



SWU-mergence: Reawakening of the Enrichment Market

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Outline

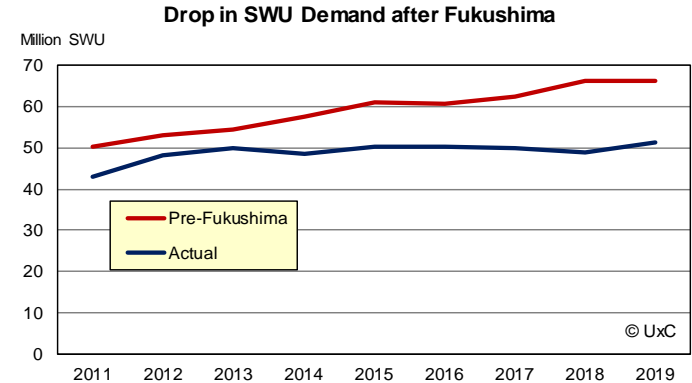
- ▶ **Historical perspective**
- ▶ **Today's enrichment market**
- ▶ **Factors leading to recent market shifts**
- ▶ **Longer term outlook**
- ▶ **Implications for uranium and conversion markets**
- ▶ **Final thoughts**





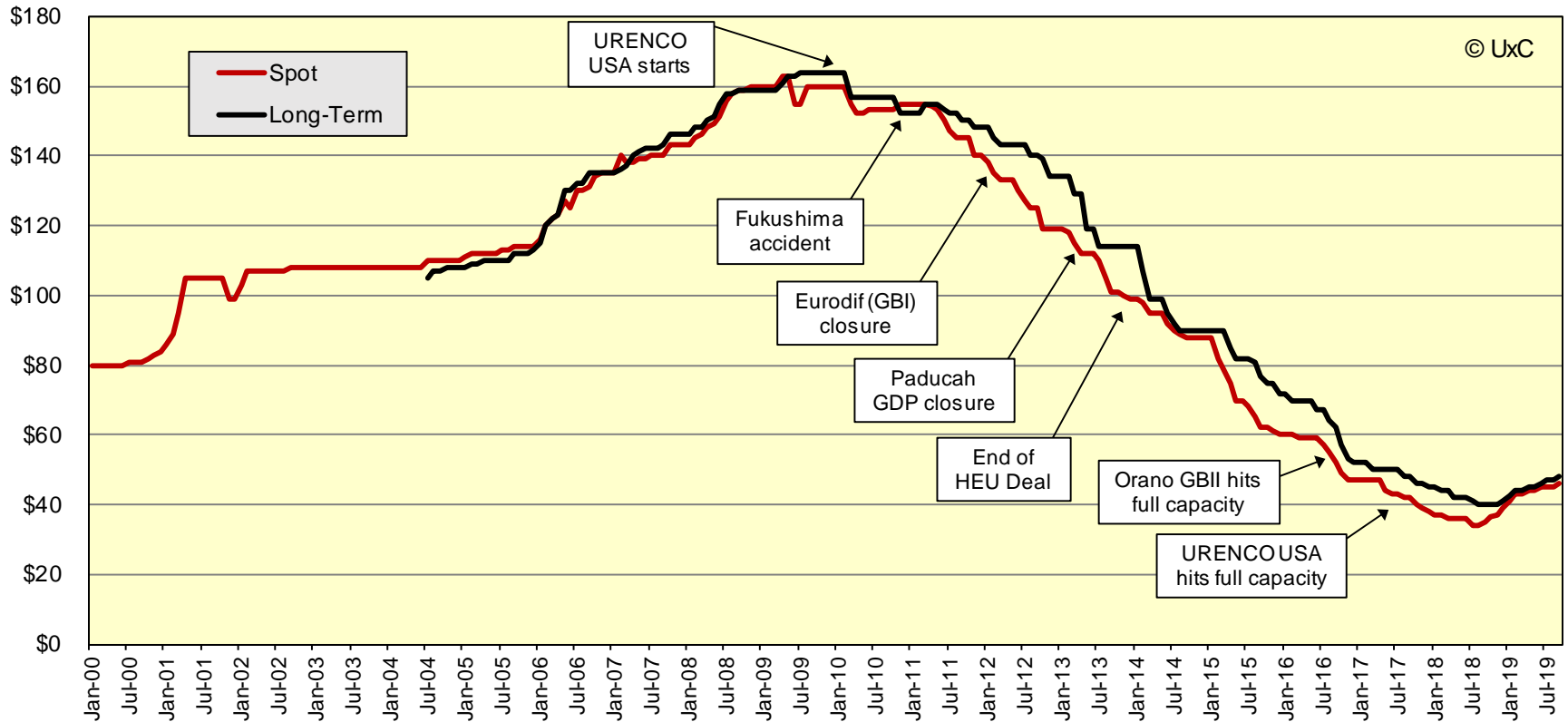
Market After Fukushima

- ▶ **Demand: Cumulative drop of 92 million**
 - Pre-Fukushima expected 532 million SWU
 - Actual demand was only 440 million SWU
- ▶ **Supply: Capacities continued to grow**
 - Some projects were canceled or delayed
 - Pre-Fukushima, UxC forecast supply at 73.5 million SWU for 2019
 - Actual current supply is 68 million SWU (up from ~58 million in 2010)
 - Most growth in China, but Russia/West also saw net additions
- ▶ **Enrichers slowly optimized capacities to align with new demand conditions, mainly by employing lower operating tails**
- ▶ **Prices for SWU continued to fall precipitously and enricher roles in uranium and conversion markets increased dramatically**





SWU Prices: 2000-2019





Centrifuge Installations Since 1990

Average centrifuge lifetimes: 20-30 years

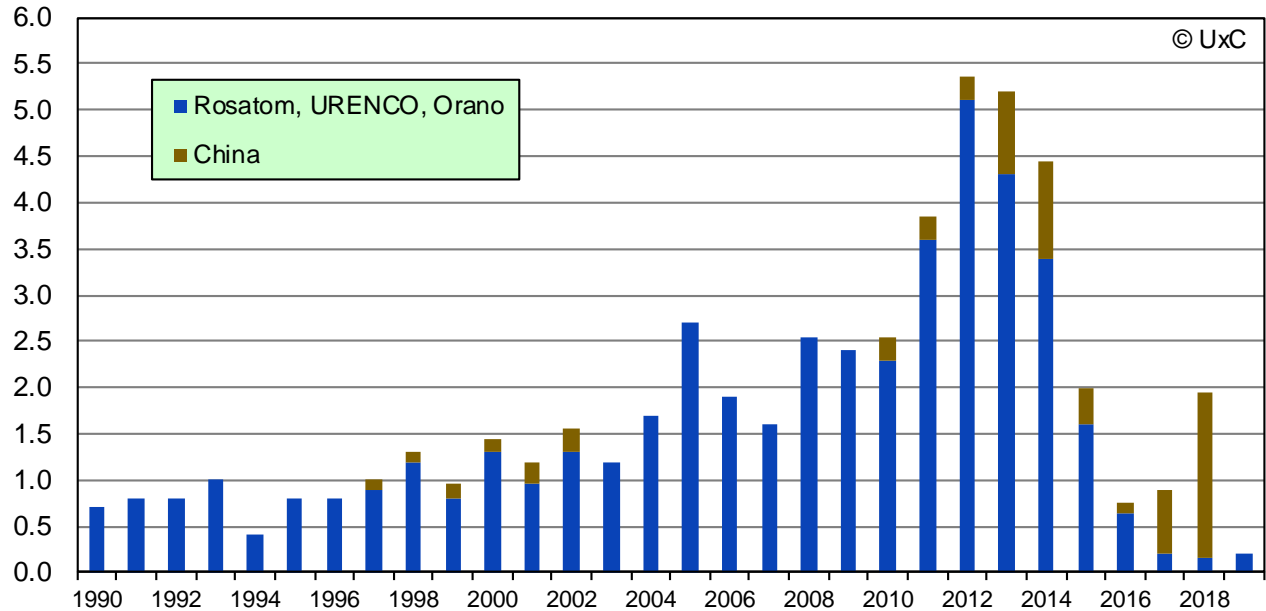
83% of non-China capacity added since 2000

70% of non-China capacity added since 2005

Current primary supply in million SWU (share):

Rosatom:	23.6 (40%)	} 85%
URENCO:	18.6 (32%)	
Orano:	7.5 (13%)	
CNNC:	7.1 (12%)	
Centrus:	1.5 (2.5%)	
Others:	0.6 (0.1%)	

Million SWU





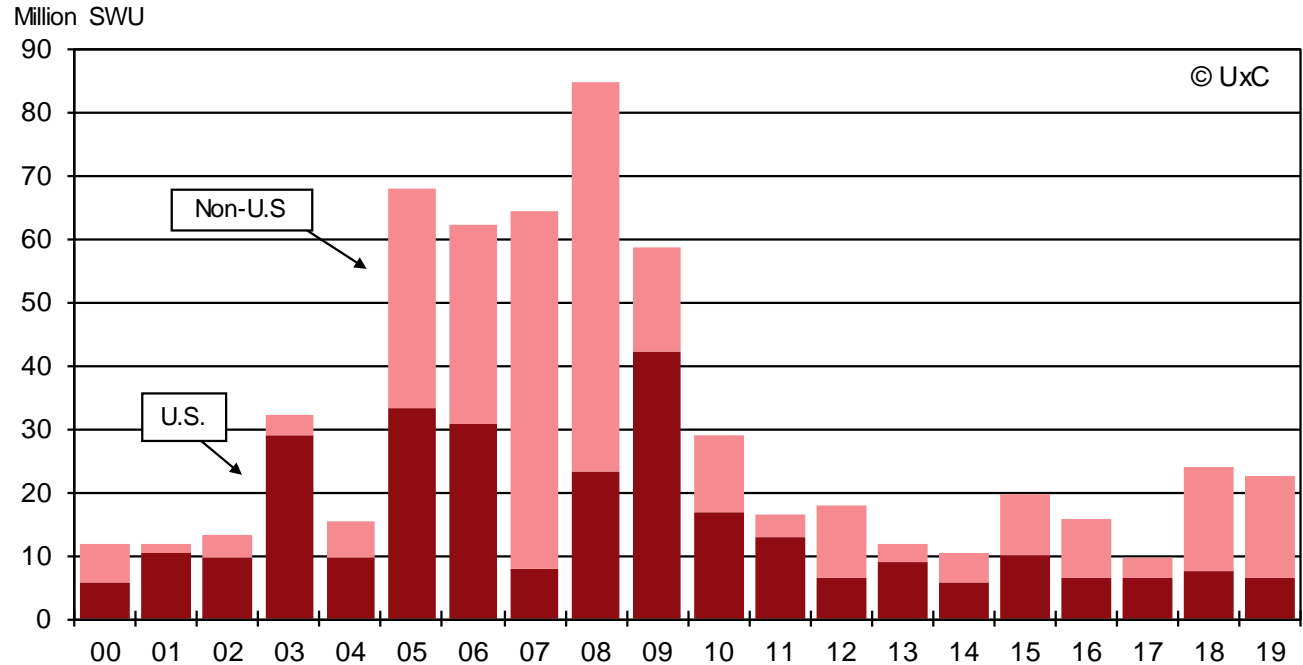
Long-Term Contracting Since 2000

2003-2010 contract volumes account for ~415 million SWU. Many with deliveries beyond 2020.

Since Fukushima, blend-and-extend has added volumes to legacy contracts.

Slight pick up in activity since 2018.

China demand largely inaccessible to major global enrichers.

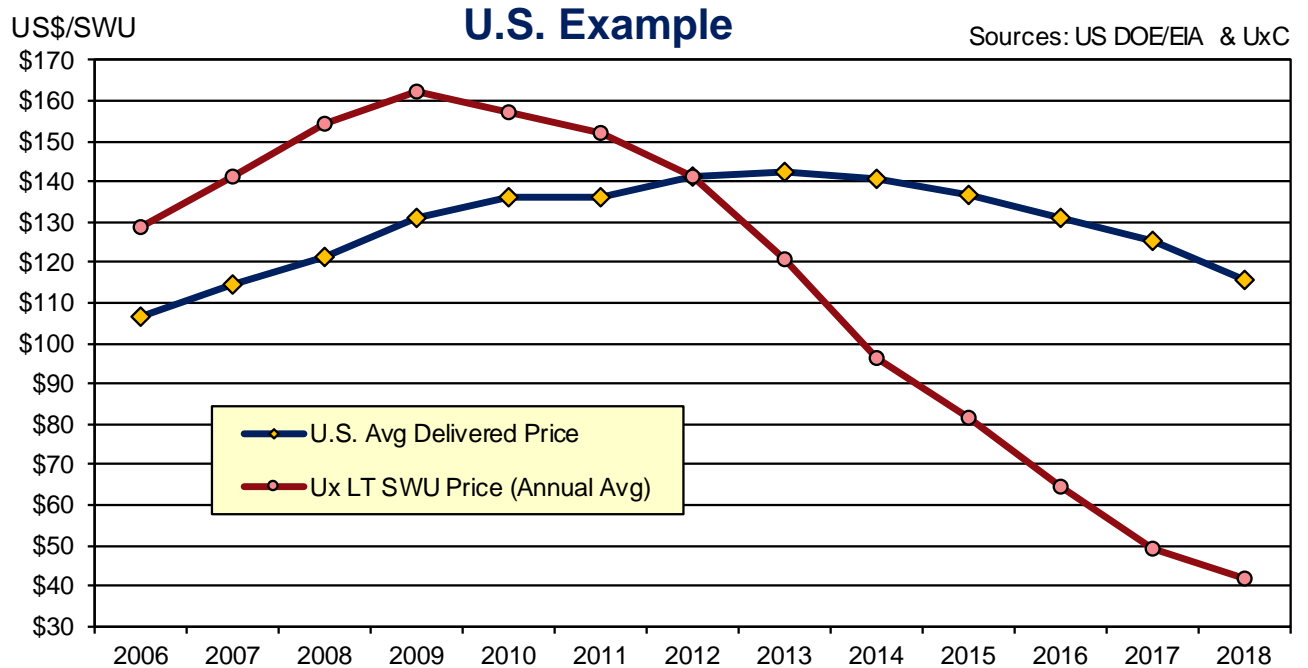




Average Delivered SWU Prices

As legacy contracts with high base-escalated prices have persisted, utilities around the world have continued to pay well above market since 2012.

Suppliers have been able to rely on higher prices given legacy contracts and recent extensions.





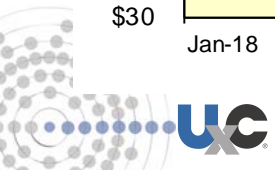
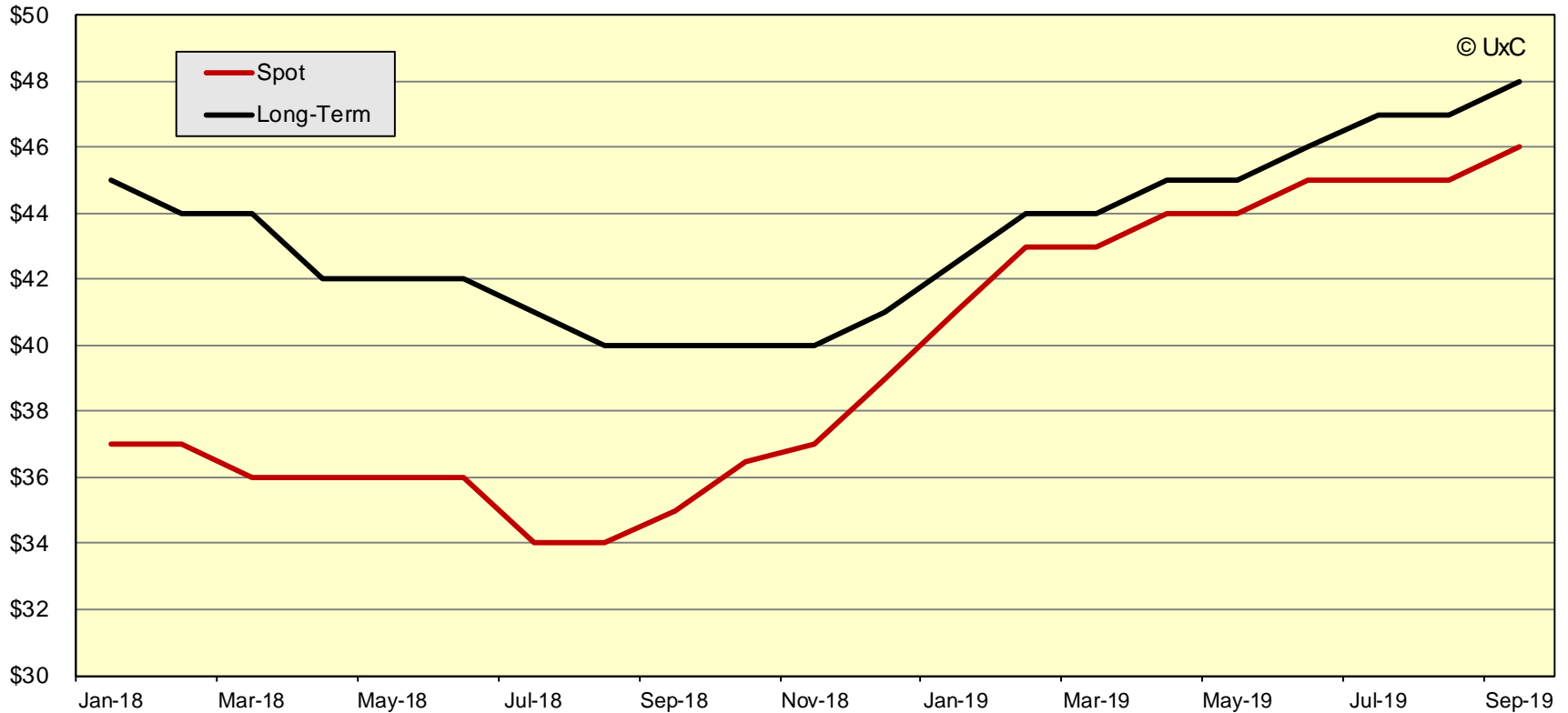
Recent Market Shifts

- ▶ **Spot SWU/EUP has seen significant reduction in available supplies due to increased purchases and drawdowns of utility and supplier inventories**
- ▶ **Enrichers have optimized production and aligned future output with SWU & UF₆ sales → excess capacities have been effectively managed**
- ▶ **Enrichers are no longer aggressively pursuing each new sales opportunity**





Recent SWU Prices: 2018-2019



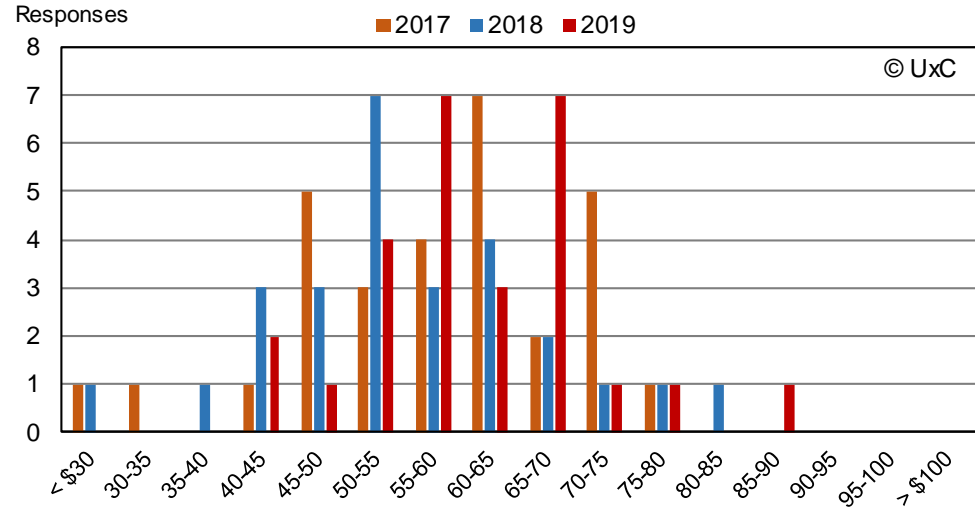


Latest Market Views

▶ **Market participants are beginning to recognize the likelihood of future SWU price increases primarily due to:**

- Expiring legacy contracts
- Prices at or below production costs
- Need for future capacity replacements

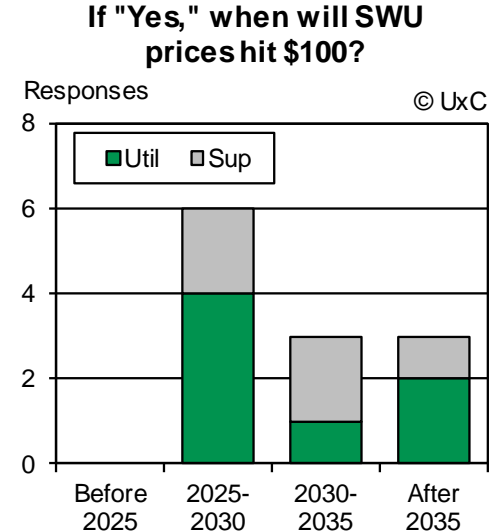
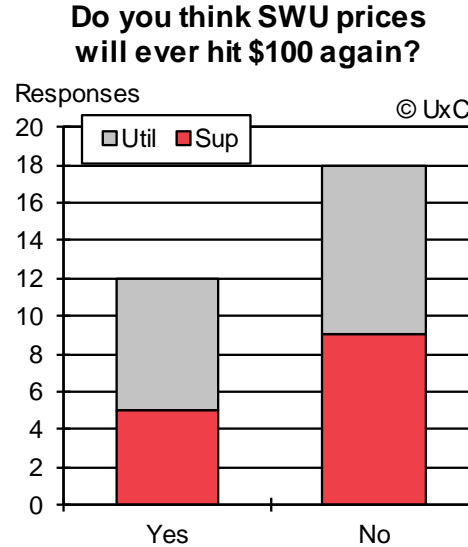
Where do you see LT SWU price in 5 years?





Latest Market Views (cont.)

- ▶ **However, price expectations remain relatively subdued, and fewer believe \$100+ SWU prices are possible anytime soon.**

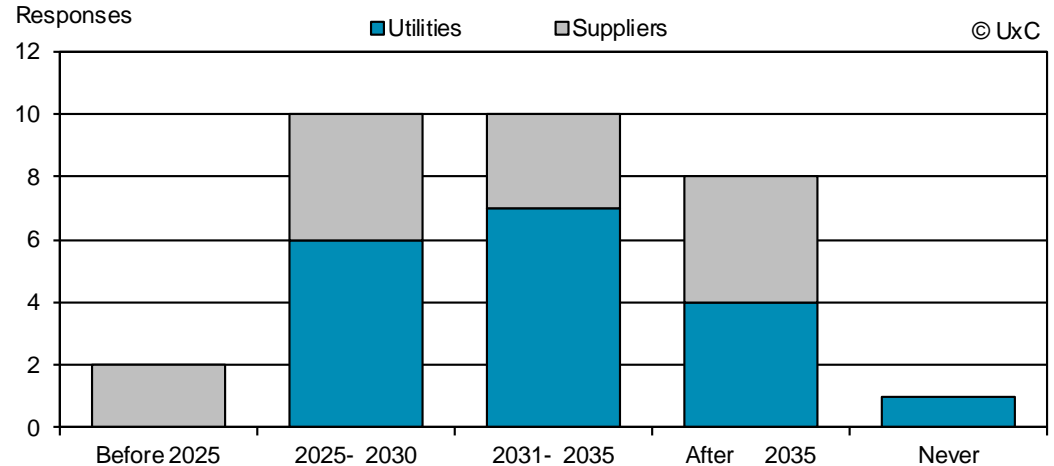




Latest Market Views (cont.)

- ▶ **Meanwhile, utilities are beginning to realize that current enrichment capacity will need future investments.**

When do you think enrichers outside of China will need to begin making major new investments to upgrade existing capacity?





Suppliers are Changing Their Tune

- ▶ **EUP/SWU inventories have been drawn down (but are still not at pre-Fukushima levels)**
- ▶ **Aging balance-of-plant equipment and other factors are affecting enrichment plant lifetimes even if centrifuges continue to spin**
- ▶ **New/replacement capacity will require higher prices to recover capital investments over an extended period**
- ▶ **Enrichers are sending clear signals that ultra-low prices are not sustainable over the long term**





Trade, Policy, and Other Issues

- ▶ **Russia's ability to sell into the West remains restricted**
- ▶ **Iran sanctions could instantly curtail purchases in U.S.**
 - Secondary sanctions could also affect many non-U.S. buyers
- ▶ **RSA revision leading to possible quota below current 20% of U.S. market would reduce long-term access**
- ▶ **URENCO is also dealing with several headaches**
 - Brexit (e.g., flow of material between EU and UK)
 - Gronau – anti-nuclear politicians in Germany seeking shutdown
- ▶ **Orano gained unfettered access to U.S. (no more duties)**
- ▶ **U.S.-China trade war has created tariffs on Chinese EUP**





Potential Future Scenarios

- ▶ **Scenario 1: “Steady as she goes”**
 - Gradual tightening of supply and demand balance over next decade
 - Incremental replacement capacity needed post-2025
- ▶ **Scenario 2: “Storm clouds on the horizon”**
 - Supply constricts sooner as underfeeding commitments remain high
 - Limited ability to bring on line capacity due to supply chain constraints
- ▶ **Scenario 3: “Alarm bells are ringing”**
 - Trade action creates near-term supply shock
 - Suppliers try to respond but are unable to shift quickly to SWU sales





Implications for the Uranium Market

- ▶ **Since 2012, the uranium market has become used to high levels of secondary supplies from enrichers**
 - UxC has long been forecasting these volumes to diminish significantly by mid-2020s
- ▶ **SWU price increases will lead to a shift to higher transactional tails in the long run**
- ▶ **Higher demand for uranium feed will have a knock-on effect and result in upward U_3O_8 price pressures**





Implications for the Conversion Market

- ▶ **Low enricher operating tails have helped manage conversion production shortfalls**
- ▶ **Enrichers will need to adjust back to higher tails leading to pressure on conversion demand**
- ▶ **Already record-high conversion prices today could see additional upward pressure in the longer term as ability to substitute feed for SWU diminishes**
- ▶ **Buyers may not be able to rely on enrichers for additional large volumes of UF₆ feed**





Conclusions

- ▶ **SWU prices clearly hit a bottom in 2018**
- ▶ **Market consensus is that SWU price rebound is destined to continue**
- ▶ **Timing for need to replace capacity remains unclear, but likely some time in the 2025-2035 period**
- ▶ **Security of supply has become a bigger concern**
- ▶ **SWU market impacts on uranium and conversion could be extremely significant**
- ▶ **“The SWU markets are a changin’!”**

