



**Mining Indaba**  
**Uranium Market Outlook 2008**



**Jeff Combs, President**

**February 4, 2008**

**The Ux Consulting Company, LLC**

**Roswell, Georgia**

**[www.uxc.com](http://www.uxc.com)**

# UxC – The Ux Consulting Company

- ▶ **Founded in March 1994**
- ▶ **Provides nuclear fuel consulting and market information services to suppliers, utilities, investors and government agencies internationally.**
- ▶ **Publishes:**
  - **The *Ux Weekly* (publication started in 1987)**
    - UxC News Headlines
  - **Quarterly *Market Outlook* reports with price forecasts for uranium, enrichment, and conversion**
  - ***Uranium Suppliers Annual***
  - **Country Uranium Mining and Export Policies**
  - **Policy Watch briefing service**
  - ***SpentFUEL* and *StoreFUEL***
  - ***Nuclear Power Outlook***
- ▶ **Launched uranium futures contract with NYMEX in May 2007**
- ▶ **Offices located in Atlanta, GA, and Washington, DC.**



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# Ux Weekly

The Leading Source For Timely Market Information

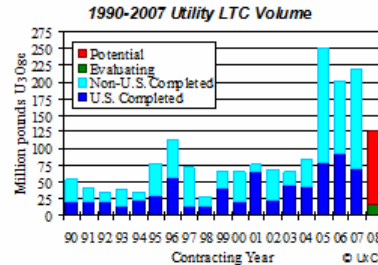
## 2007 Uranium Long-Term Contracting Review

In 2005, we said "Wow." In 2006, we were still amazed. In 2007, as shown in the chart below, the uranium term market has been anything but quiet. About 220 million pounds were awarded last year by utilities under term deals, easily surpassing 2006's level. Even with the higher level of term contracting and the increased volatility discussed in last week's review of the 2007 spot market, the term price indicator during 2007 remained fairly flat, but does that tell the whole story? Below is a summary of last year's term uranium activity and prospects for 2008.

**Volume remains at record levels** – A total of 53 deals involving 220 million pounds U<sub>3</sub>O<sub>8</sub> equivalent have been reported as awarded during 2007 (this number is likely to rise slightly as off-market activity is confirmed). This is a 9% increase over the 2006 final volume of 201 million pounds, and marks the third straight year that contracting volume has surpassed the 200 million pound mark. A major reason for the higher volumes over the past three years has been the continued increase of

extended-term contracts. The trend towards these larger-sized deals can be seen in the 20 million pound increase in 2007 volume over that posted in 2006, and, with 53 contract awards in 2007 versus the 77 awarded in 2006, this increase reflects that the average size of individual contracts almost doubled in delivery volume. In fact, 31 of these 53 deals involved deliveries that extend out for the next ten years, with 10 of these going 15 years or more and several contracts extending past 20 years in term. There were five contracts that ranged from 12 to 30 million pounds of total deliveries each.

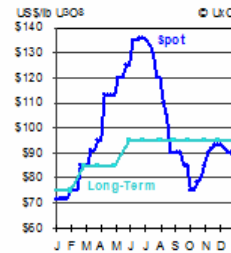
The average time period before for the first delivery for U.S. utility contracts was 2.5 years, with non-U.S. utilities waiting 2.9 years. During the life of the term contract, U.S. utilities averaged 6.5 years of deliveries resulting in an overall average contract length of 8.9 years. Non-U.S. utilities, on the other hand, averaged 9.1 years with deliveries and their overall average contract lengths hit the 12.0 year mark. This term length easily exceeds the 9.1 year average



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Ux U<sub>3</sub>O<sub>8</sub> Price: (1/28/08)  
\$78.00 (-\$8.00)  
Ux LT U<sub>3</sub>O<sub>8</sub> Price: (1/28/07)  
\$95.00

2007 Ux U<sub>3</sub>O<sub>8</sub> Prices



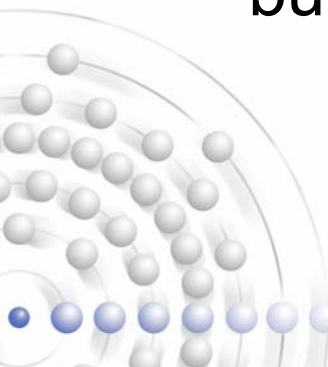
**Term price: flat line?** – Call the doctor, because it appears that the term price may have stopped beating last year. As the Ux Long-Term (LT) U<sub>3</sub>O<sub>8</sub> Price held firm at the \$95 level for most of last year (see chart above), this flat line pricing does not give the complete picture. The Ux LT U<sub>3</sub>O<sub>8</sub> Price ended 2006 at \$75.00 per pound, slightly higher than the spot price at the time. The two prices briefly came together by the end of January and tracked each other up for the next two months until hitting the \$85 level at the end of March. As the term price increased over the \$70 level, buyers started showing increased signs of resistance to this higher pricing level, and the preference towards market-related contracting – especially by sellers – was in full swing. Not only did the number of base-escalated price offers decline early last year, the percentage that base-escalated pricing in hybrid contracts represented declined as well. Most new offers only contained an average of a 25% base-escalated component, with the remaining 75% as market-



# 2007 Uranium Market Review

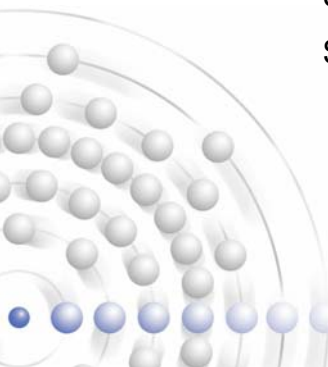
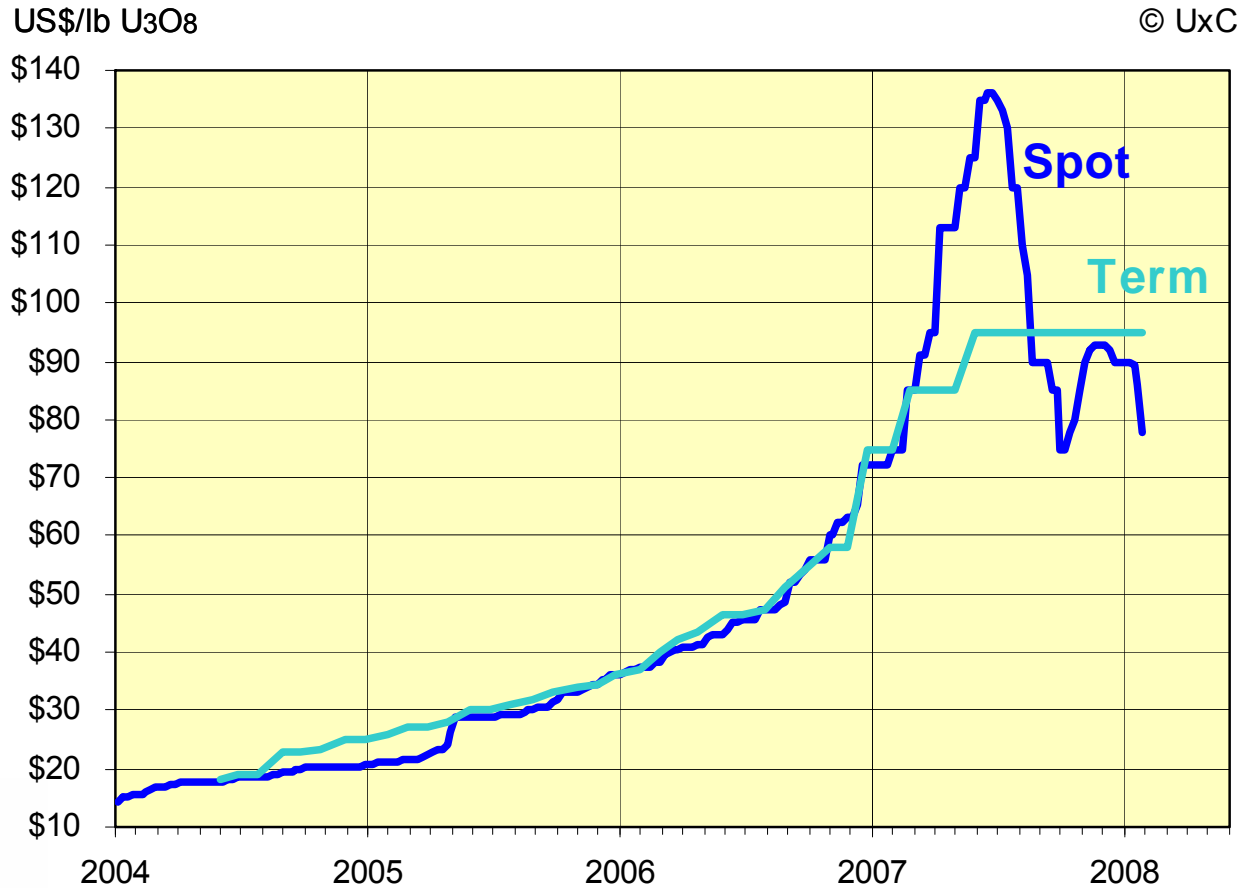


- ▶ **Unprecedented spot price volatility**
  - Less fund buying and more selling
- ▶ **Continued production problems**
  - Production again failed to meet targets
- ▶ **Intensified interest in new nuclear build**
  - COL applications in the United States
  - Number of countries announcing plans/intentions to build reactors

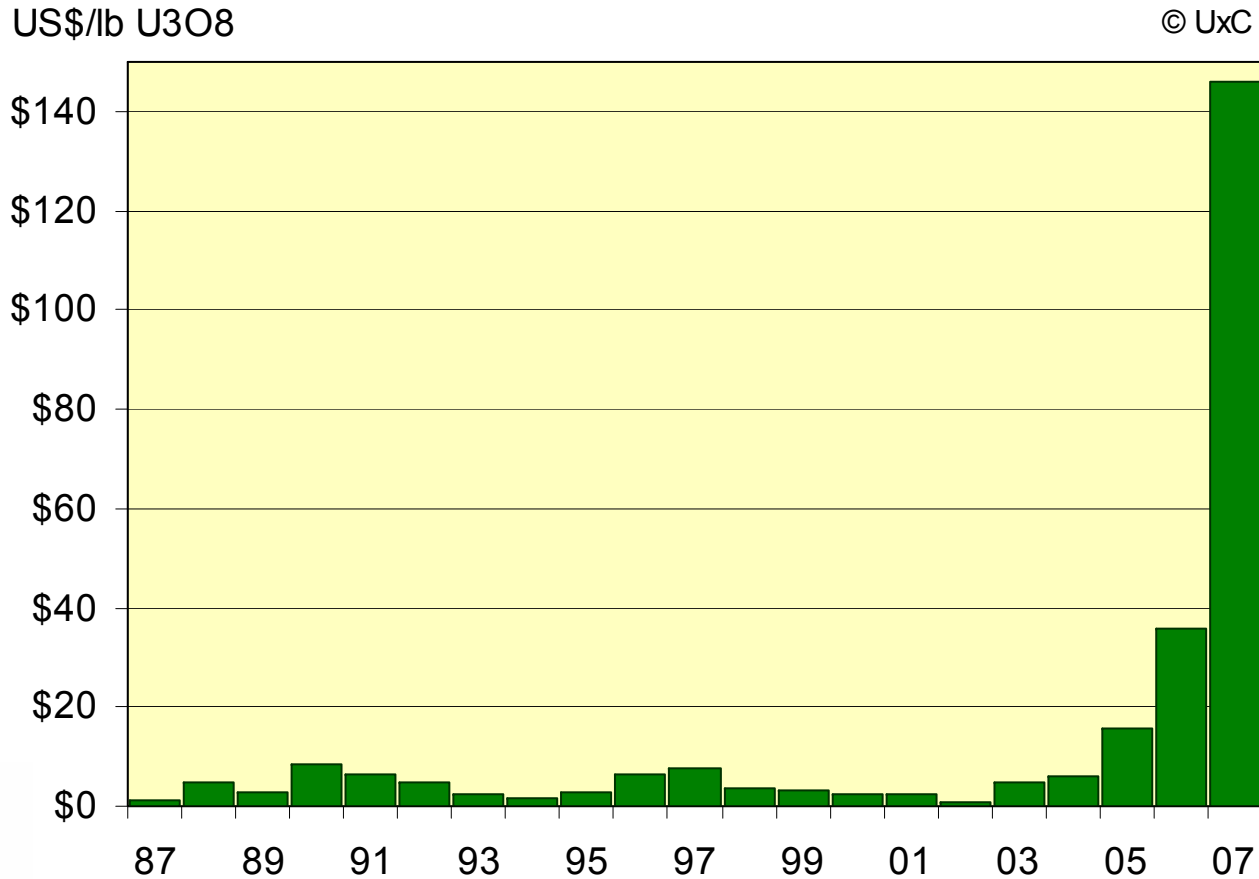


# Uranium Prices, 2004-2008

## Spot Ux U<sub>3</sub>O<sub>8</sub> Price & Ux Long-Term (LT) U<sub>3</sub>O<sub>8</sub> Price



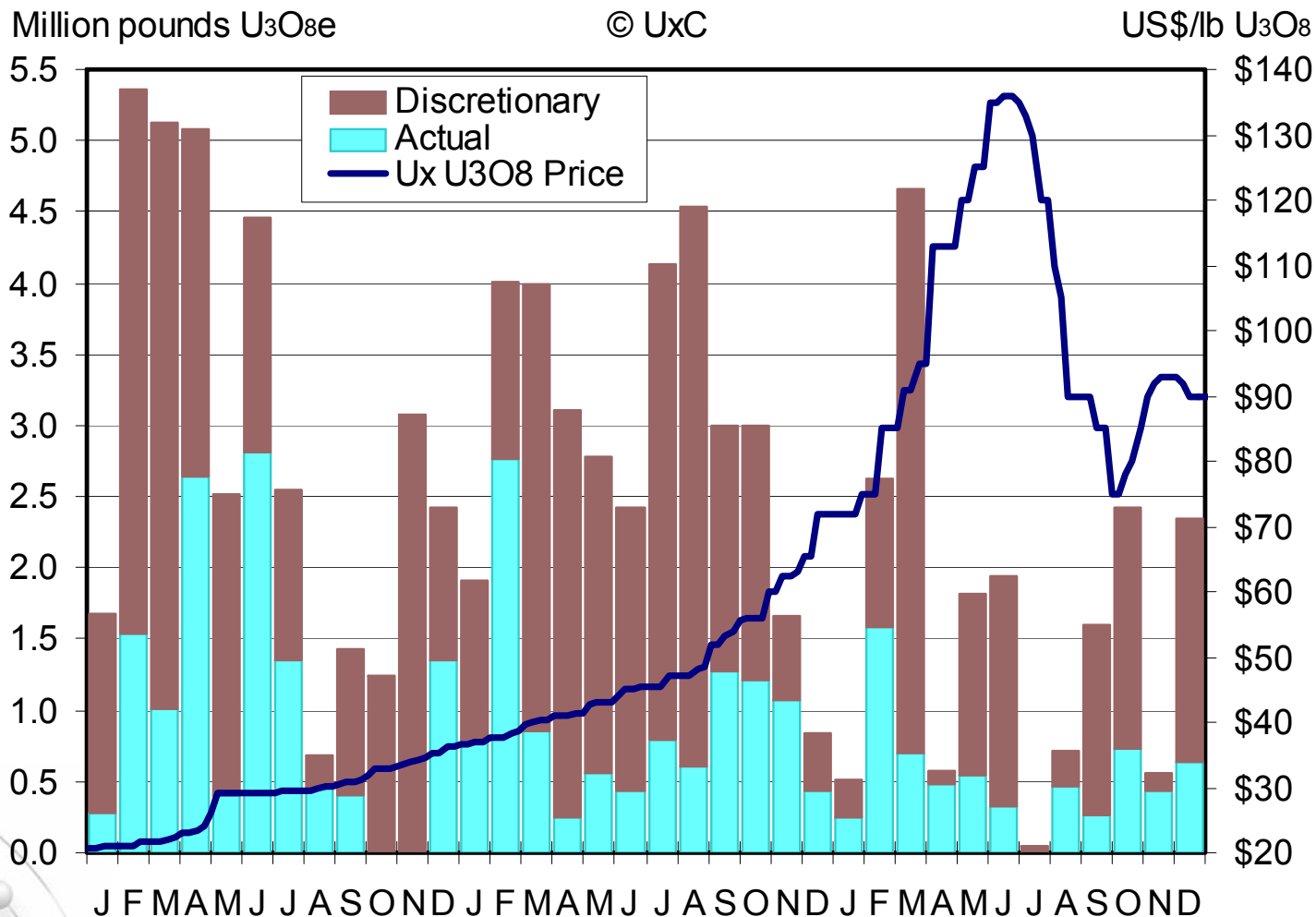
# Total Changes in the Ux U<sub>3</sub>O<sub>8</sub> Price by Year



Source: *Ux Weekly*, January 7, 2008



# Ux U<sub>3</sub>O<sub>8</sub> Price vs. Volume by Need 2005-2007

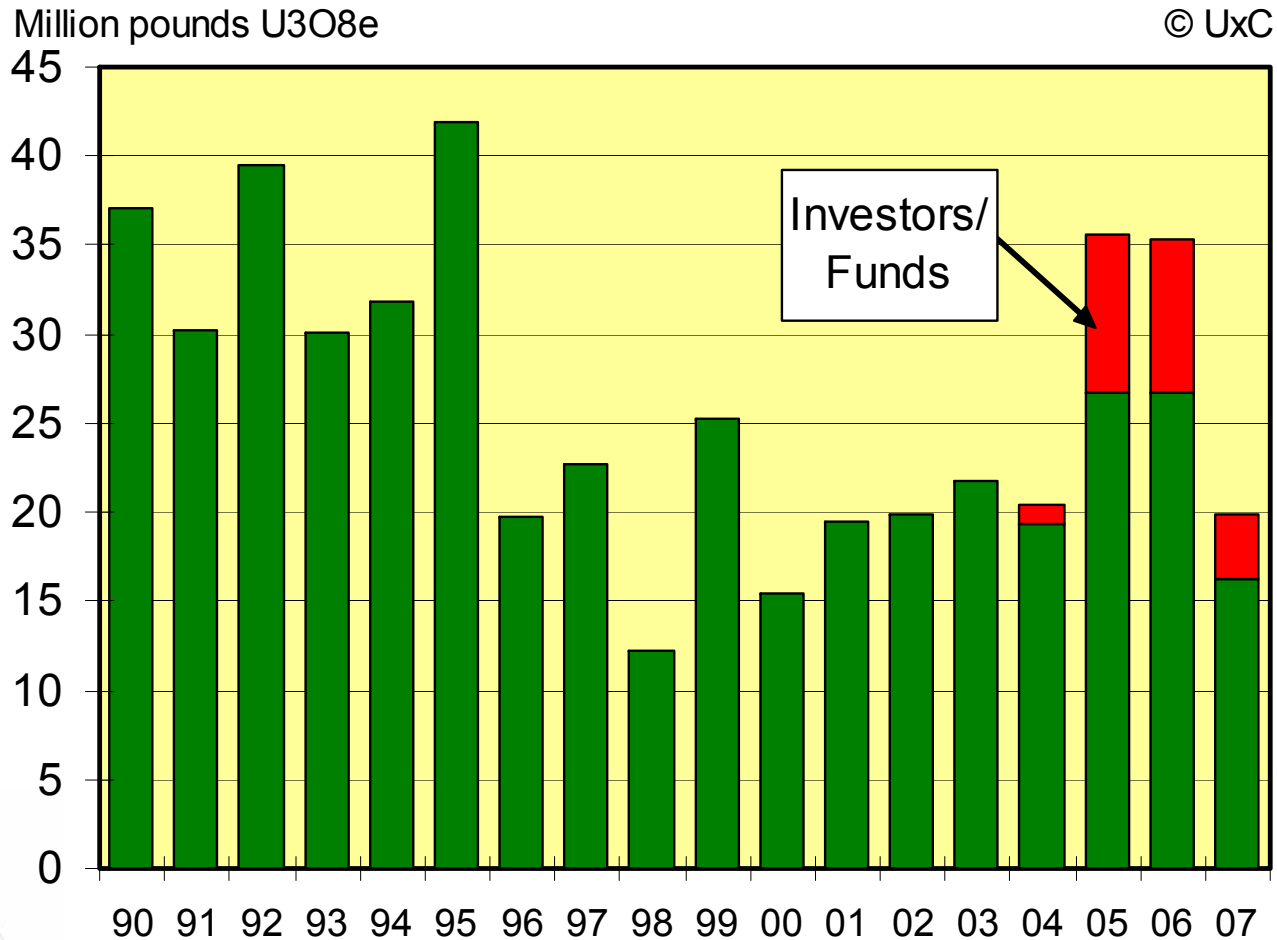


Source: Uranium Market Outlook



# U<sub>3</sub>O<sub>8</sub> Spot Volumes, 1990-2007

## Investor/Hedge Funds Identified



Source: *Uranium Market Outlook*, January 2008 Preliminary

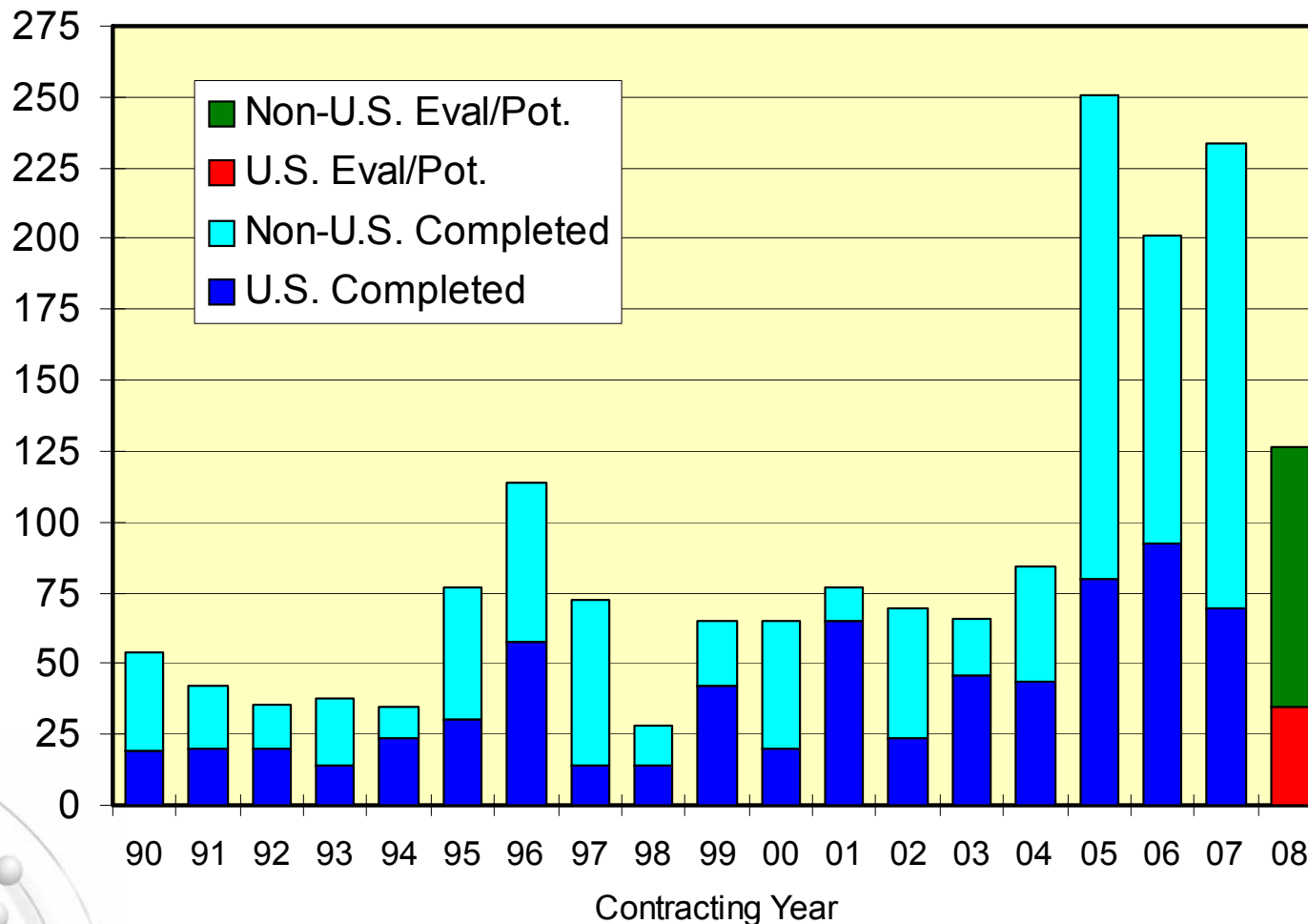


# Utility LT U<sub>3</sub>O<sub>8</sub> Contract Volume 1990-2007



Million lbs U<sub>3</sub>O<sub>8</sub>e

© UxC



Source: *Uranium Market Outlook*, January 2008 Preliminary

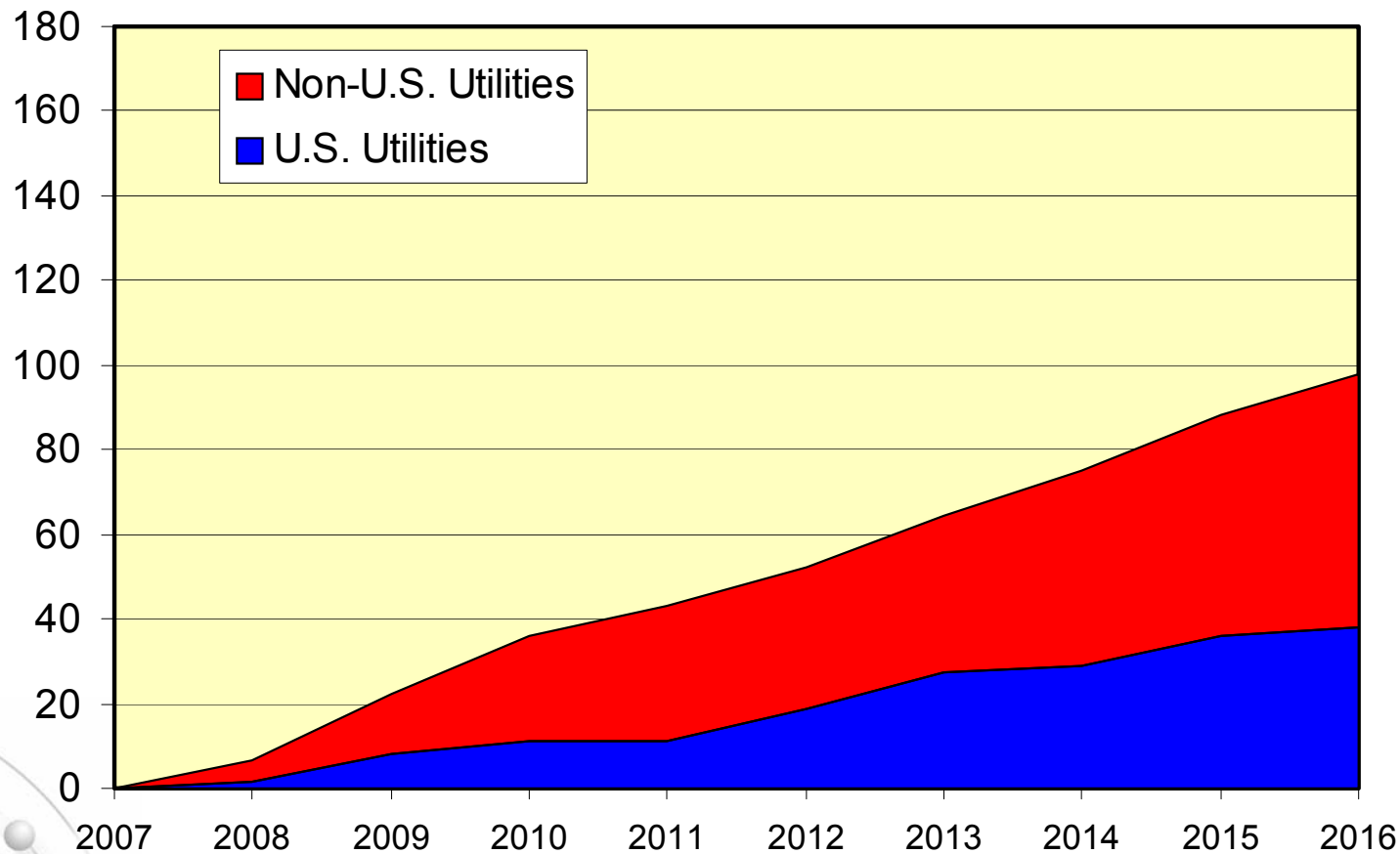


# Uncovered Utility Uranium Requirements



Million pounds U3O8

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Source: *Uranium Market Outlook*, October 2007



Uranium Market Outlook 2008 – February 4, 2008

# Challenges For Production Expansion

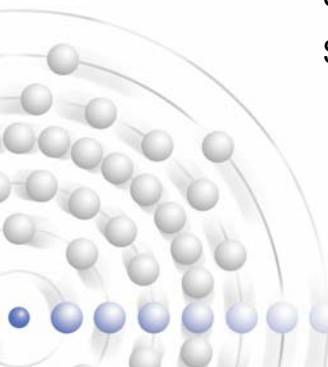
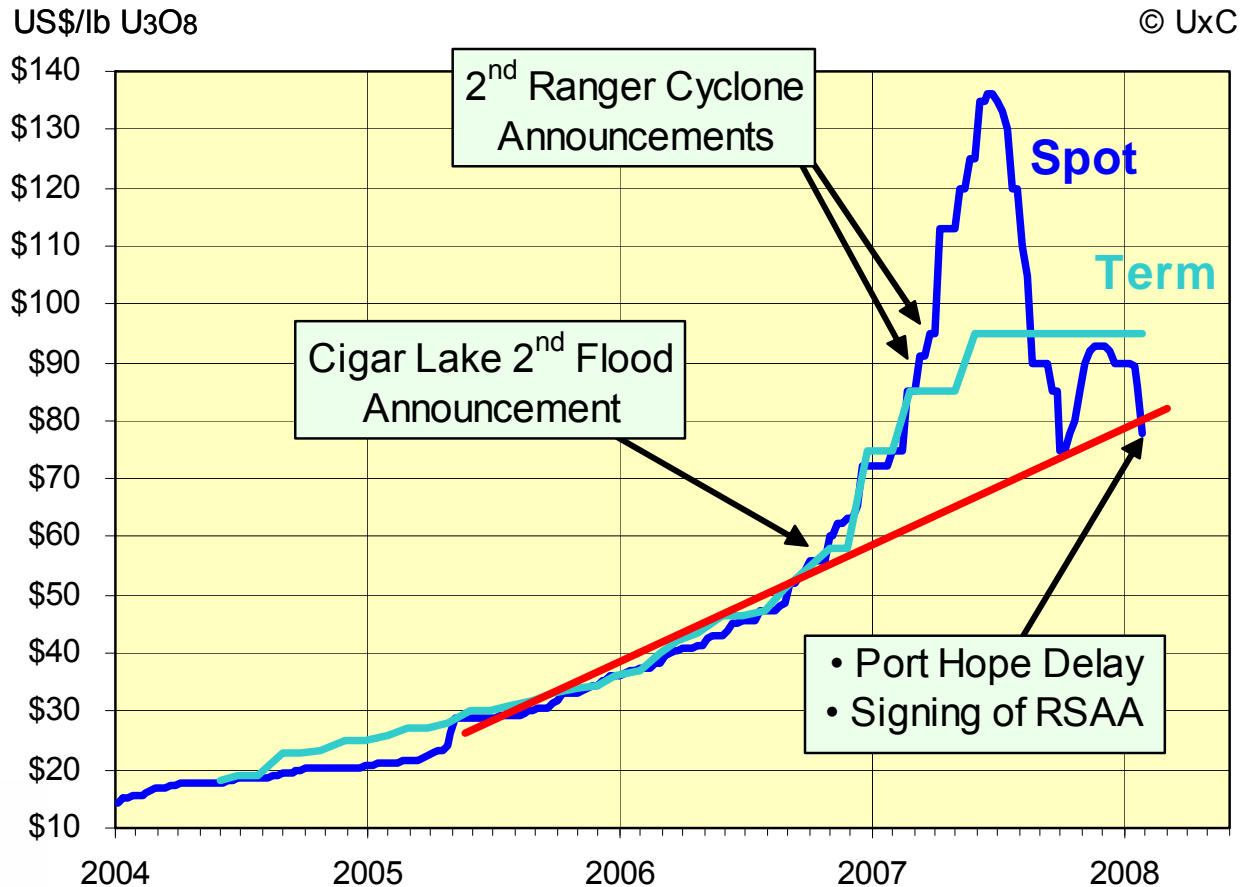


- ▶ **Extensive period of depressed prices led to depressed production, exploration**
  - Not many projects in the queue
  - Inadequacy of infrastructure
- ▶ **Small number of mega-projects contributing most of production**
  - Makes supply susceptible to disruptions when there are floods, etc. – need to hold more inventories
- ▶ **Government polices toward production and exploration not as favorable now as in 1970s**



# Uranium Prices, 2004-2008

## Spot Ux U<sub>3</sub>O<sub>8</sub> Price & Ux Long-Term (LT) U<sub>3</sub>O<sub>8</sub> Price

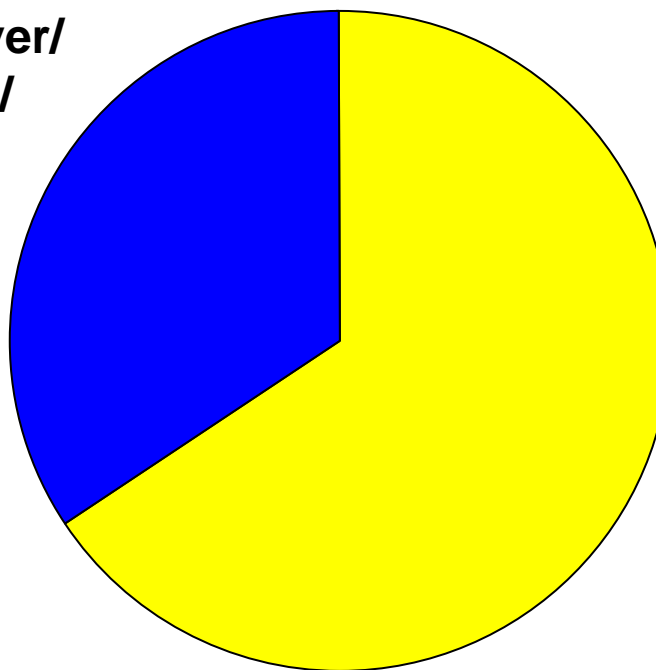


# Uranium Production

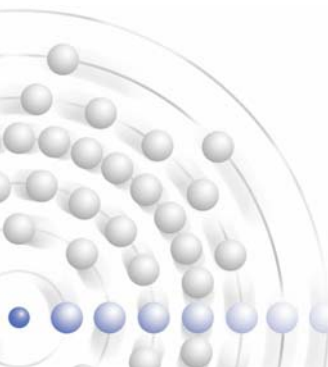
## 2006 Production Estimates for 2008



McArthur River/  
Cigar Lake/  
Ranger

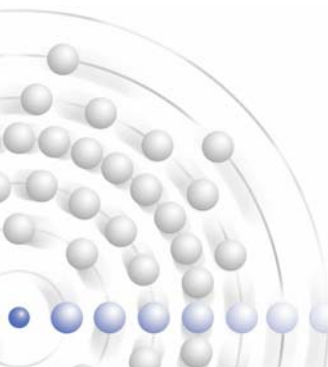
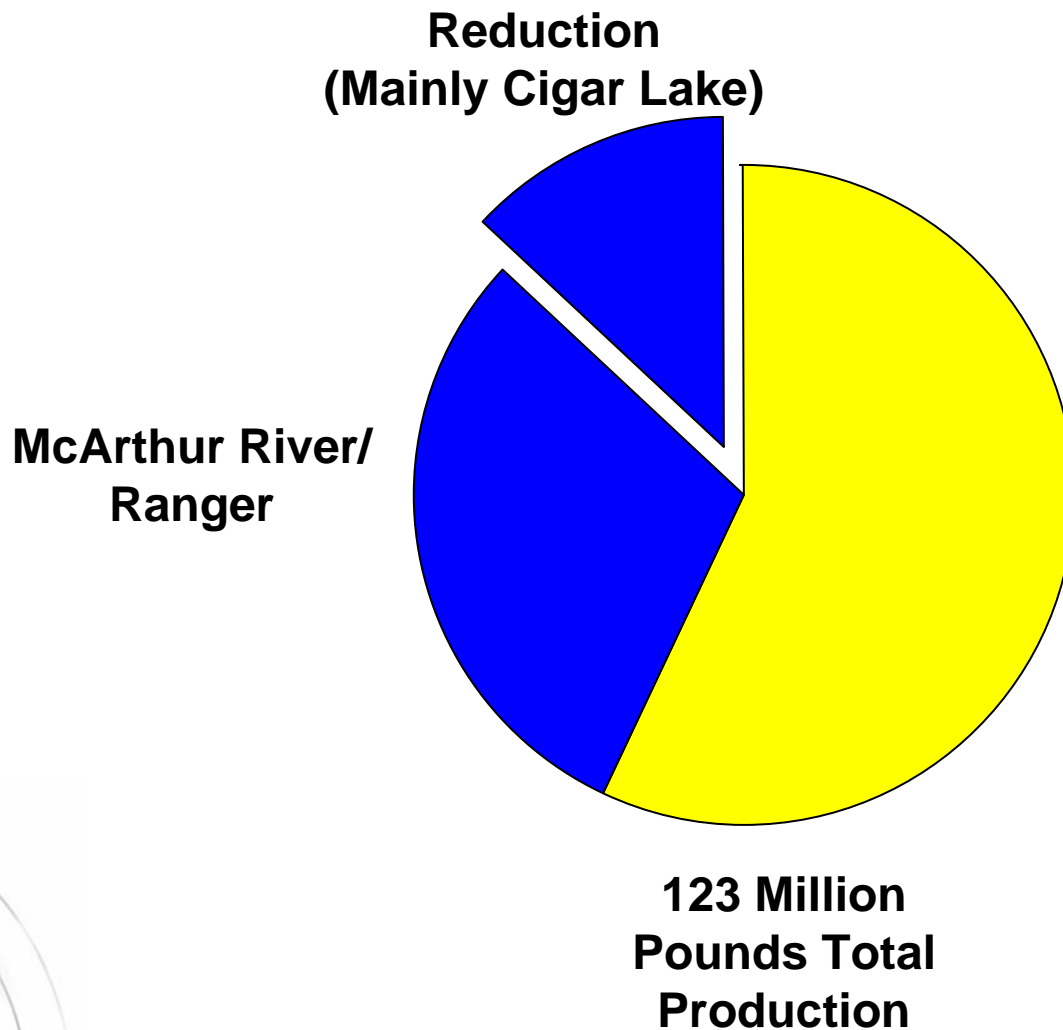


145 Million  
Pounds Total  
Production

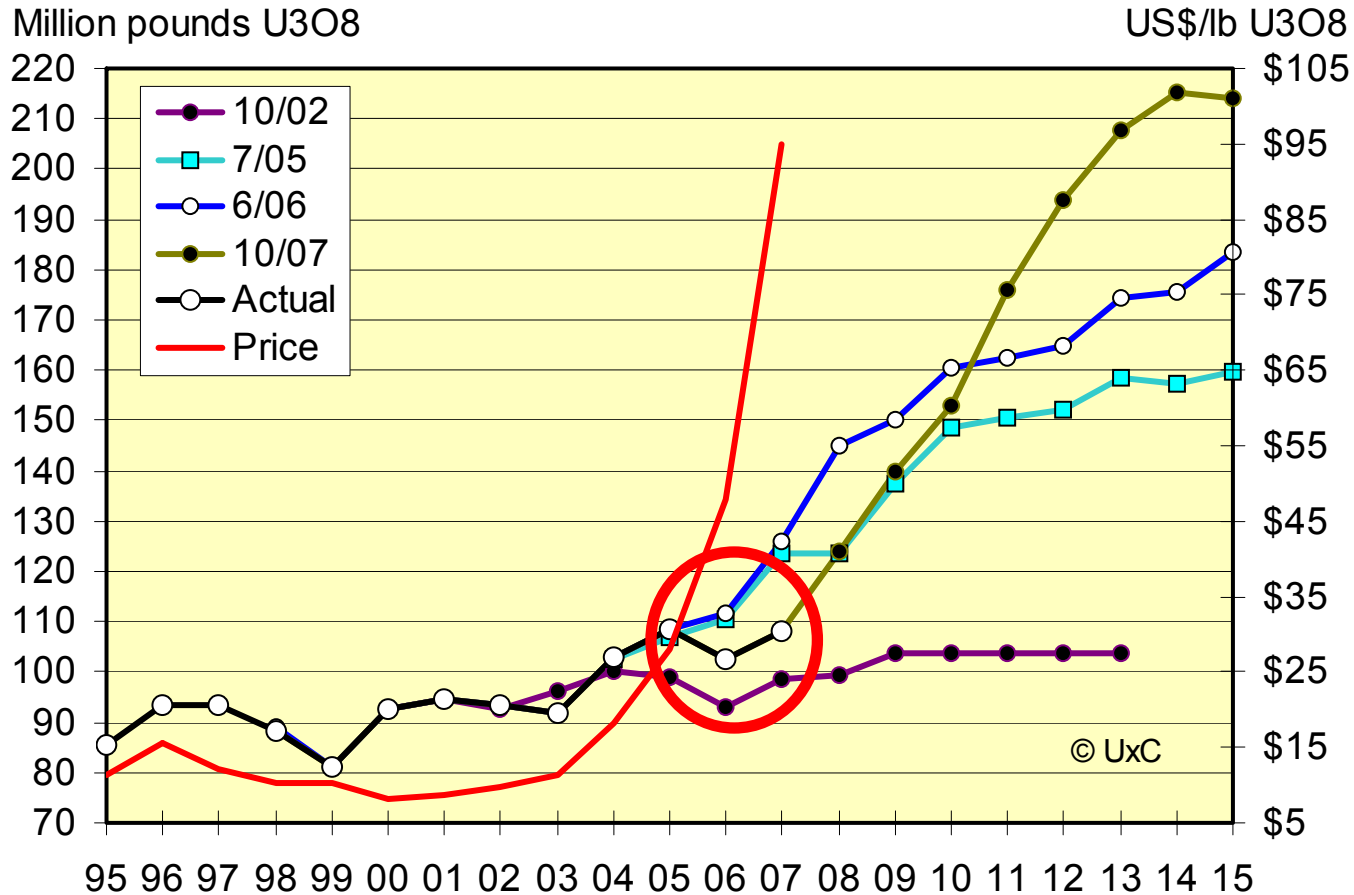


# Uranium Production

## 2007 Production Estimates for 2008



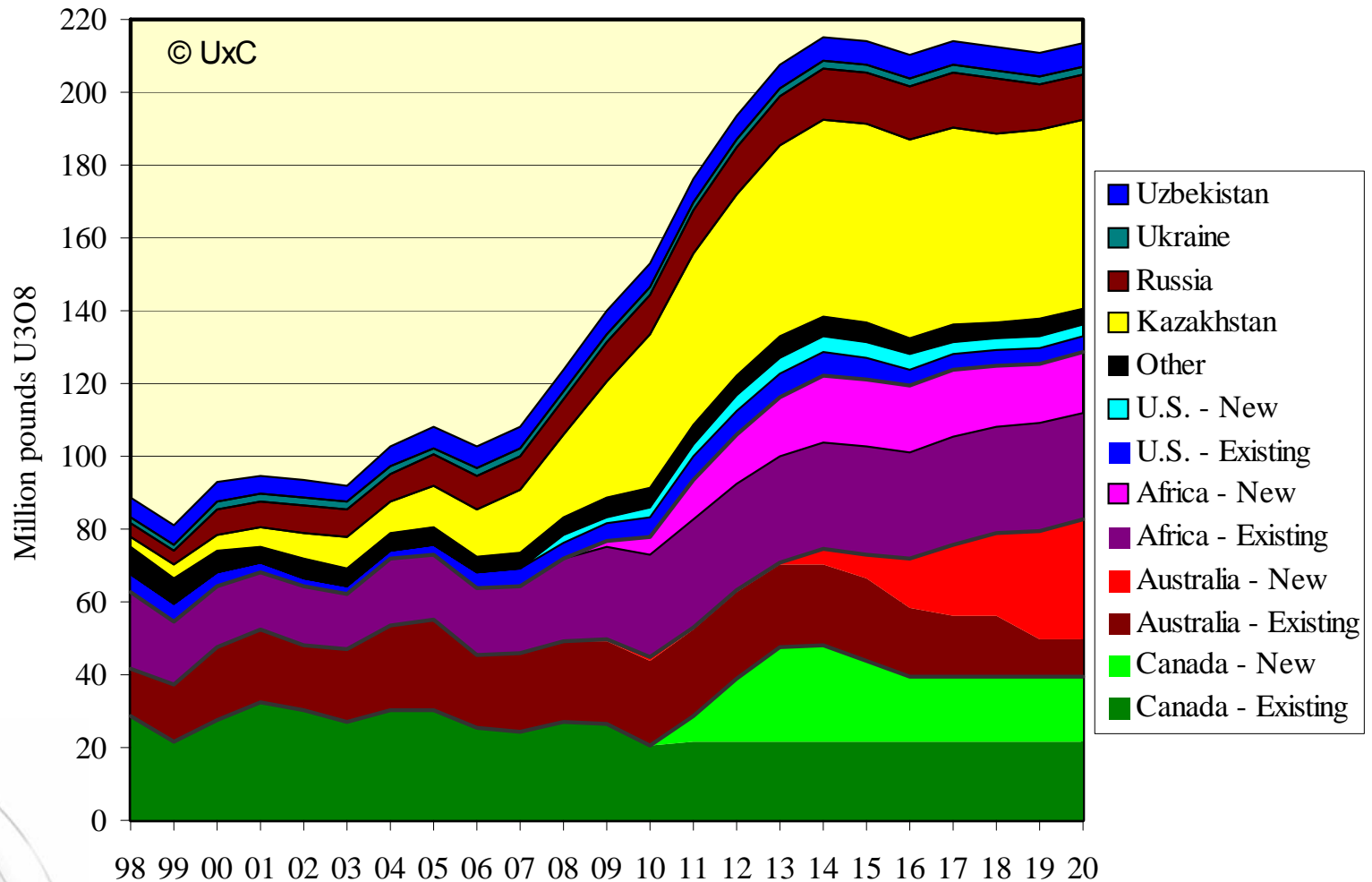
# Western Supplier Production Plans vs. Actual Production



Source: Uranium Market Outlook



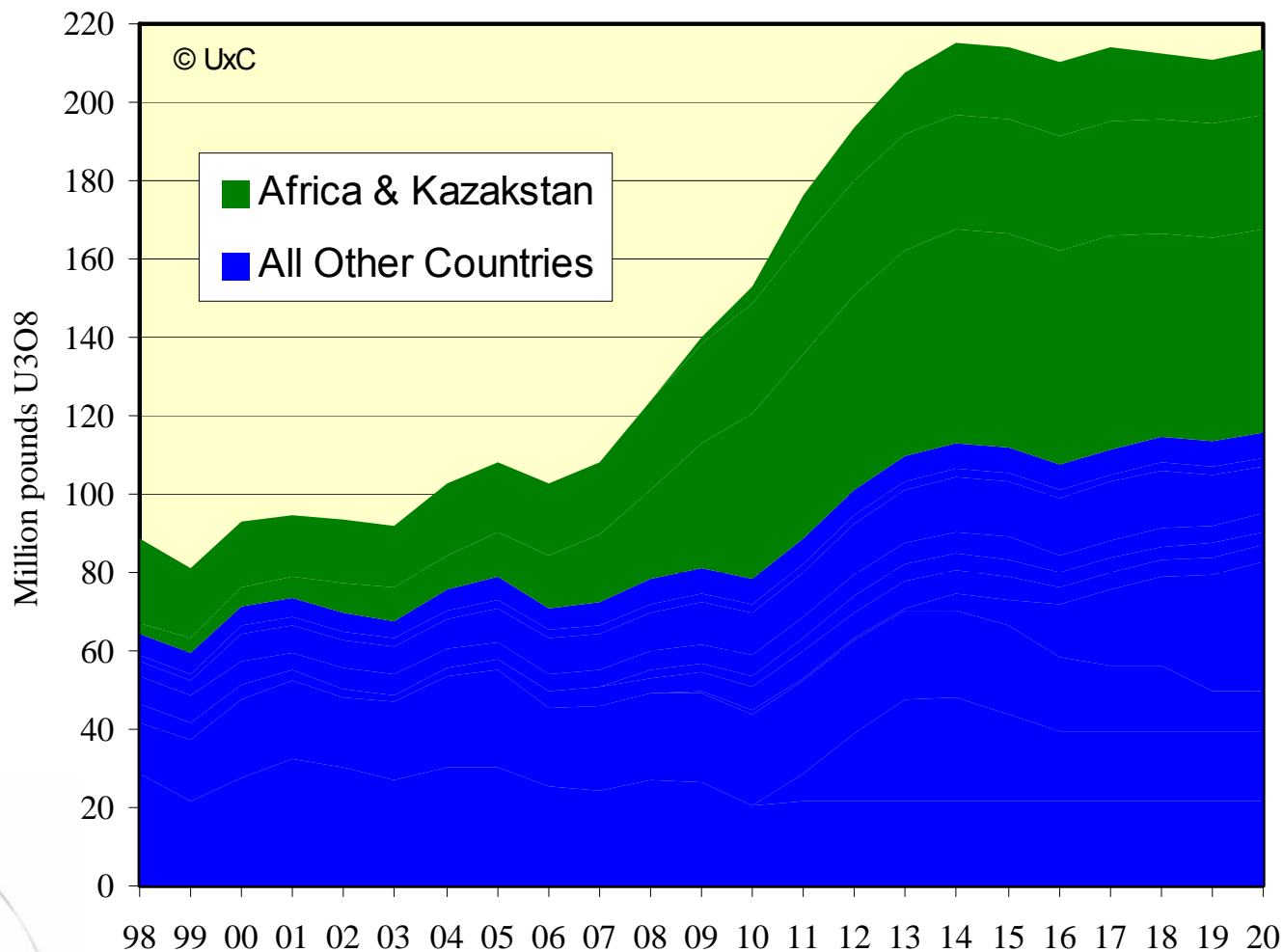
# Major World Supply Sources 2003-2020 – Mid Production Case



Source: *Uranium Market Outlook*, October 2007



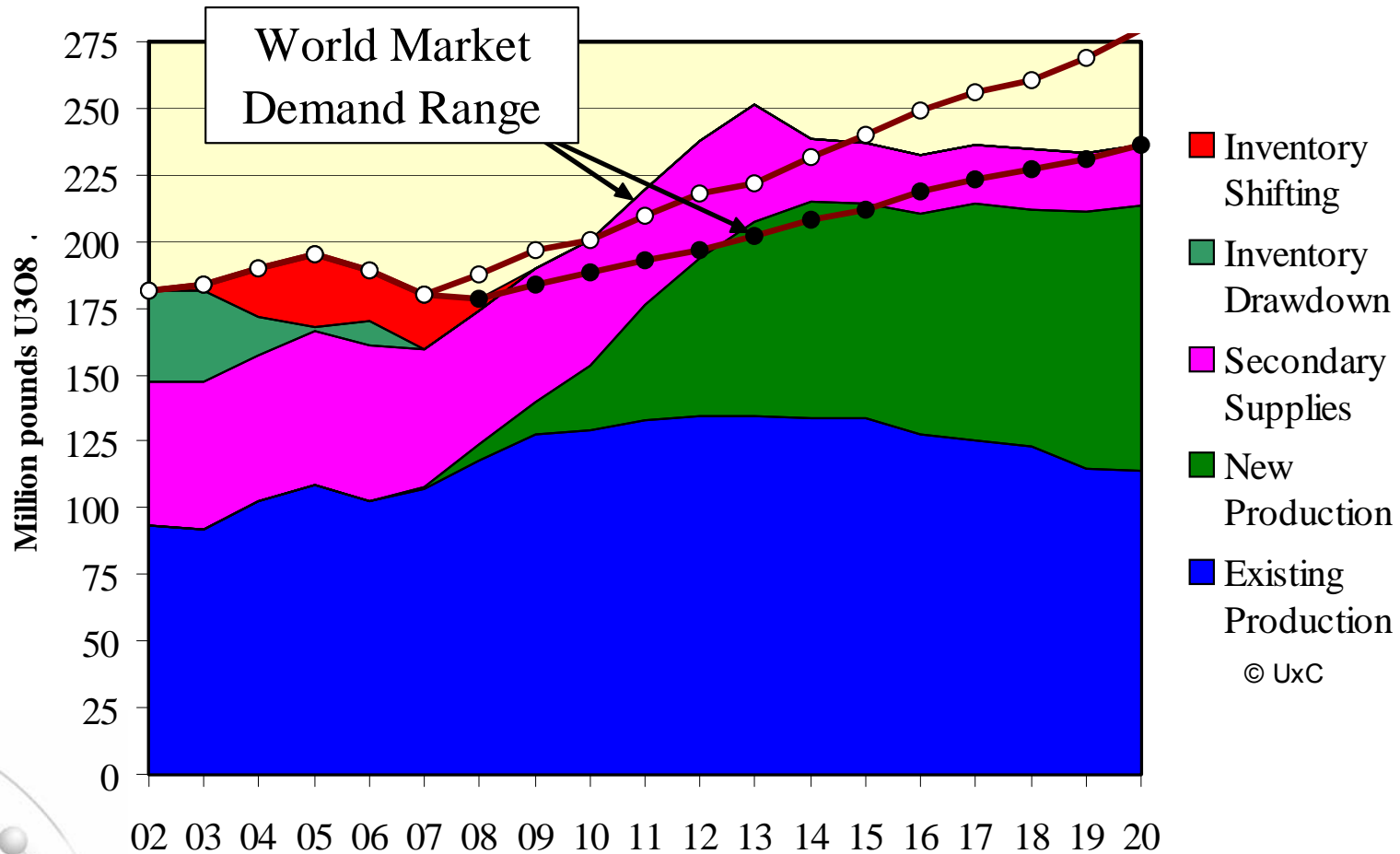
# Production Contribution from Kazakhstan and Africa – Mid Case



Source: *Uranium Market Outlook*, October 2007



# Major World Supply Sources 2003-2020 – Mid Production Case



© UxC

Source: *Uranium Market Outlook*, October 2007

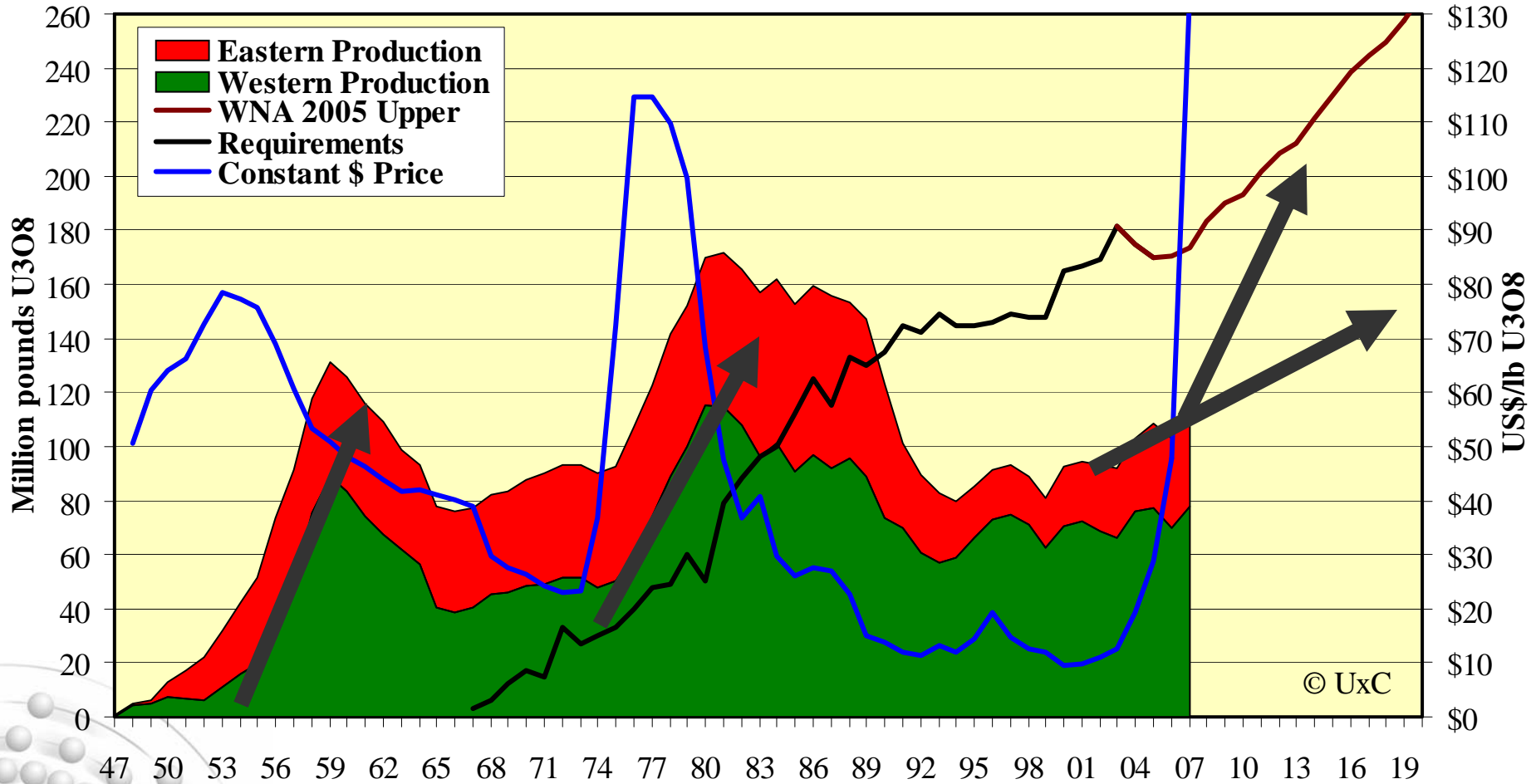




# Historical Uranium Price Formation

- ▶ The following slide provides a history of world uranium production, reactor requirements, and price (expressed in 2007 dollars) for the history of the uranium market. There have been three price booms, the first of which was in the phase where all uranium demand was for military purposes and the U.S. Government was the sole buyer. The second boom was in the 1970s when the U.S. Government had a virtual monopoly on the supply of enrichment services and artificially inflated requirements. (Note that production was much higher than requirements during this period.) The third boom is the one we are currently in and has occurred during a period when production has been far below requirements.
- ▶ It is important to note that the third price boom is not so much a function of increasing reactor requirements, as the current rate of growth is only somewhat higher than the historical rate. Rather, it is primarily due to the unusual evolution of the market, where huge inventories were built up during the military procurement phase and during the first part of the commercial nuclear reactor era, and these inventories (including uranium from dismantled nuclear warheads) were liquidated over a twenty year period during which price and production were severely depressed.
- ▶ The need for production to recover from this depressed state is the overriding story for uranium and the reason that hedge funds sought to take positions in this market. Production would have to recover strongly even if the growth in requirements was moderate, but an accelerated growth obviously makes this situation more challenging. The arrows on the chart indicate the rate of production response during the three price booms. During the first two booms, the response was fairly rapid, but so far during this boom, the rate of response has been lackluster, as indicated by the lower arrow for the post-2000 period. The upper arrow shows what the production response would be if production followed our mid-case scenario (shown earlier). The rate of this production response is very similar to what happened during the first two price booms; the question is whether or not it will be realized.

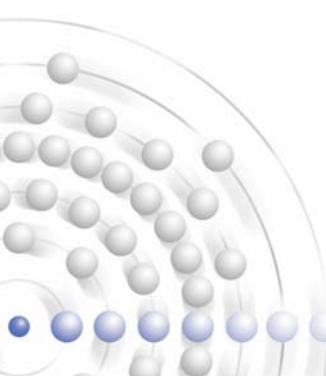
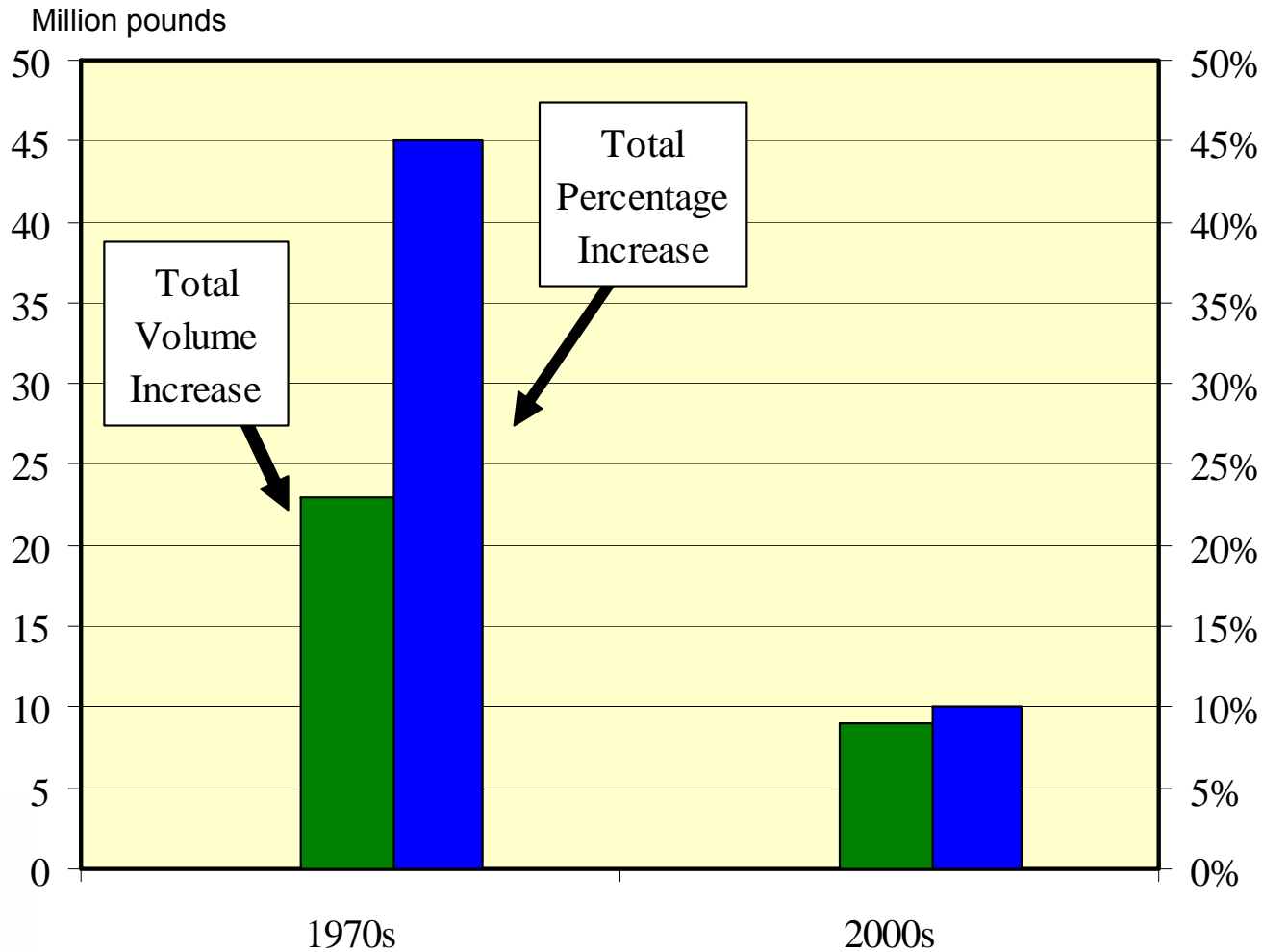
# World U Supply & Demand 1947-2007



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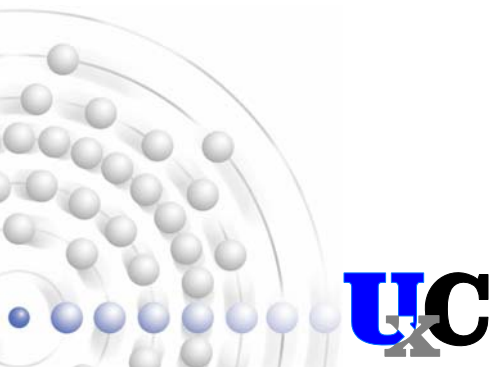
# Production Response Comparison



# Key Reactor Data from 2007



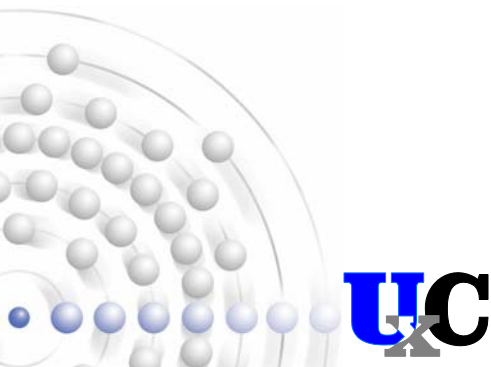
- ▶ **5 reactors with over 4,000 MWe started commercial operations**
- ▶ **10 reactors with over 9,100 MWe started construction**
- ▶ **At least 22 reactors with about 26,000 MWe were ordered**



# Key Reactor Developments – 2007



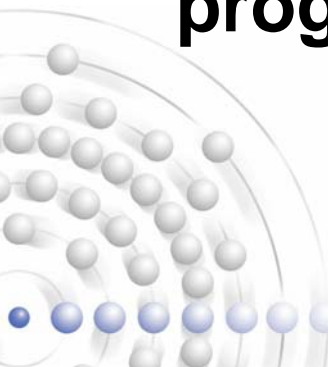
- ▶ **China** – approved state goal of reaching 40 GWe by 2020
- ▶ **Russia** – announced construction target of adding 2 reactors (~2,000 MWe) per year over next 15 years
- ▶ **India** – issued national goal of reaching a minimum of 20 GWe by 2020



# Key Reactor Developments (Con't)



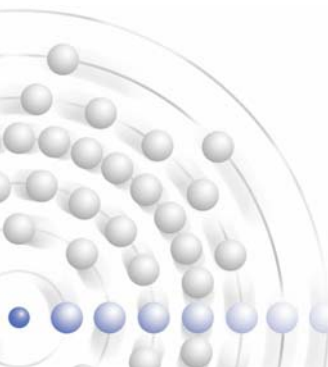
- ▶ **United States** – 5 U.S. utilities filed COLs with the NRC for 8 new reactors and Government authorized \$18.5 billion in new reactor loan guarantees for next two years
- ▶ **Germany** – utilities began court proceedings to extend life of plants and Government began discussion of ending nuclear phase-out
- ▶ **UK** – Government approved new reactor program (January 2008)



# Key Reactor Developments (Con't)



- ▶ **Egypt** – Plans for first reactor (~1,000 MWe) at Dabba with startup by 2018
- ▶ **Turkey** – plans for 5,000 MWe (2-4 reactors) at 2 sites with first startup in 2015
- ▶ **Ukraine** – announced plans to double nuclear capacity by 2030 (~15,000 MWe additional)



# South Africa's Nuclear Energy Future



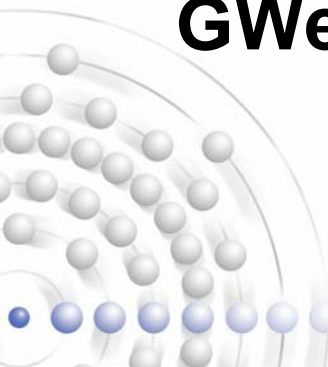
- ▶ **Massive energy demand growth leading to large investments in new generation**
- ▶ **Plans for over 25,000 MWe of nuclear by 2025 (~30% share of electricity)**
  - 12-17 imported PWRs (~20,000 MWe) at 5 designated sites
  - 24 PBMRs (165 MWe x 24 = 3,960 MWe)
- ▶ **Bids from AREVA & Westinghouse for first new plant (~3,200 MWe) underway**





# Nuclear Renaissance Stats

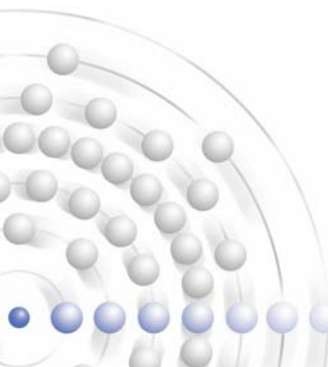
- ▶ **31 countries operating 440 reactors today (~375 GWe)**
- ▶ **55 additional countries that could turn to nuclear power (i.e. already discussing reactor development) – with more possible**
- ▶ **86 total potential countries with reactors by 2050**
- ▶ **55 total countries with ~630 reactors (~630 GWe) by 2030 (UxC mid-case estimate)**



# Outlook Summary



- ▶ **Spot price is dropping now because of little near-term demand, but long-term price steady**
- ▶ **Questions about production expansion remain**
- ▶ **More reactors are being ordered, so long-term prospects for uranium demand look good**
- ▶ **Spot prices are likely to remain volatile until a clear picture of future supply/demand emerges**



# Potential Market Scenarios



- ▶ The following slide looks at some potential market scenarios for the spot price. The current trend in price indicated by the blue line shows further weakness following a short recovery off its low of \$75. The question is whether the recent recovery was what is known as “dead cat” bounce, where price makes an abortive recovery following a sharp fall, or whether price will eventually recover to even higher levels than it previously attained. We label this second scenario a “rhinoceros market” given the shape of the initial price spike (the horn) and the subsequent more sustained increase (the rhino’s head), as shown by the green line. In the former case, price can be seen as being bid up in a speculative frenzy which was unsustainable, resulting in price now falling back to earth. From here, it could level off or perhaps fall further, as the market is currently under downward pressure. In the latter case, the initial price run-up can be seen as a situation where the market just got ahead of itself, suggesting that price will return to these levels and go higher.
- ▶ A case can be made that the lower the price goes this cycle, the higher it will eventually increase provided that there is a fundamental supply/demand imbalance in the future. (This being the case, anything that serves to slow down the production increase, such as a reversal in price, will ultimately make the supply/demand imbalance worse in the future.) In this respect, there is currently a dichotomy in the market where the spot price is under downward pressure as near-term supplies exceed demand, but the long-term contract price, which relates primarily to deliveries that begin several years in the future, is holding steady and may even be under some upward pressure, as the supply/demand balance is much tighter over this time horizon.
- ▶ The situation where the spot price (currently \$75) and the long-term contract price (currently \$95) deviate by such a large margin cannot persist for long. It is likely that the spot price will continue to be volatile until the time when the production recovers sufficiently enough to restore confidence in supply.

# Uranium Price Trends: A Rhinoceros Market?



US\$/lb U3O8

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