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## EPRI Perspectives on the Back End of the Fuel Cycle

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### Key Points - 1

- **Main goal: extract more energy from the atom**
  - R&D on fast reactors should be fast-tracked
    - Focus on breeding ratio  $\geq 1$
  - Keep concepts as simple as possible
    - Simplicity is critical for operational, economic, licensing, and public acceptance reasons
- In the mean time: enough U supply to last 50 to 100+ years with once-through cycle
  - Recycling in LWRs *currently* not economical – no need to rush into it (for economic reasons)

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### Key Points - 2

- All fuel cycles require disposal
  - Reducing the amount of waste is a technological optimization issue, not a resolution path for siting and licensing a centralized storage or disposal facility
  - Reducing radiotoxicity is a misleading fuel cycle goal (w/o disposal contributions taken into account)
  - A closed fuel cycle will not eliminate the need for long-term minor actinide inventory management
- Safeguards/security is NOT a discriminator

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## Current Situation

- Light water reactor technology
  - Remains technology foundation for much of 21<sup>st</sup> century
  - Industry is comfortable with technology ... It works!
- Once-through fuel cycle
  - Most economic option for at least next 50+ years
  - Uranium resources not limiting for near-term fuel cycle decisions
  - MOX use not economically competitive unless driven by external factors, such as need to manage plutonium stockpiles

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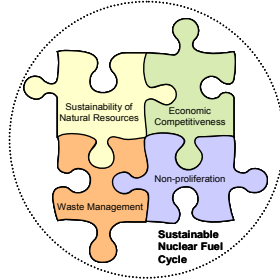
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## What are the performance criteria?

- Economic competitiveness
- Natural resource sustainability
- Waste management
- Non-proliferation
- *Safety – a mandate for all fuel cycle options*



Advanced Nuclear Fuel Cycles – Main Challenges and Strategic Choices, EPRI Report 1020307, September 2010.

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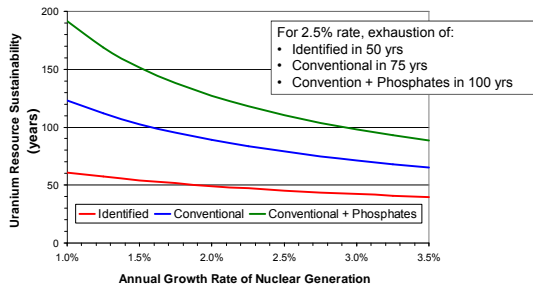
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## Natural Resource Sustainability\*



**RD&D on advanced reactors and fuel cycle technologies can help ensure fuel supply if uranium resources become limiting.**

\*Advanced Nuclear Fuel Cycles – Main Challenges and Strategic Choices, EPRI 1020307, 2010.

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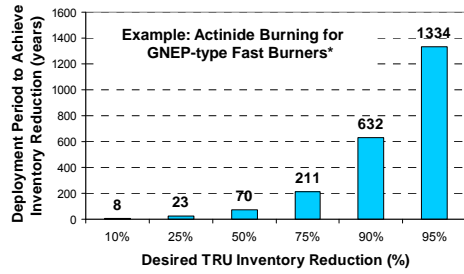
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## Waste Management



Waste management benefits are secondary. Advanced fuel cycle technologies are NOT needed for safe disposal of used fuel and high-level waste.

\*A. Machiels, S. Massara, and C. Garzenne. Dynamic analysis of a deployment scenario of fast burner reactors in the U.S. nuclear fleet. Proc. Global 2009. Paper No. 9069. Paris, France (2009).  
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## Non-proliferation

- Institutional (extrinsic) issues dominate
- Intrinsic characteristics tend to be more debated
  - fissile material attractiveness
  - self-protecting dose rate

No silver bullet: All fuel cycle options require a combination of intrinsic AND extrinsic measures.

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## How should criteria be weighted?

- **High: Economics**
  - simple, deployable; someone has to build, maintain, and operate facilities for reliable, affordable power generation
- **Medium: Resource utilization**
  - natural uranium supply not likely limiting for next 50+ years, but resource amplification represents a compelling driver for security of future fuel supply
- **Low: Waste management**
  - technical solutions for waste management exist
- **Universal: Safety and Non-proliferation**
  - must be adequately addressed regardless of fuel cycle option, not as useful for differentiating options

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