

Fuel Cycle

Sustainability of Fuel Supply

- There are relatively few research reactor fuel suppliers in the world
 - This represents an impact on availability of RR and utilization (Mogg production)
 - Currently, no qualified supplier of U-Mo fuels and there is very little pilot plant experience for full size elements (reliability and fuel costs)
 - HEU to LEU conversions supplied fuels for existing reactors extending their lifetimes but there is no financial incentive to produce fuel for some LEU cores because the market is too small

Recommendations

- IAEA could provide survey of RRs that have unusual fuel designs to examine potential market to suppliers
- IAEA could support core re-design analysis to convert some RRs to new fuel design (LEU to LEU conversions)
- Could IAEA provide fuel support cost share to facilities under a TC project?

Closed or Open Fuel Cycle

- What is final disposition of RR fuels?
 - Reprocessing is not currently considered for U-silicide, ZrH or U-Mo. This may represent a vulnerability to reactors in the future.
 - IAEA should examine the return of all RR fuels, not just U.S. or Russia source. What is the return policy for MNSR?
 - Current political focus is on return of HEU fuels but some LEU fuel has been stored for 40+ years and must be considered for fast-track disposition.

Recommendations

- Coordinate the design and safety analysis for dry storage casks to remove aluminum clad elements from wet storage until final disposal
- Consider a CRP to investigate reprocessing pathway for high density LEU fuels

U.S. Foreign RR SNF Returns

- Current program
 - Remove from core or shutdown by 2016
 - Fuel must be shipped by 2019
- At this point, it is too early to discuss another extension of the program but it would be wise to try and ship before 2019
- (Sean's Opinion) State Governors may limit future shipments or Yucca licensing may impact after 2019

Foreign Research Reactor Fuel Shipped to Savannah River Site (MTR)

Year	Country	# of Casks	# of Assemblies
1996	Chile, Columbia, Germany, Sweden, Switzerland	8	280
1997	Canada, German, Italy, Japan, Spain, Sweden, Switzerland	15	542
1998	Australia, Denmark, Germany, Greece, Italy, Sweden	11	549
1999	Denmark, Germany, Indonesia, Japan, Philippines, Portugal, Spain, Sweden, Taiwan, Thailand, Uruguay, Venezuela	28	869
2000	Brazil, Canada, Japan, Venezuela	15	412
2001	Argentina, Austria, Chile, Germany, Italy, Japan, Netherlands	24	822
2002	Denmark, Germany, Japan, Sweden	30	1102
2004	Germany, Indonesia, Japan	17	545

Foreign Research Reactor Fuel Shipped to Savannah River Site (MTR)

Year	Country	# of Casks	# of Assemblies
2005	Japan, Netherlands, Sweden	12	449
2005	Japan, Netherlands, Sweden	12	449
2006	Argentina, Austria, Germany, Greece, Netherlands	9	338
	Total 1996-2006	169	5908

Foreign Research Reactor Fuel Shipped to Idaho National Laboratory (INL)

Year	Country	# of Assemblies
1998	South Korea	299
1999	Germany, Italy, Romania, Slovenia	646
2000	United Kingdom	90
2001	Germany	126
2003	Japan	71
2004	Indonesia	181
	Total Fuel Returned	1469

HEU to LEU Conversions

- Core conversions for qualified fuels (TRIGA or U-Al-Si) continue this past year (2008).
 - Oregon State, Washington State University Reactors
 - Uzbekistan, Argentina, Ukraine, South Africa
- High density monolithic fuels are still under development prior to qualification by U.S. NRC
 - MITR has offered to perform full core conversion when fuels are qualified

Recommendations

- Coordinate with RERTR and High Performance Reactor stakeholders (operators, regulators) as to data needed in updated conversion guidebooks.
 - The data available may not support a full safety analysis
 - If the fuel is so good, why doesn't anybody want to put a lead element in their core?

On the horizon

- Next generation actinide burners or fast reactors will be MOX fueled
 - We can expect a prototype facility to be built at some point
 - What are the proliferation issues of a research reactor partially fueled with plutonium?
 - Pu fueled critical assemblies and pulse reactors exist but what incentives exist to convert to LEU?

Recommendations

- There was a TM a few years ago on the need for pulse reactors. Outcomes?
- Higher security controls should be in place if Pu fueled facilities can't or won't convert or decommission
- Cost-benefit analysis could be funded to demonstrate if these facilities can support Gen IV designs

Questions?
