Nuclear Power and the International Uranium Market

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NMA/NRC Uranium Recovery Workshop

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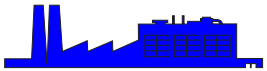
The Nuclear Fuel Cycle

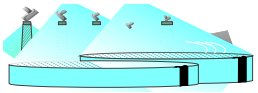
Uranium Mining and Milling



Producers, world-wide, sell U_3O_8 to utilities and traders.

55 Gal. drums = 850 lbs U_3O_8

Conversion to UF_6



14 Ton cylinders = 8,000 kg UF_6

Enrichment

"Tails"

Fuel Fabrication

UO_2 Fuel Rods

Light Water
Power Reactors

Spent Fuel

Spent Fuel Storage
at Reactors

**Waste Management
Program**

Reprocessing

World Nuclear Capacity

(May 2006)

441 Reactors

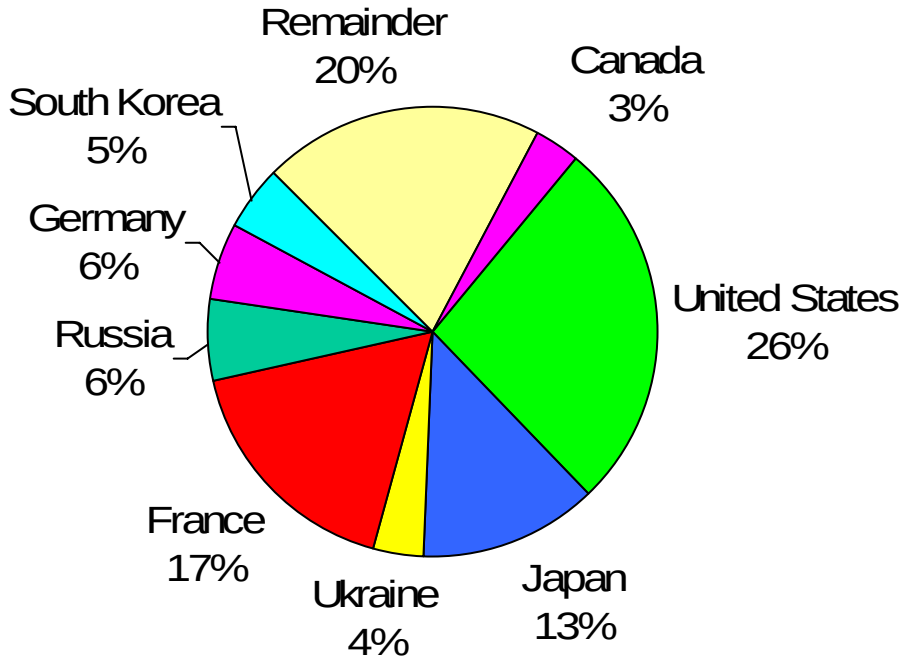
369,374 Mwe

31 Countries

Annual Requirement - 170 million pounds U_3O_8

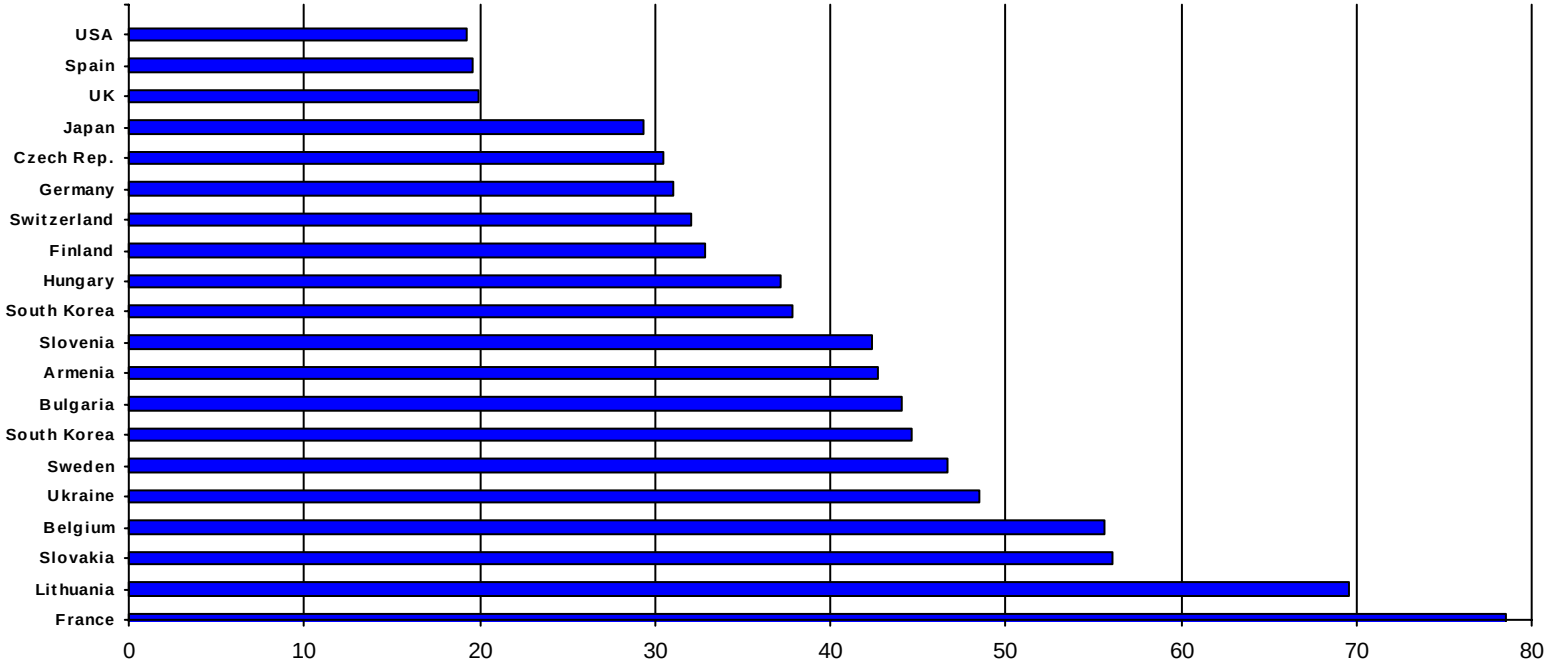
Nuclear Generating Capacity

(Total – 369,374 Mwe)



Electricity Generation

Nuclear Share (%) - 2005



Reactors Under Construction

(May 2006)

27 Reactors

21,051 Mwe

11 Countries

Longer Term Prospects

- China
- Finland
- France
- India
- Japan
- Russian Federation
- South Korea
- Canada (?)
- United Kingdom (?)
- United States (?)

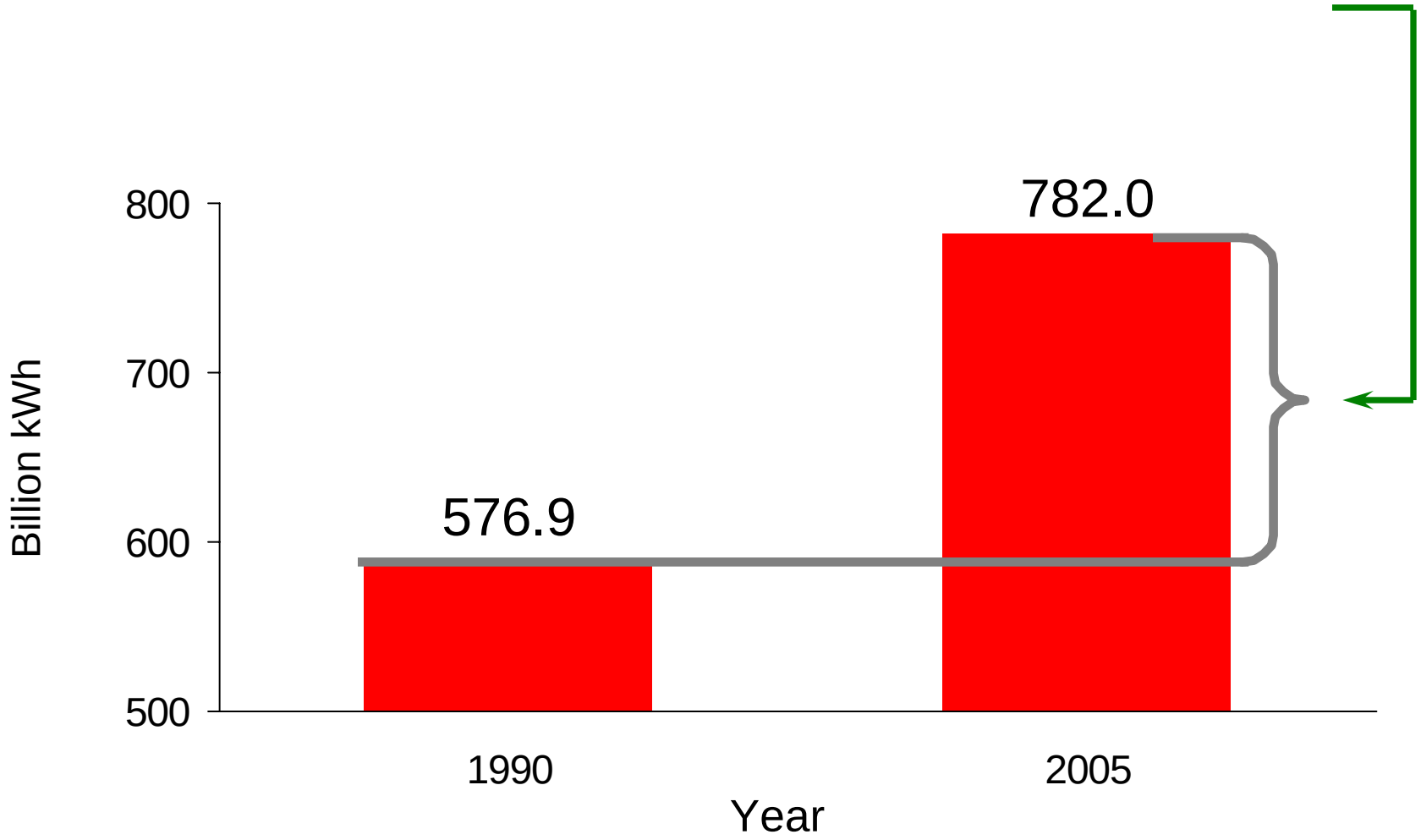
United States

- Capacity Factors
- Operating License Extensions
- Early Site Licensing Program
- Browns Ferry -1 Restart (US$1.9 billion)
- Energy Policy Act of 2005
- New Nuclear Build
  - Sixteen companies have expressed an interest in constructing up to 25 new nuclear power plants (no orders formalized)
  - COL applications expected 2007-2008
  - Expected commercial operations beginning 2014-2015

Increase in U.S. Nuclear Plant Output:

(1990-2005)

Equivalent to 26 new 1,000-megawatt power plants



President George W. Bush

- Position on Nuclear Power -

"*Our goal is to start the construction of new nuclear power plants by the end of this decade*."
(February 18, 2006)

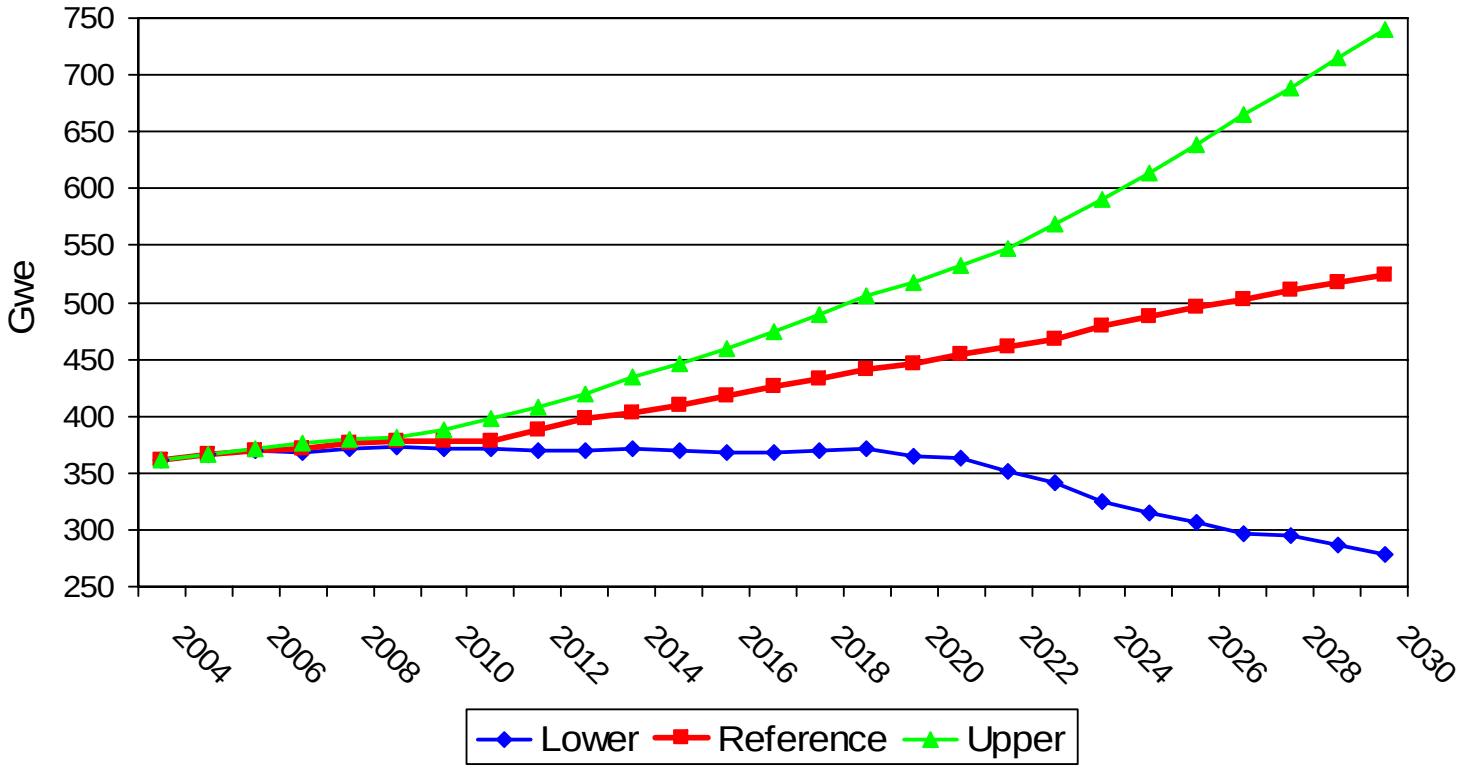
"For the sake of economic security and national security, the United States of America must aggressively move forward with the construction of nuclear power plants."
(May 24, 2006)

Nuclear “Phase Out” Programs

- Belgium
- Germany
- Sweden
- United Kingdom (replacement)

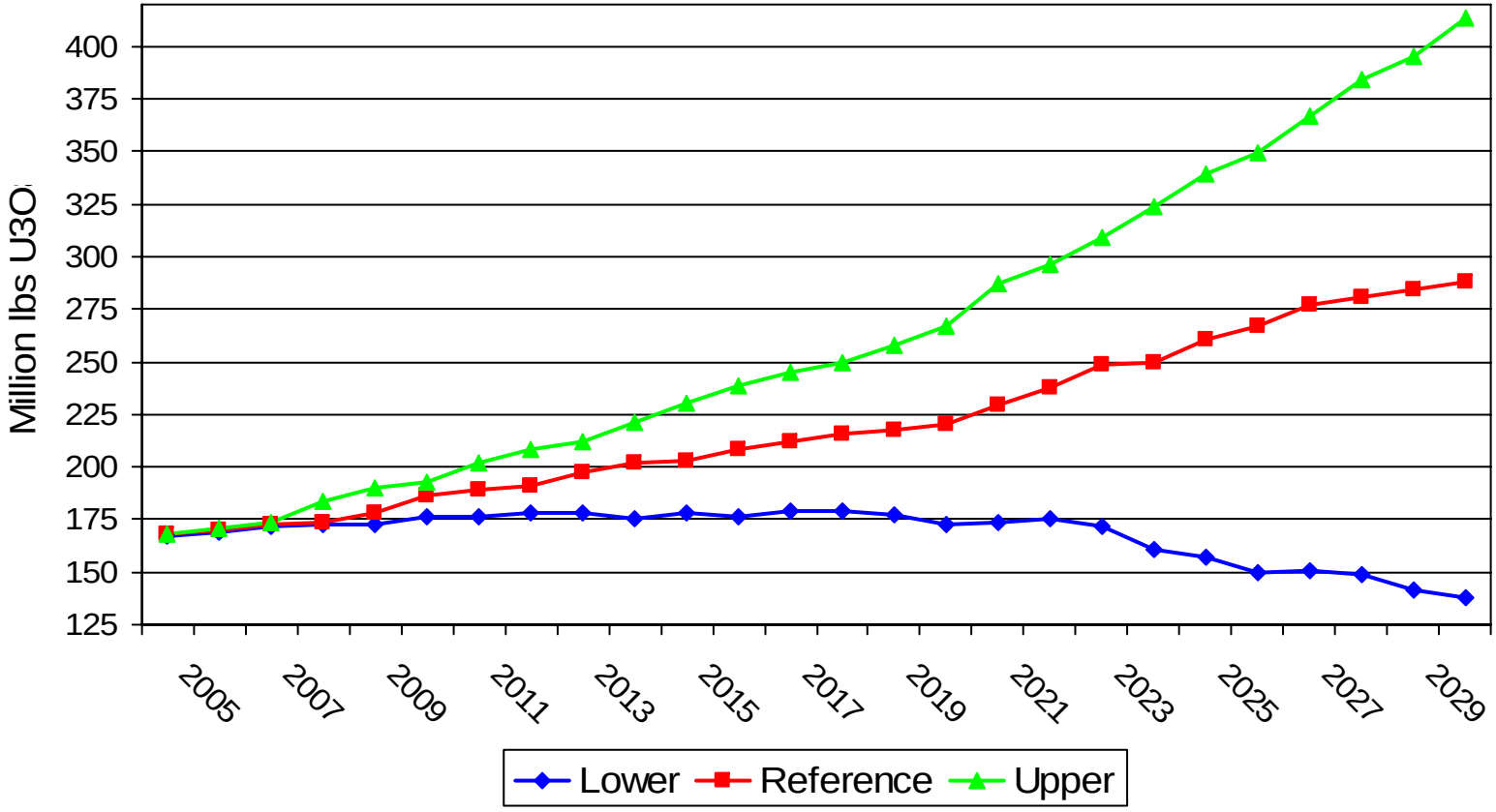
World Nuclear Capacity Forecast

(World Nuclear Association - 9/05)



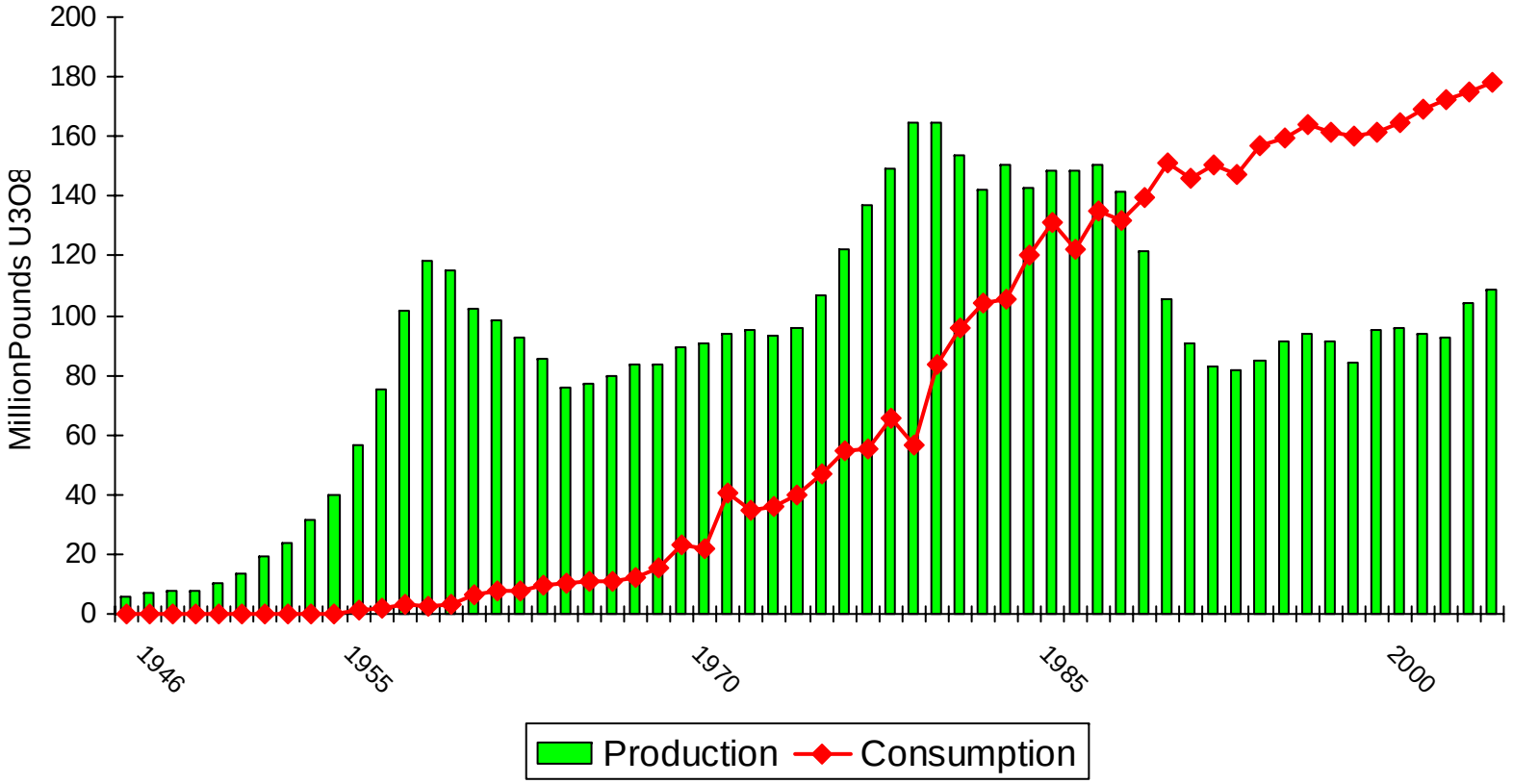
World Uranium Requirements

(World Nuclear Association - 9/05)



World Uranium Production and Consumption

1946-2005



Secondary Uranium Sources

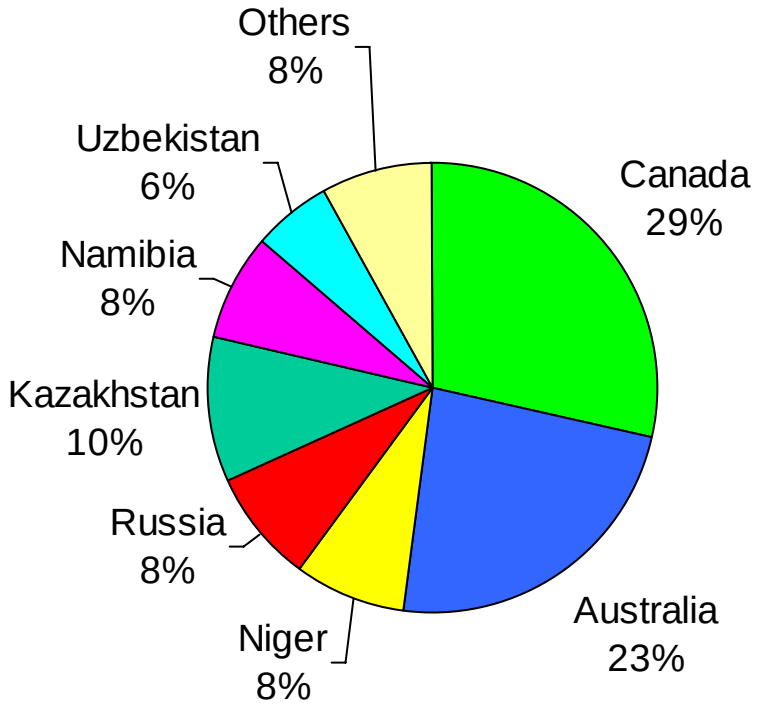
- U.S.-Russian Highly Enriched Uranium Program (1994-2013)
- U.S. Department of Energy Inventory
- Re-enrichment of Depleted UF_6
- Mixed Oxide (MOX) / Reprocessed U

U.S. - Russia Highly Enriched Uranium Program

- 500 Metric Tons of Russian HEU (>90 % U^{235})
- Down-Blended to Commercial Fuel Grade (4.95 % U^{235})
- Contains 360-400 Million Pounds U_3O_8
- Deliveries continue through 2013
- Status - 269 Metric Tons HEU processed (equivalent to 10,746 nuclear warheads)
- HEU-II

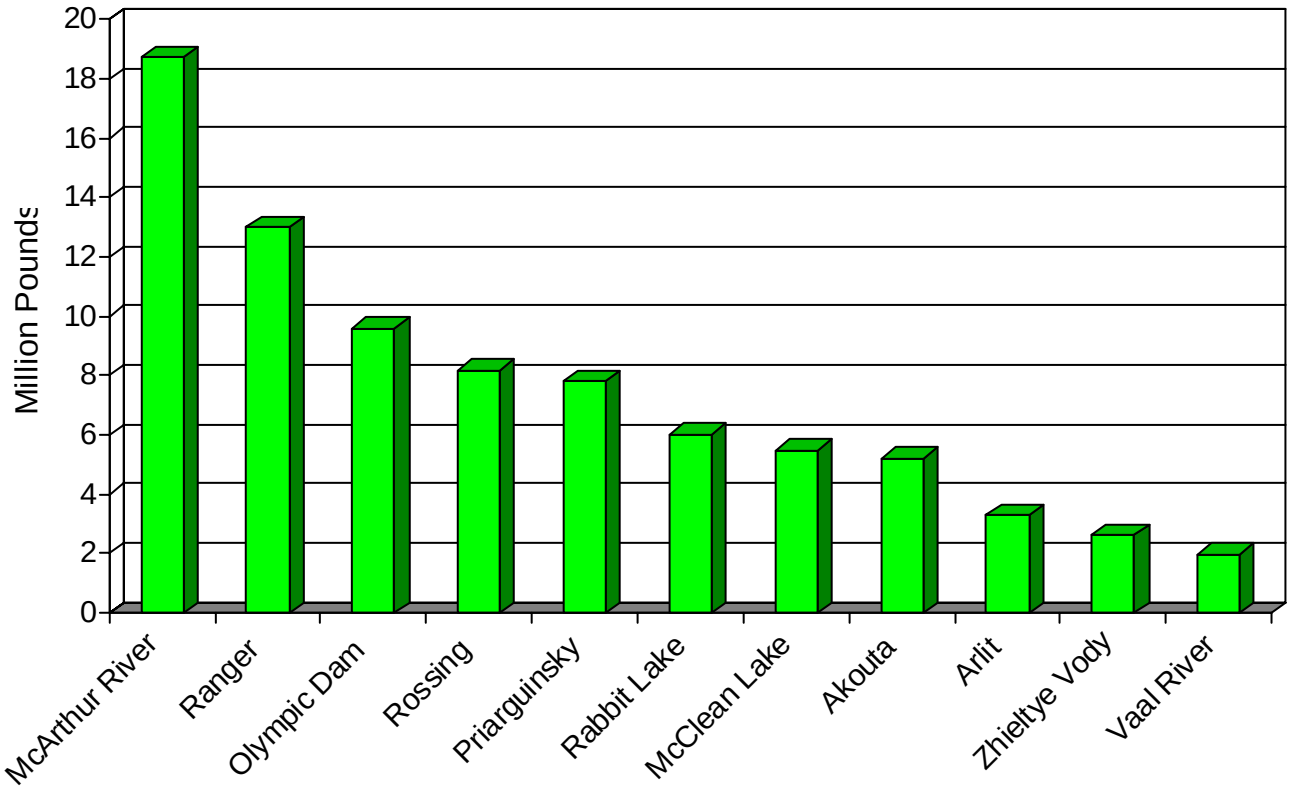
Uranium Production - 2005

(Total – 108.9 million lbs U_3O_8)



World's Largest Uranium Mines

2005



Uranium Production - 2005

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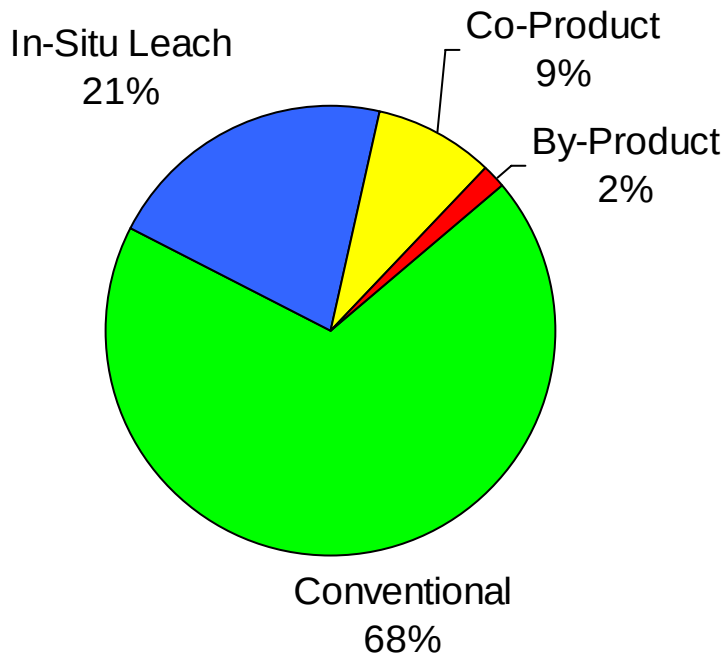
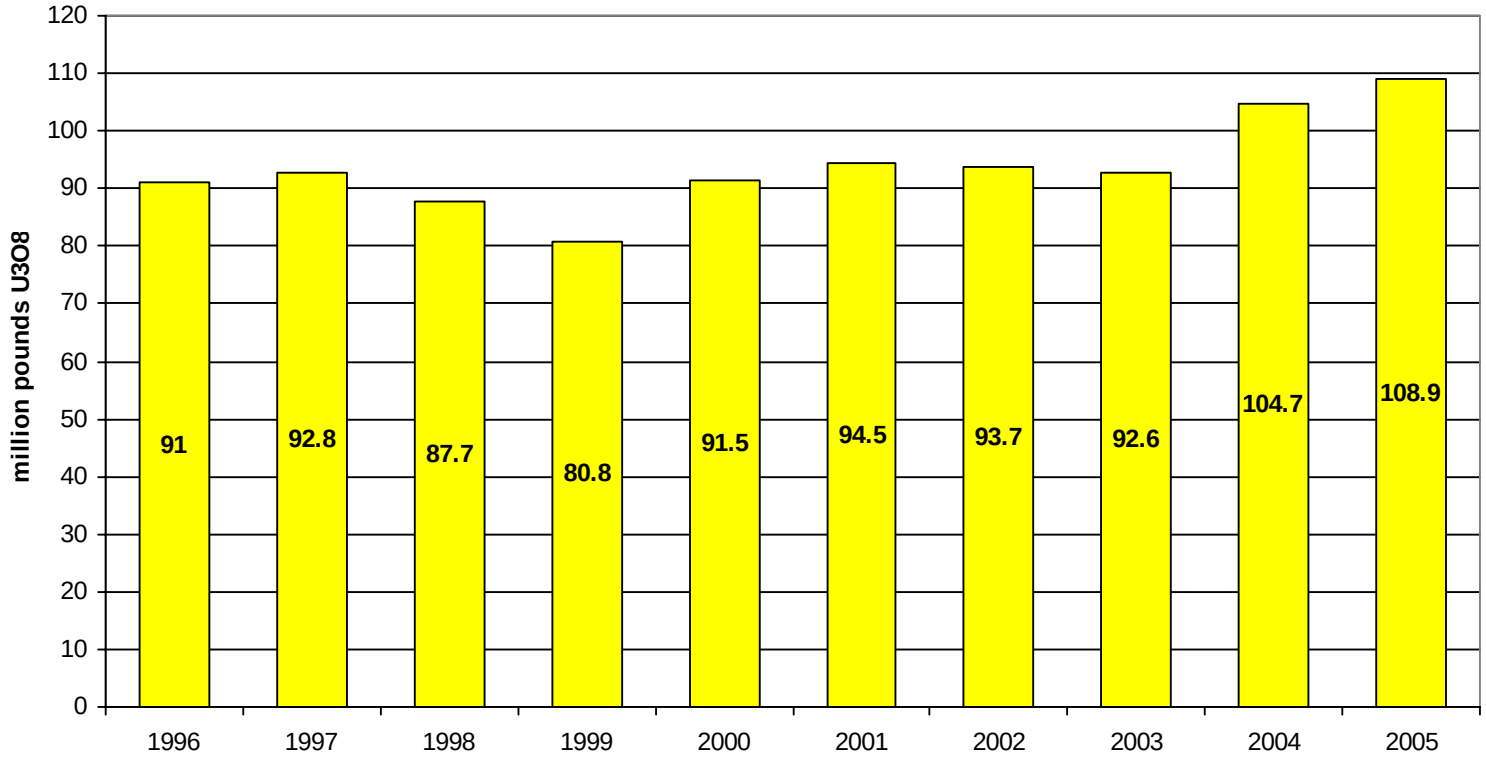


Global Uranium Production

1996-2005

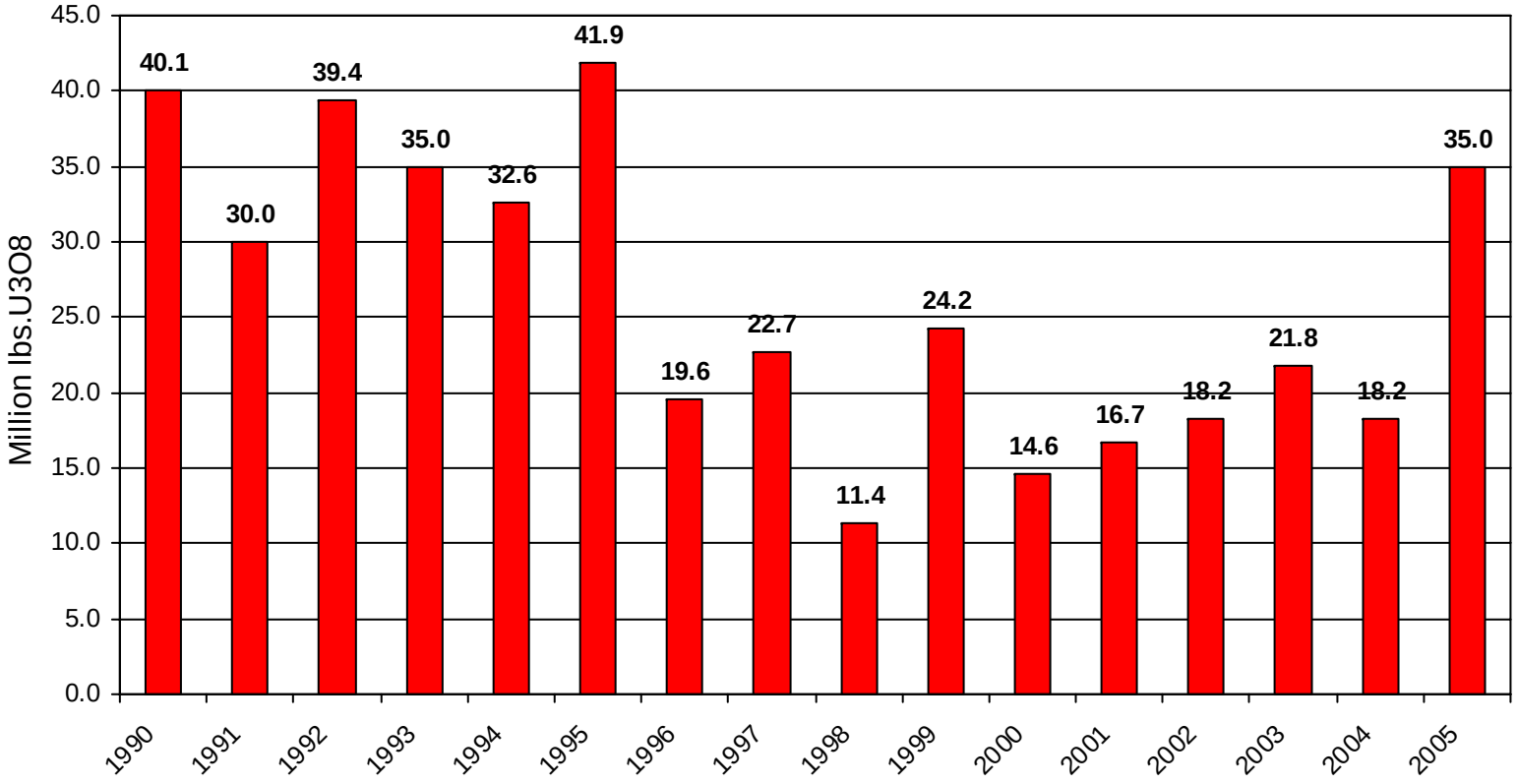


How Do Utilities Buy Uranium?

- Spot (or near-term market) represents about 10-15% of annual volume
- Vast majority of uranium needs are filled through “term” uranium purchase agreements
- So, the important market to watch is not the spot demand and supply but conditions in the long-term (or multi-year) market

Uranium Transactions - Spot Market

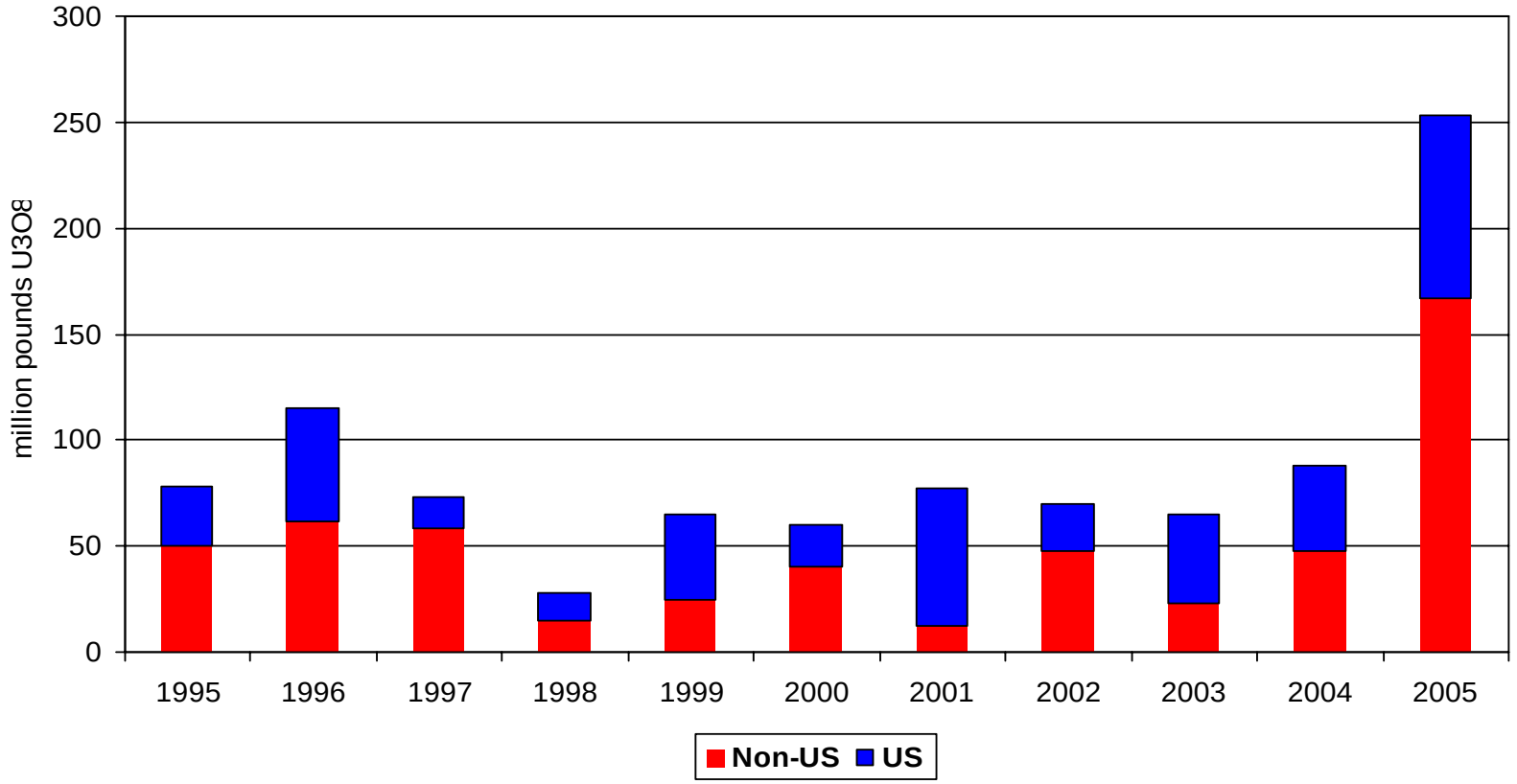
1990-2005



Long-Term Uranium Contracting

1995 – 2005

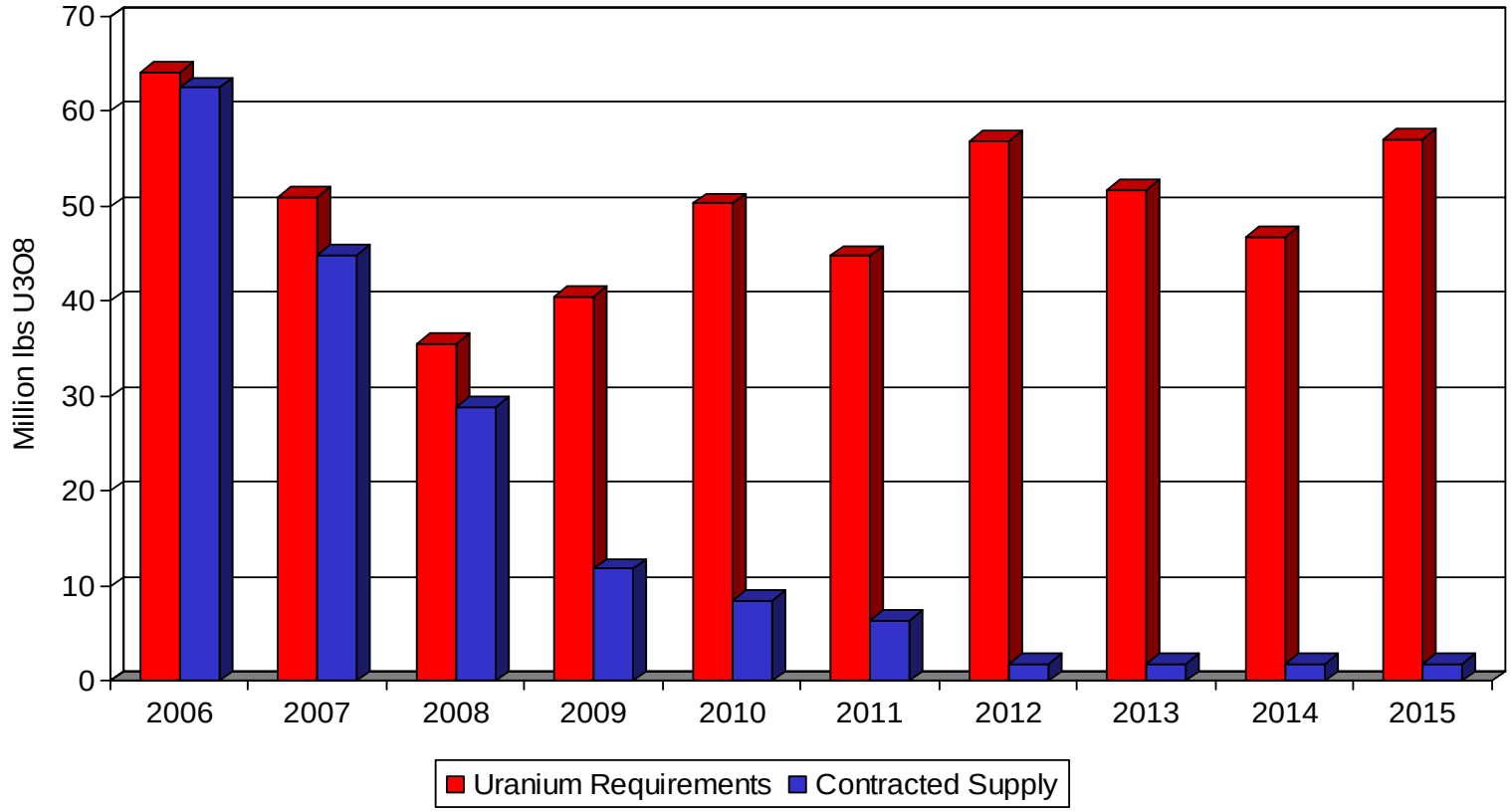
(Source: The Ux Consulting Company)



U.S. Nuclear Utilities

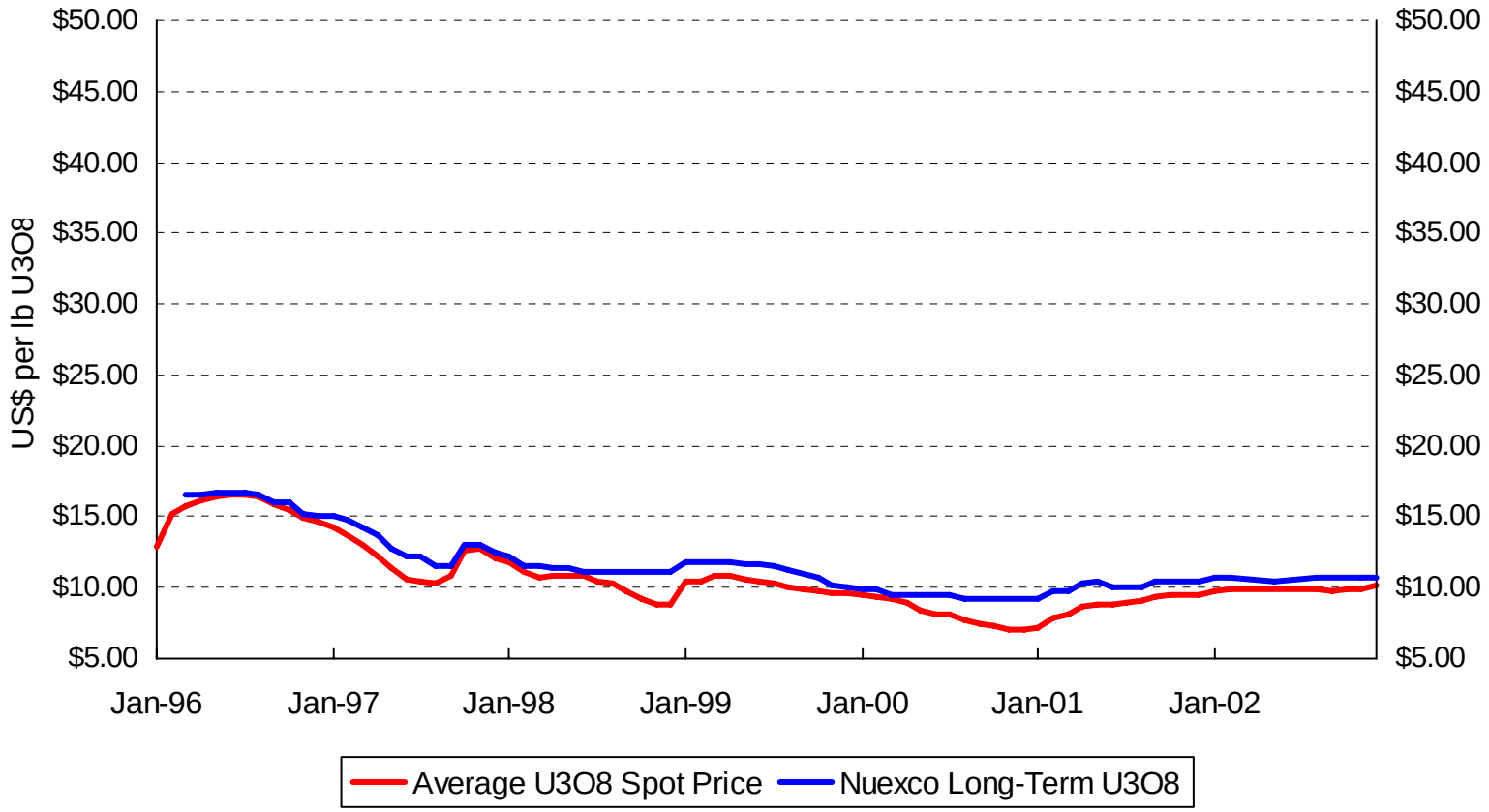
Uranium Requirements vs. Contracted Supply

(December 31, 2005)



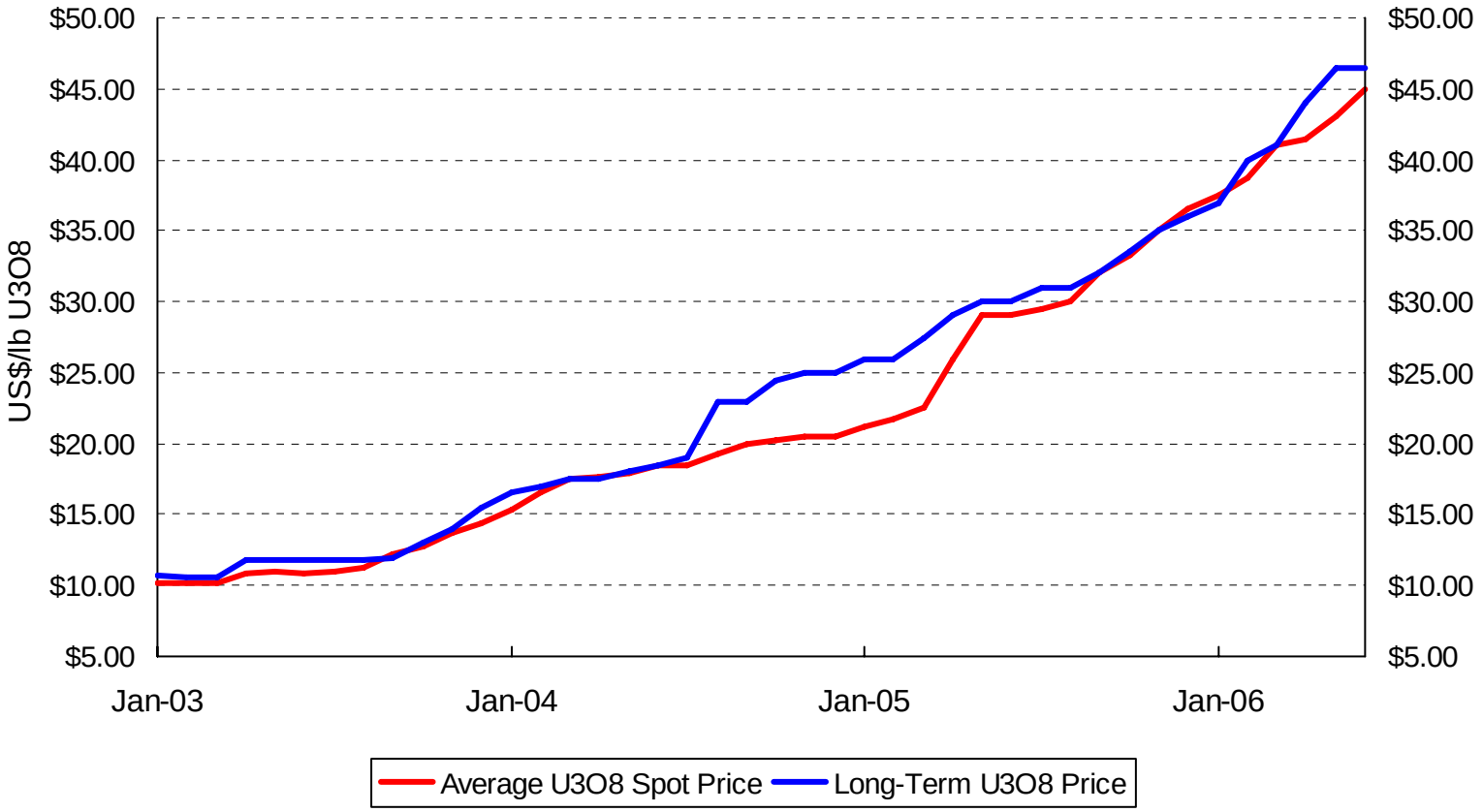
Uranium Price Trend

1996 - 2002



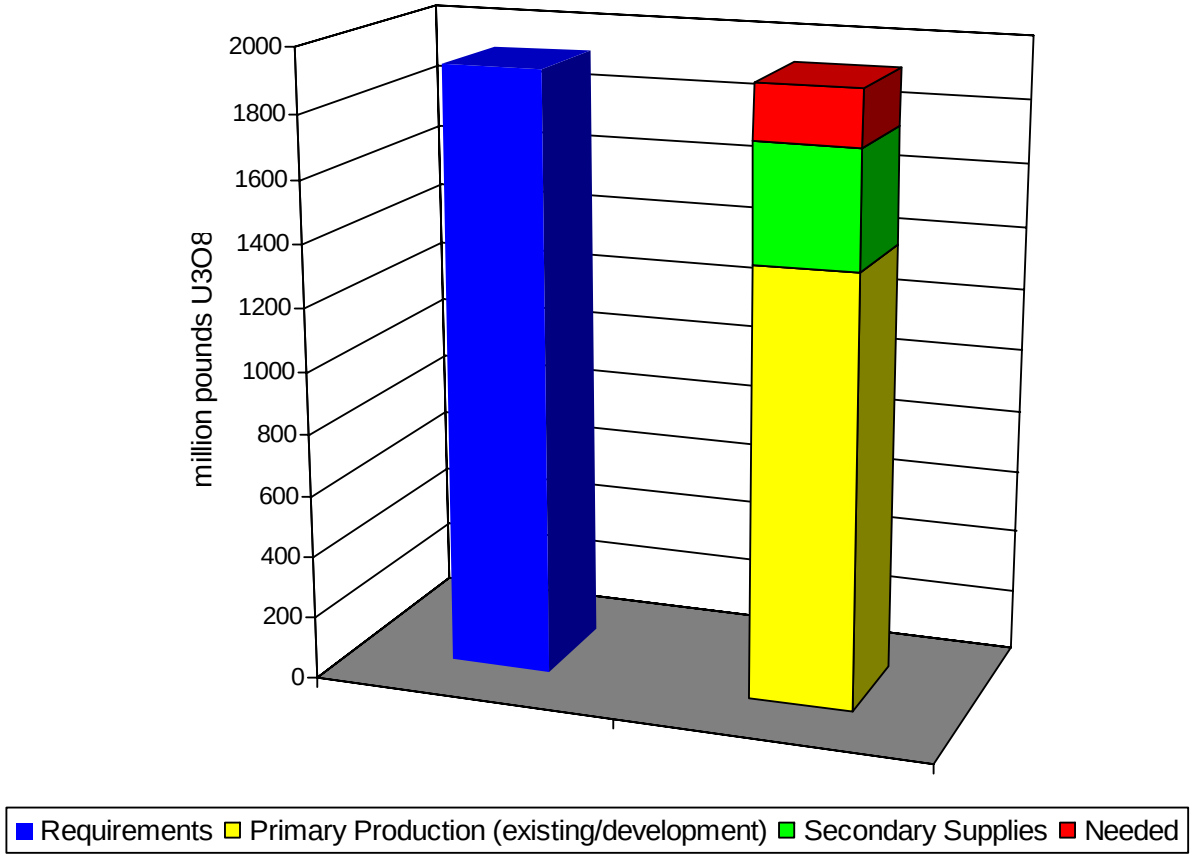
Uranium Price Trend

2003 - Present



Uranium Market Balance

2006-2015



Conclusions / Observations

- Nuclear power will continue to expand globally
- New uranium production is needed in order to meet requirements
- Uranium market continues to adjust to changes in fundamental demand and supply forces
- Resultant price effects underscore continuing imbalance especially in the term market
- Uranium market instability can be expected for the foreseeable future