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Front-end Nuclear Fuel Cycle: The Present is the Key to the Future

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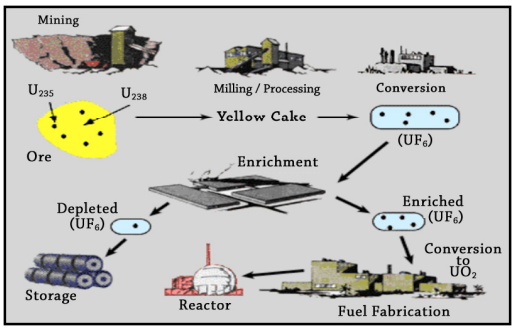
Front-End of the Nuclear Fuel Cycle – Steps in Preparing Uranium for Reactor Fuel



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Nuclear Generators Fuel Procurement Practices – Examples

- Favor long-term contracts with deliveries over many years over purchases on the spot market (spot-market purchases are for a one-time delivery generally within one year of contract execution)
- Diversify suppliers
- Seek contracts that would limit the impact of increasing price on fuel costs
- Carry some amount of strategic inventory (the amount and form varies by country policy and individual generator)

Uranium concentrate "Yellow Cake" from processing ore

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Key Factors Affecting the Nuclear Fuel Markets

- Prospects for nuclear power worldwide
  - New construction
  - Existing reactors: license renewals or retirements
  - Fukishima event is changing the way some countries view nuclear power but demand is expected to grow
- Timing of supply entering the market
  - New production
  - Commercial and government inventories
- Tails assay selected for enrichment services
- Improvements to reactor performance (higher burnup)

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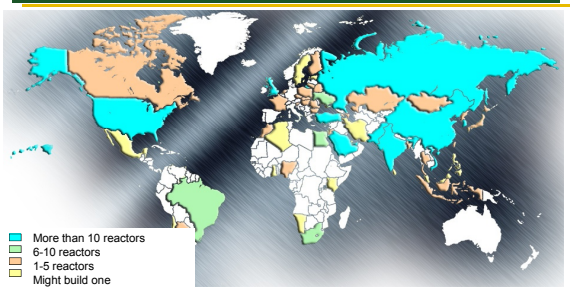
Countries That Have Targeted Nuclear Power Construction Before 2040



Source: Compiled by the Office of Nuclear Energy from various sources

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New Nuclear Facilities Are Being Built For the Long Term and Will Require Significant Capital Investments

Investments (estimated) of:

- **$5 billion to $10 billion for a Light Water Reactor designed to operate for 60 years**
- **Up to $5 billion for a fuel cycle facility with an anticipated operating life of 25+ years (uranium enrichment facility)**

Are driven by:

- **Market**
- **Regulatory certainty**
- **Financing/profit**

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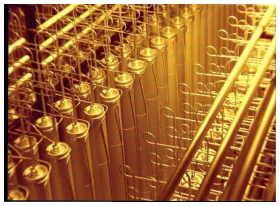
Example of Investment in the Fuel Cycle: More Efficient Gas Centrifuge Technology To Replace Gaseous Diffusion Plants

Gaseous Diffusion Cascade

Source: U.S. Department of Energy

Gas Centrifuge Cascades

Source: Urenco. Ltd.



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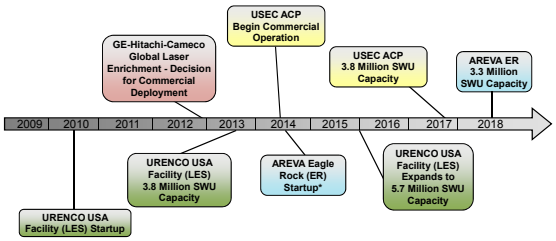
Planned U.S. Enrichment Capacity



* AREVA announced in December 2011 a deferral of construction startup for the Eagle Rock Enrichment Facility.

Source: Office of Nuclear Energy from public source information

Version: January 2012

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Conclusions

- The Future is Today: Light Water Reactors worldwide will require low enriched uranium for decades
- Nuclear power generators will continue to seek reliable and cost-effective supplies of nuclear fuel
- Customer demand and regulatory certainty will drive capital investments in fuel cycle facilities being built for long term operations
- R&D opportunities in nuclear fuels going forward but policy and implementation dominate in the near term

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