

A Utility's View on Security of Supply of Nuclear fuel

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Agenda

- Basics about nuclear fuel sourcing
- Tools for security of supply
 - Tool 1: Contract coverage rate
 - Tool 2: Selection of suppliers
 - Tool 3: Inventories
- Example of assessment of security of supply



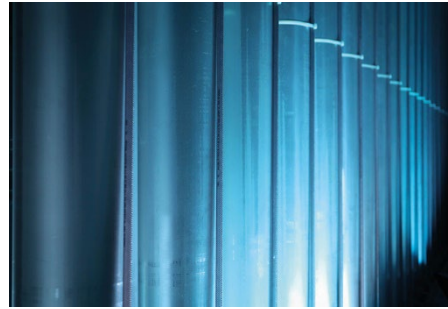
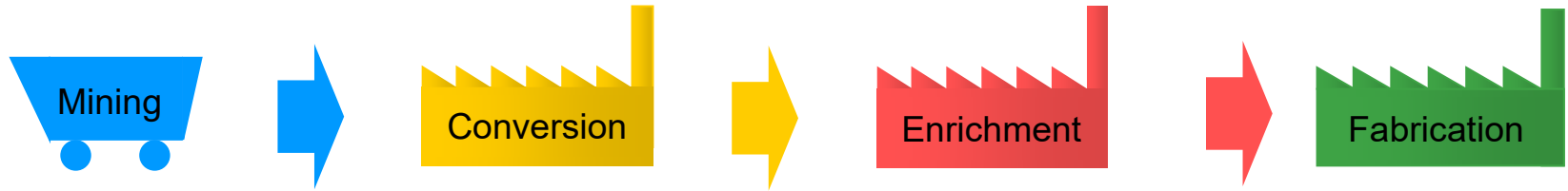
Nuclear fuel supply

- Reactor outage one time each year
- Approximately 20% of the nuclear fuel bundles are then replaced with new fuel bundles

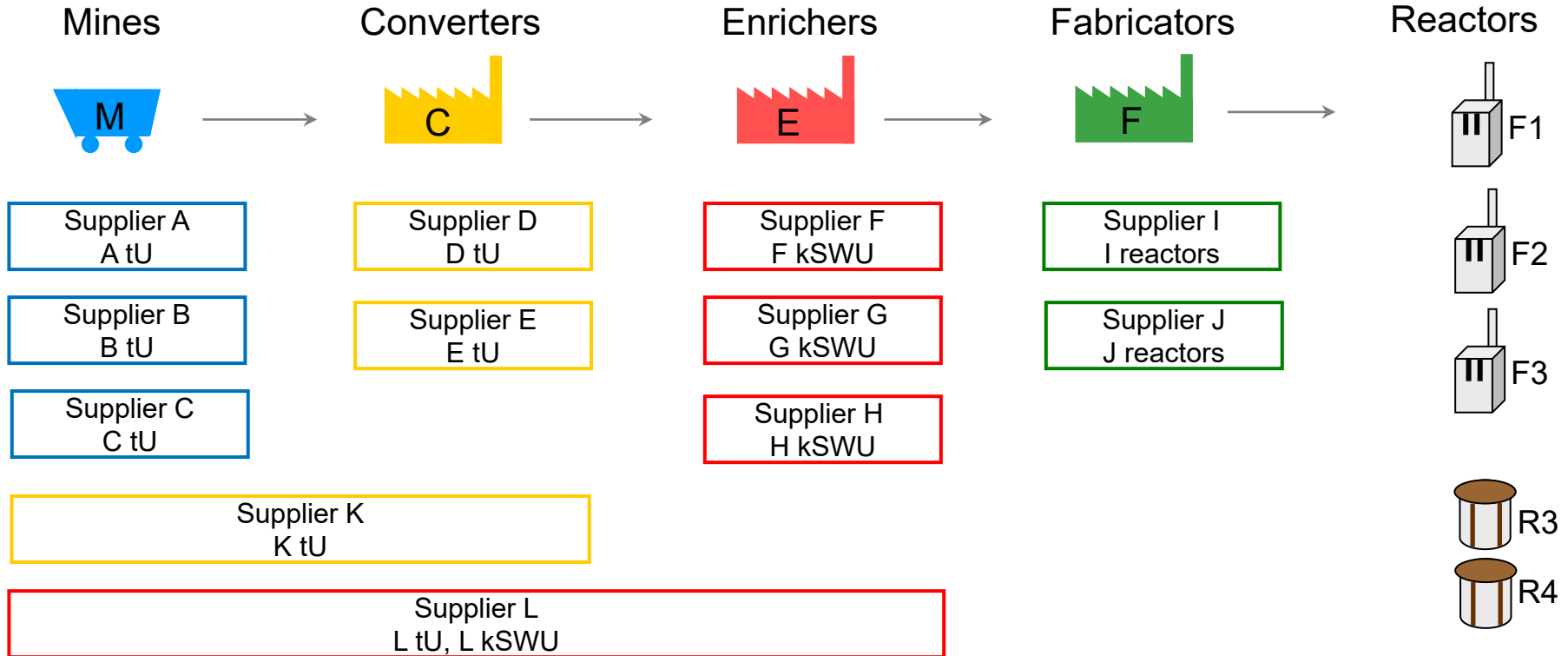
Vattenfall aims to have 2-3 fuel types from 2-3 different vendors qualified for operation in each reactor.



The front end process

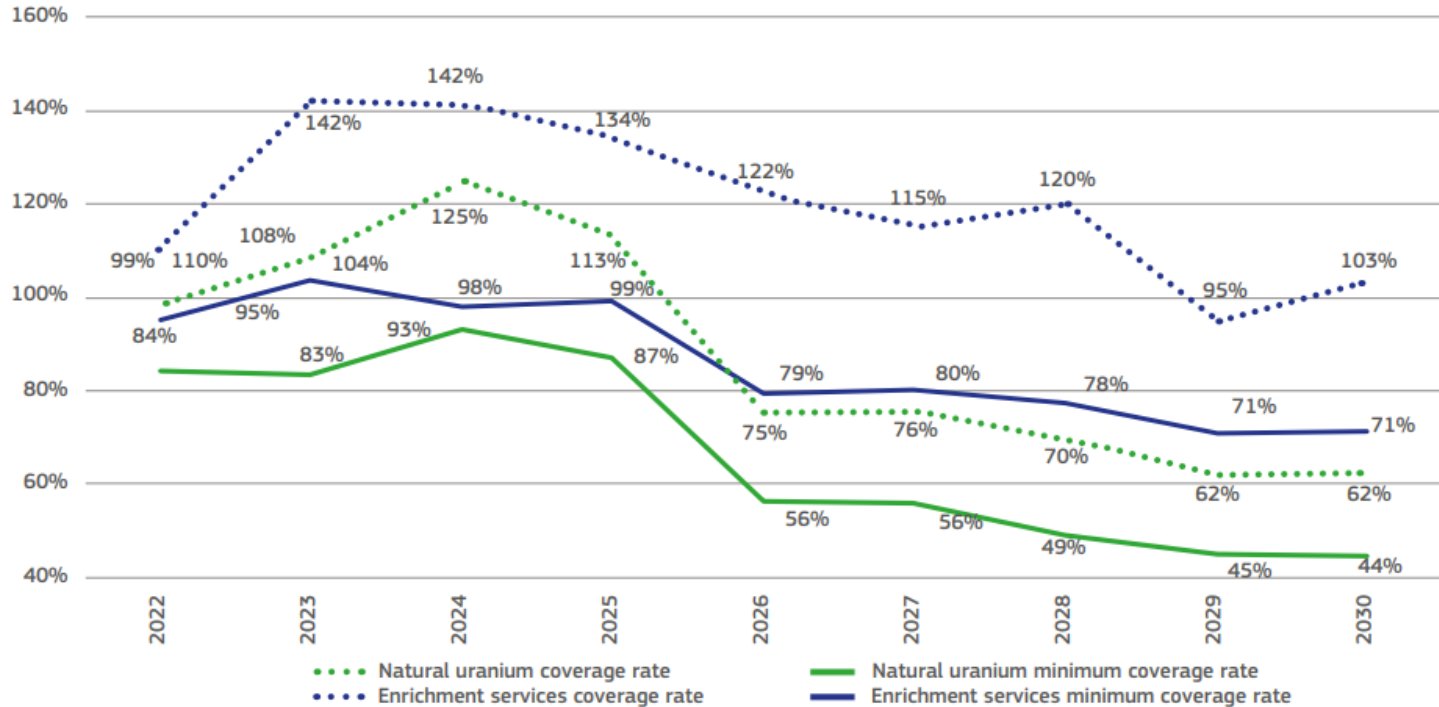


Contract structure - example



Tool 1: Contract coverage rate

Figure 9. Coverage rate for natural uranium and enrichment services, 2022-2030 (%)

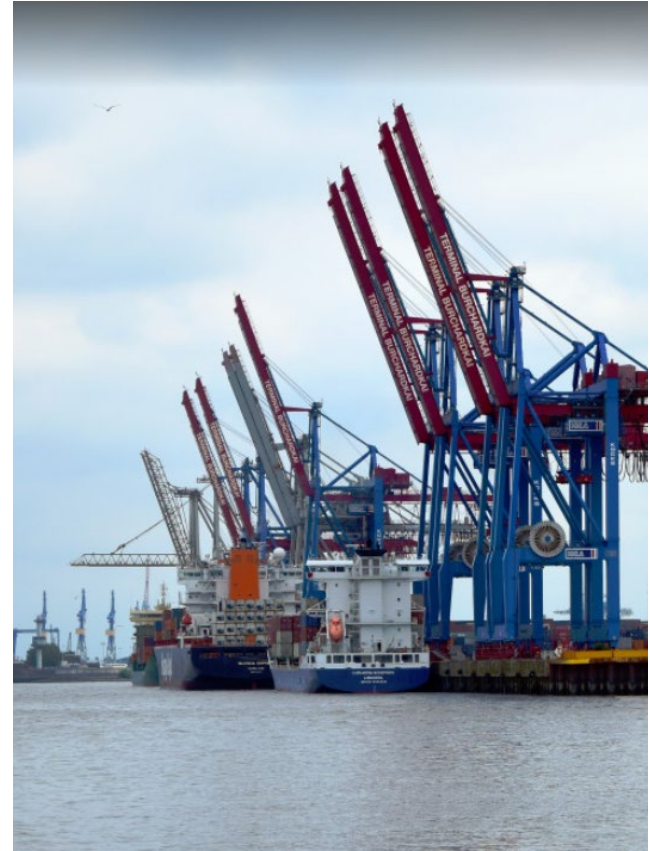


Tool 2: Selection of suppliers

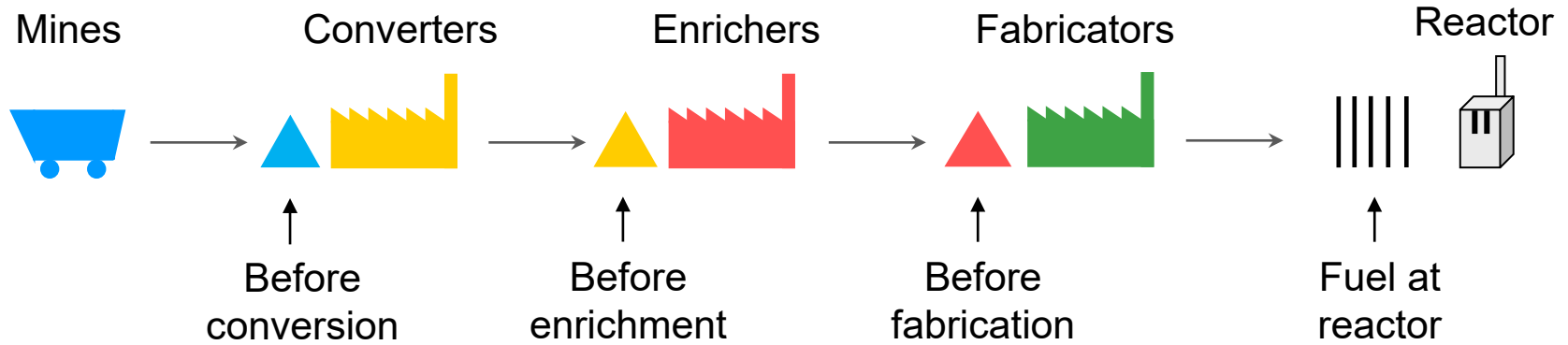
Some aspects to consider in the selection of suppliers*:

- Financial status
- Number of production facilities
- Location
 - Political situation in the country of origin
 - Risk for natural disasters
 - Risk for trade restrictions
 - Transportation risk
- Diversification

*Vattenfall also has other selection criteria, which are not related to security of supply, for example ESG related criteria.



Tool 3: Inventory



Evaluate for each stage:

- Cost for inventory
- The risk for supply disruption (geopolitical, transportation, natural disasters etc.)
- Global inventory levels and market liquidity

Inventory business case

Storage cost

Potential loss of production



- Electricity prices
- Probability for a supply disruption



- Market prices
- Cost of capital

Example: High level assessment



Tool	Mining	Conversion	Enrichment	Fabrication
1. Contracting	Less uncertain supply situation. Normal contracting.	Uncertain supply in the 2020:s. Strong contracting.	Uncertain supply in the 2020:s. Strong contracting.	Less uncertain supply situation. Normal contracting.
2. Selection of supplier	More suppliers. All factors in slide 7 can come into play.	Very few suppliers. Focus on diversification.	Very few suppliers. Focus on diversification.	Long term cooperation with fewer suppliers.
3. Inventory	Higher risk for supply disruption, but liquid market for replacing material.	Higher risk for supply disruption and low availability of UF6.	Lower risk for supply disruption.	Complicated product and logistics. Not liquid market.

Thank you for your attention.

