or LWR including MOX



Urania feed material


Reduced product

Oxide Reduction Technology Status

ANL lab-scale cell studies

- Complete reduction of UO_2 demonstrated at kilogram scale
- Complete reduction of $UO_2 – PuO_2$ demonstrated at gram scale
- Alkali and alkaline fission products do not effect conversion process

ANL high capacity cell studies

- Kilogram-scale demonstrations of process yielded high current efficiency and efficient oxygen gas removal from cell
- Cells designed to collect fundamental data

Metallic uranium product from high-capacity reduction cell test

Licensing Path

Demonstrate electro-reduction at Wilmington using current SNM license.

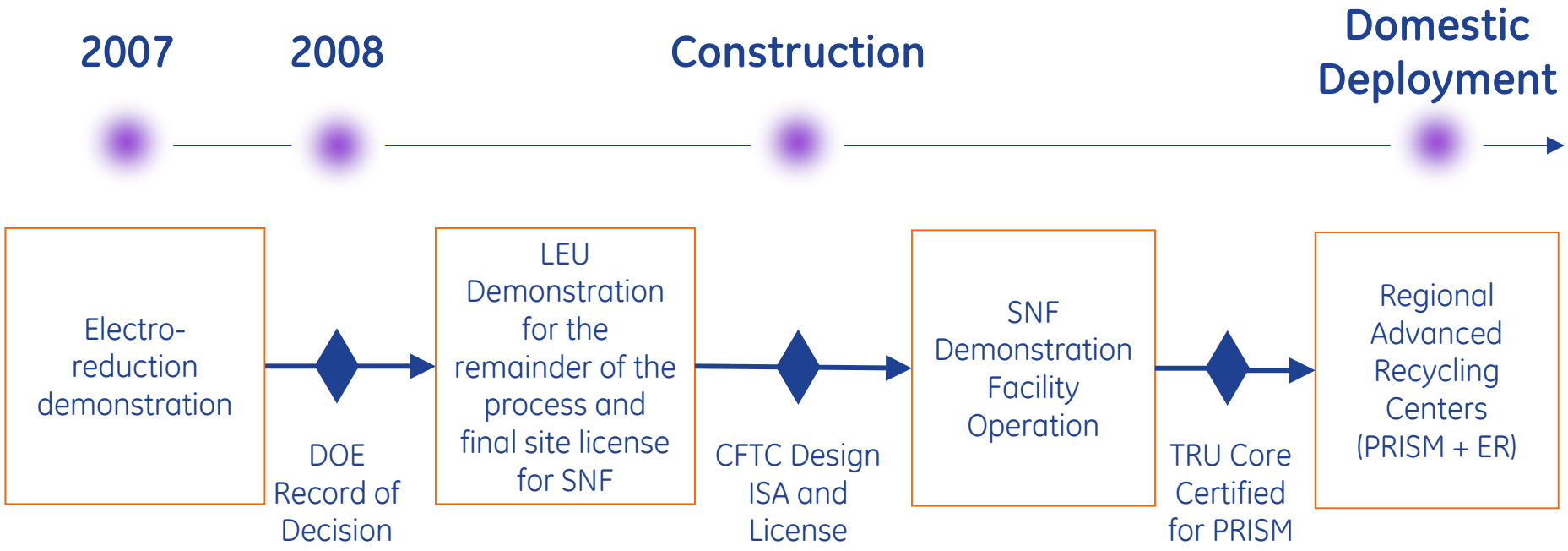
Update Integrated safety analysis for site. In addition, perform criticality analysis for Spent Nuclear Fuel (SNF) to assure design is robust enough to be used at future site.

License at final facility for SNF

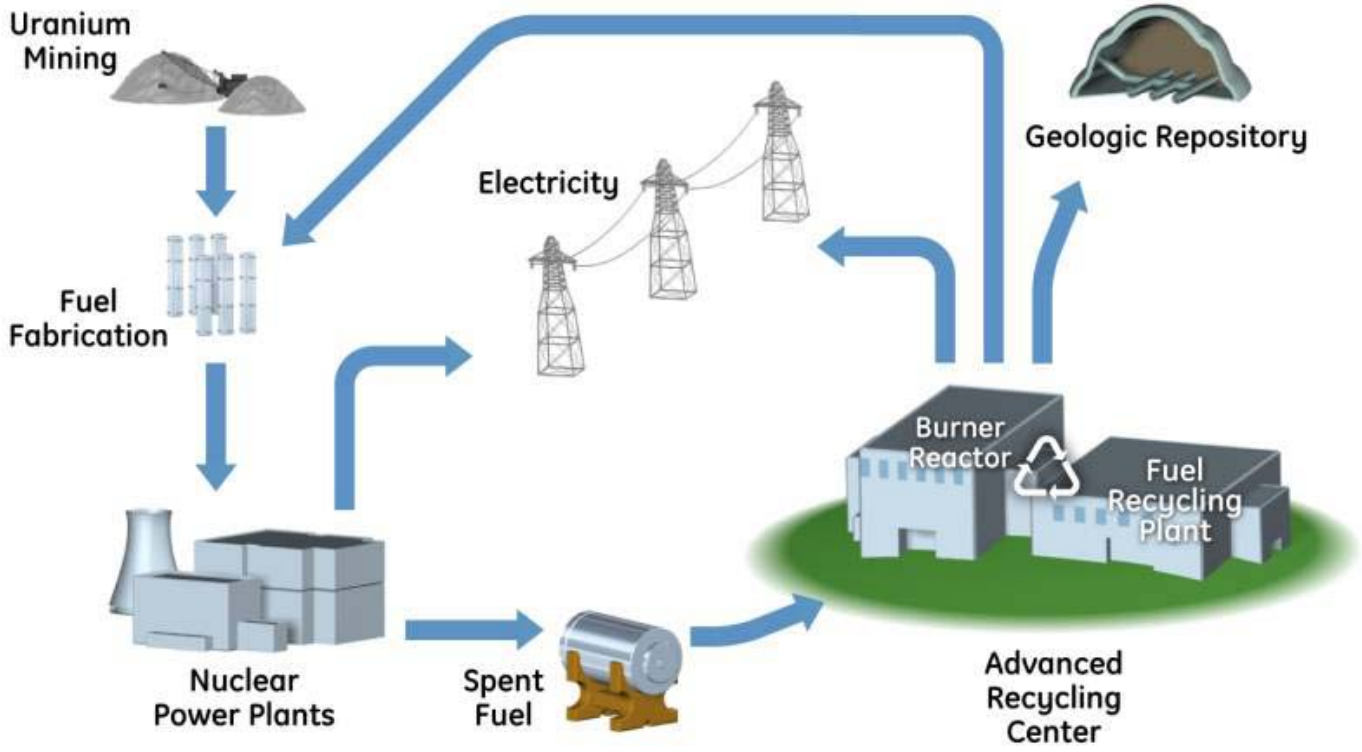
Complete Site license using lessons learned in Wilmington

imagination at work

High Level ARC Deployment Plan



Summary



Electro-refining…

- Ideal for fast reactors and metal fuel
- Removes all actinides together
- Can process LWR SNF using proven technology
- Low environmental impact

GE's Approach…

- Integrated solution
- Available technology
- Excellent site for deployment