

# ***The Global Uranium Market – Continuing to Evolve***

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**U2009 – Global Uranium Symposium**

**Keystone, Colorado**

**May 11, 2009**



# Uranium Market Factors / Trends

## Increasing Uranium Demand

- Existing Nuclear Fleet Expanding
- New Build Programs

## Lagging Production Response

## Production Cost Pressures

## Uranium Price Trend

- Near-Term (spot) Volatility
- Long-Term Price Strengthening



## Investment Analysts' Perspectives

"Global nuclear utilities and producers, including Chinese players, are moving aggressively to secure future uranium supply. The main driver is heightened uncertainty of future supply growth (in the face of expected strong Chinese demand)"

[Macquarie Research - Commodities \(24 April 2009\)](#)

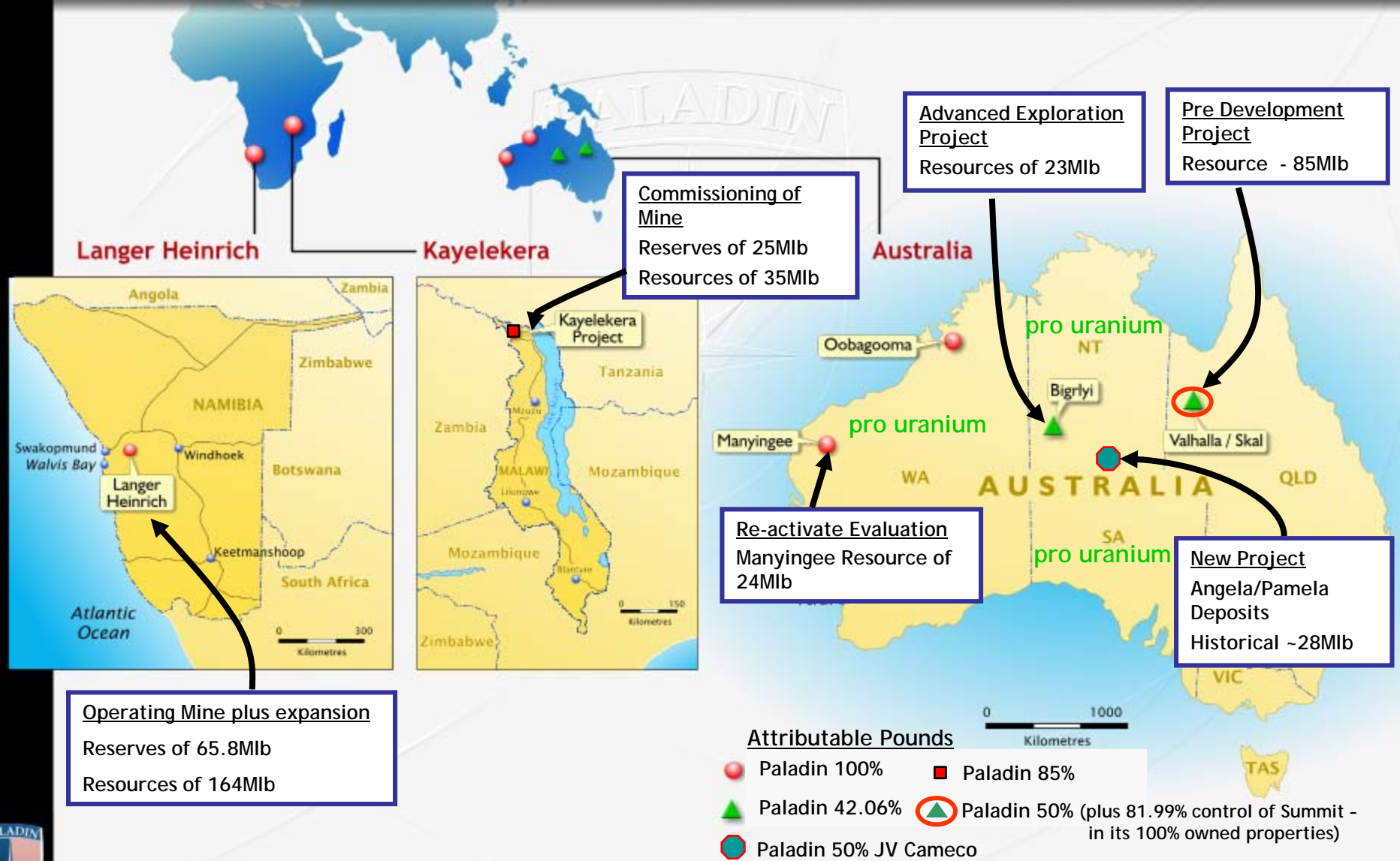
"We believe that the uranium market is in the early stages of a bull market rally that could last three to four years. We think the primary drivers of the bull market will be:

- 1) Looming supply/demand shortfall that will drive pricing significantly higher;
- 2) Asian utility buying is driving up both uranium asset and equity evaluations; and,
- 3) We believe consolidation will occur in the uranium sector that will result in higher equity valuations."

[RBC Capital Markets \(29 April 2009\)](#)



# Paladin's Uranium Production Centers and Projects



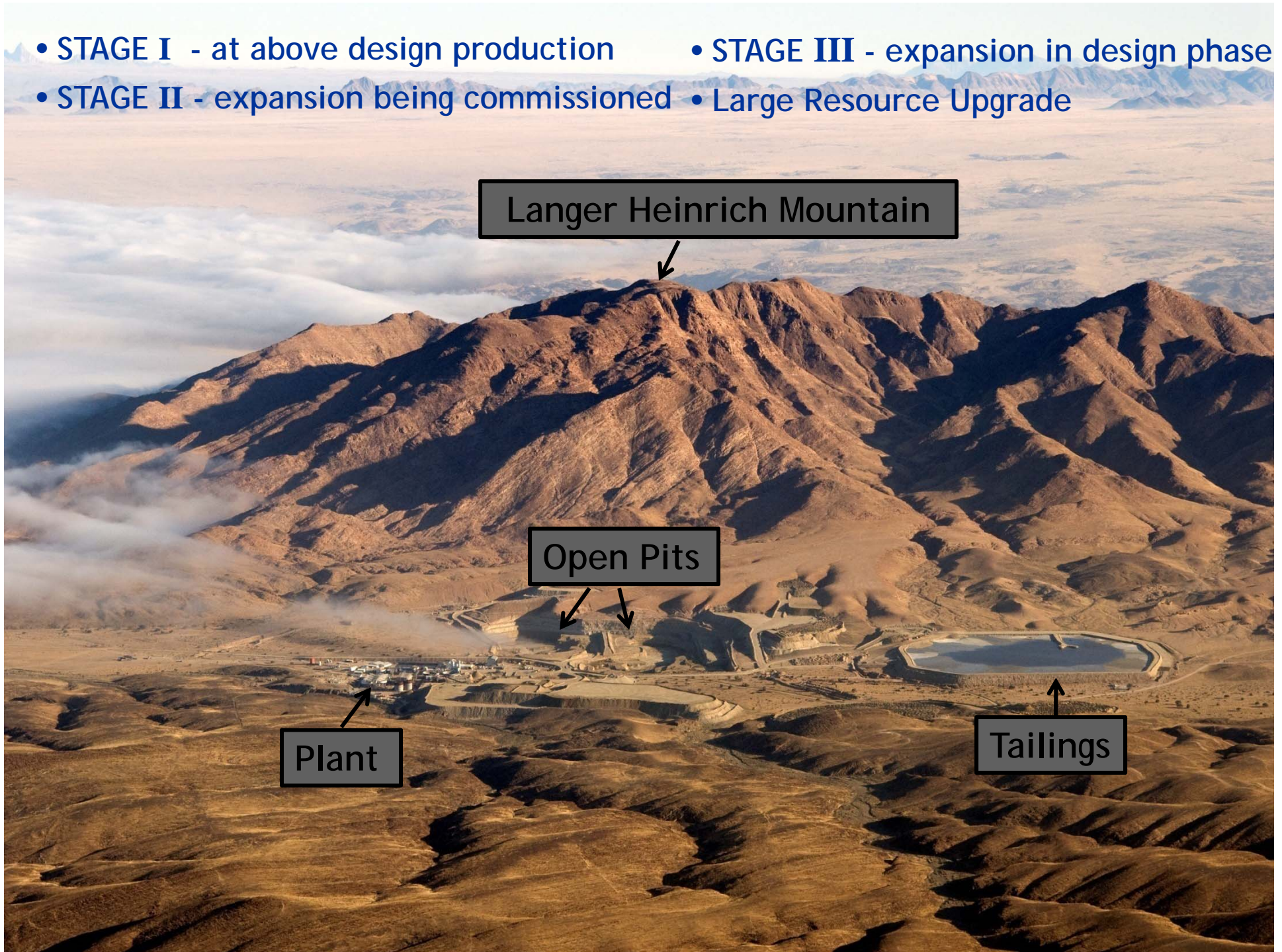
- STAGE I - at above design production
- STAGE II - expansion being commissioned
- STAGE III - expansion in design phase
- Large Resource Upgrade

Langer Heinrich Mountain

Open Pits

Plant

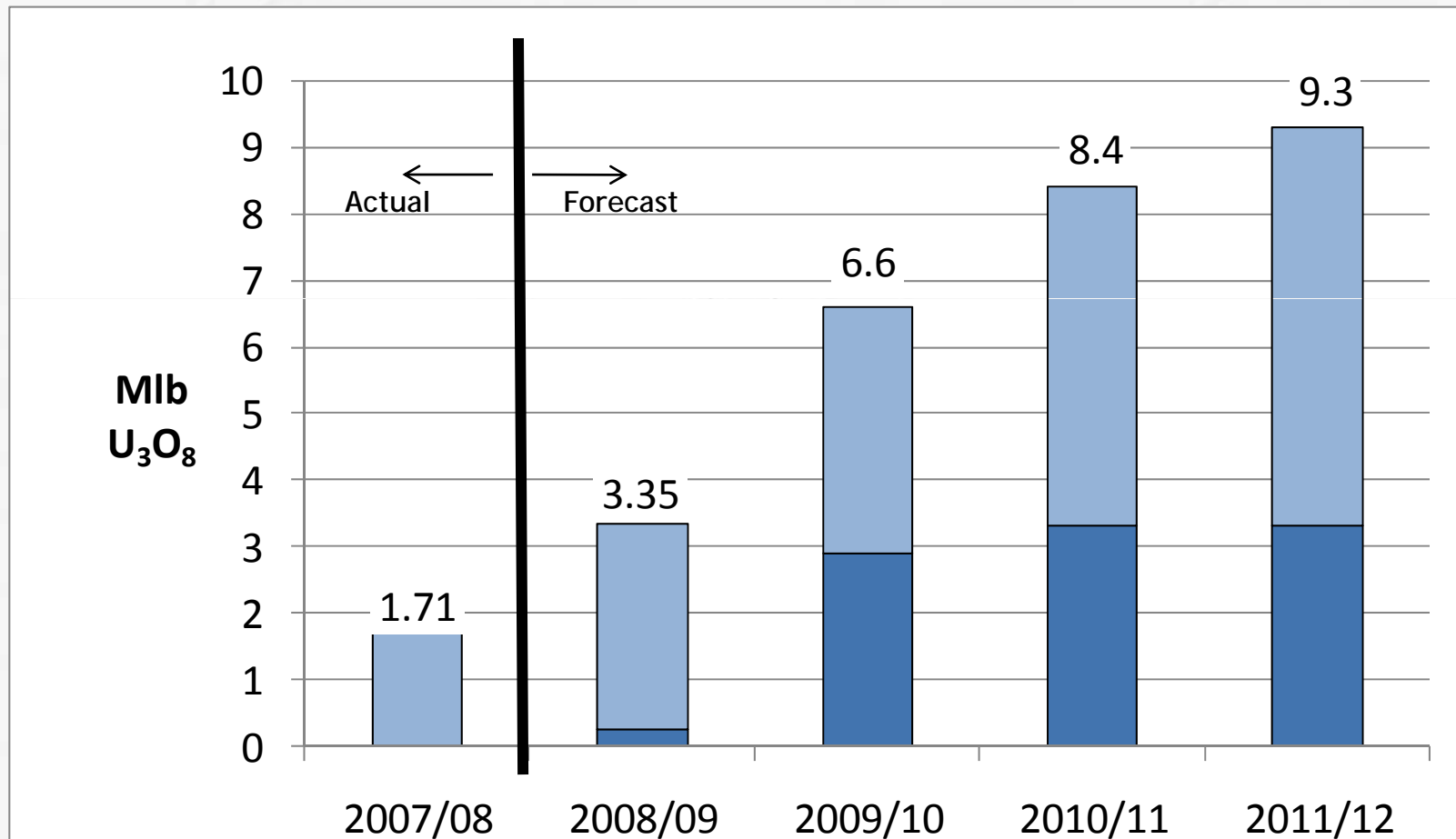
Tailings



# Kayelekera Uranium Project



# Paladin's Uranium Production Outlook



Langer Heinrich Production

Kayelekera Production



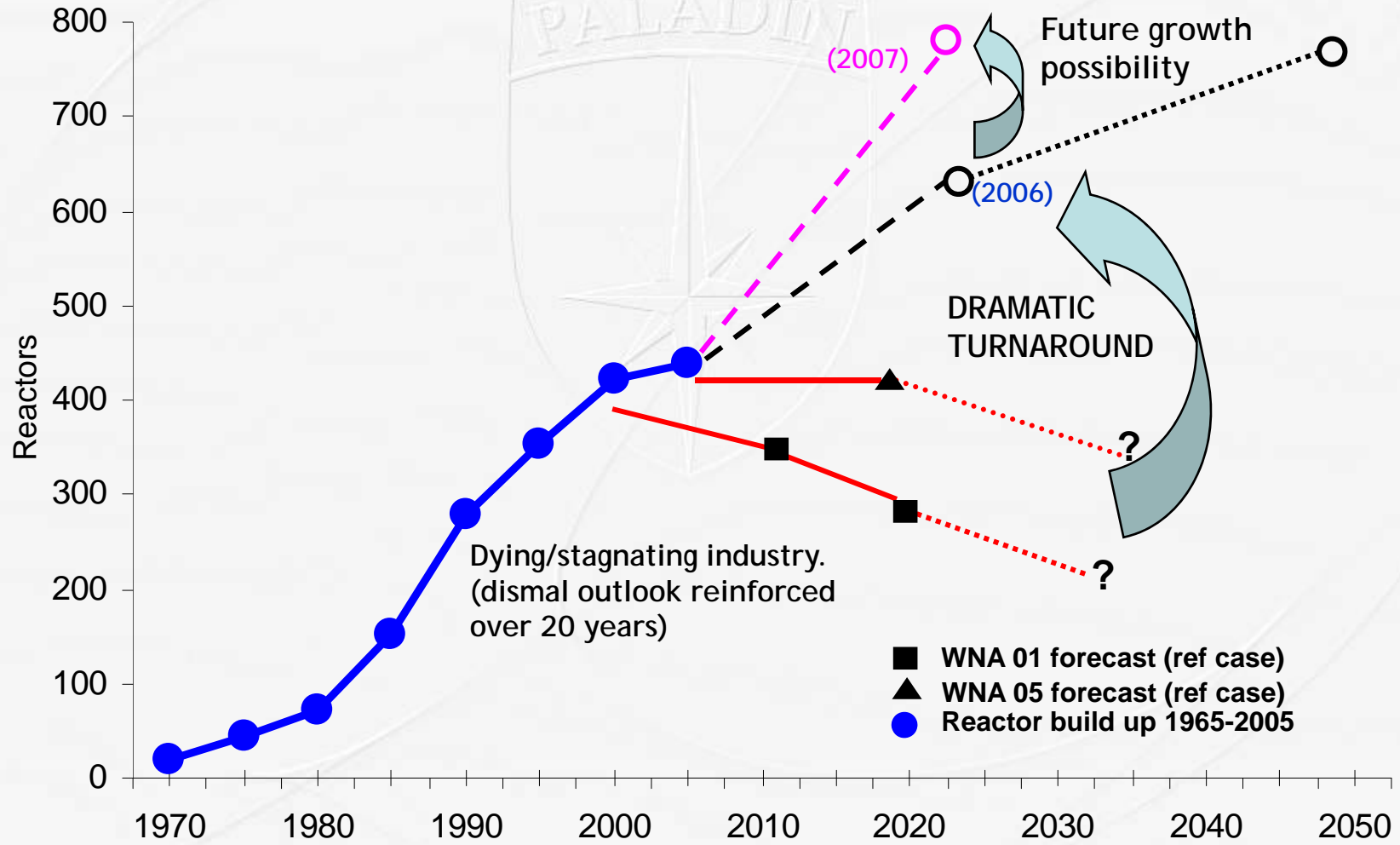
# Nuclear Power Growth and Uranium Demand





# The Nuclear Reactor Fleet (1965 to 2050)

- From stagnation to full revival



## Second Commercial Nuclear Power Era

Driven by China, India, Russia (rather than United States, Japan and Western Europe)

National nuclear power programs driven by escalating electricity needs and energy security

Governments responding to growing concerns regarding climate change



# World Nuclear Capacity

(May 2009)

	Current Nuclear Capacity	Under Construction	Planned
Reactors / (Capacity)	436 (372,220 MWe)	45 (39,948 MWe)	112 (131,145 MWe)
	170Mlb U <sub>3</sub> O <sub>8</sub> required (WNA Estimate)		
Countries	30	13	25
China	11 (8,587 Mwe)	12 (12,100 MWe)	33 (35,320 MWe)
Russia	31 (21,743 Mwe)	8 (5,980 MWe)	8 (9,360 MWe)
India	17 (3,779 Mwe)	6 (2,976 MWe)	10 (9,760 MWe)
South Korea	20 (17,716 Mwe)	5 (5,350 MWe)	7 (9,450 Mwe)
Japan	53 (46,236 Mwe)	2 (2,285 Mwe)	13 (17,915 MWe)
United States	104 (101,119 Mwe)	1 (1,180 Mwe)	11 (13,800 MWe)

**In addition:**

**Proposed Reactors (May 09): 276 Reactors (299,405 Mwe) in 36 countries**



# China

Current Program: 11 reactors (8,587 Mwe)  
12 reactors (12,100 Mwe) under construction  
Planned Program: 75,000 Mwe by 2020  
120,000-130,000 Mwe by 2032

- Current generation mix: 80% coal / 18% hydro / 2% nuclear
- National goal of no less than 5% nuclear by 2020
- National economic stimulus – US\$585 billion focused on infrastructure including power generation
- Increased uranium market activity (spot purchases; long-term contracting; production sector investment)



# United States

- Formal applications for Combined Construction/Operating licenses (COL) filed with the USNRC
  - NRG Energy & South Texas Project (2 reactors; 2700 MWe)
  - TVA & NuStart Energy (2 reactors; 2000 MWe)
  - Dominion (1 reactor; 1000 MWe)
  - Duke (2 reactors; 2000 MWe)
  - NuStart Energy (1 reactor; 1000 Mwe)
  - SCE&G (2 reactors; 2000 Mwe)
  - Progress Energy (2 reactors; 2000 Mwe)
  - Georgia Power (2 reactors; 2000 Mwe)
  - UNISTAR (1 reactor; 1000 Mwe)
  - AmerenUE (1 reactor; 1000 Mwe)
- USNRC expects total of 23 COL applications (34 reactors) to be filed during 2007-2010
- U.S. utilities filed applications for USDOE loan guarantees totaling US\$188 billion (21 reactors at 14 sites; 28,800 Mwe)



# Uranium Supply



# Secondary Uranium Supplies

- U.S.-Russia Highly Enriched Uranium Program
  - Generates 24.0 million pounds  $U_3O_8$ /year
  - Terminates 2013
  - Will not be extended
- USDOE Excess Uranium Inventory Management Plan
  - Released 16 December 2008
  - Inventory totals 58,931 MTU (153.2 million pounds  $U_3O_8$ )
  - Various forms including HEU (further processing required)
  - Market introduction at annual rate equal to no more than 10% of U.S. reactor requirements (5.0 million pounds  $U_3O_8$ /year)
  - Program extends post-2040



# Uranium Production

Global production industry devastated by depressed prices extending over prolonged period

Major new production centers taking longer and costing more than originally planned

Junior companies will provide minimal relief in the near-to-intermediate term

Access to financial resources diminishing for unproven junior companies

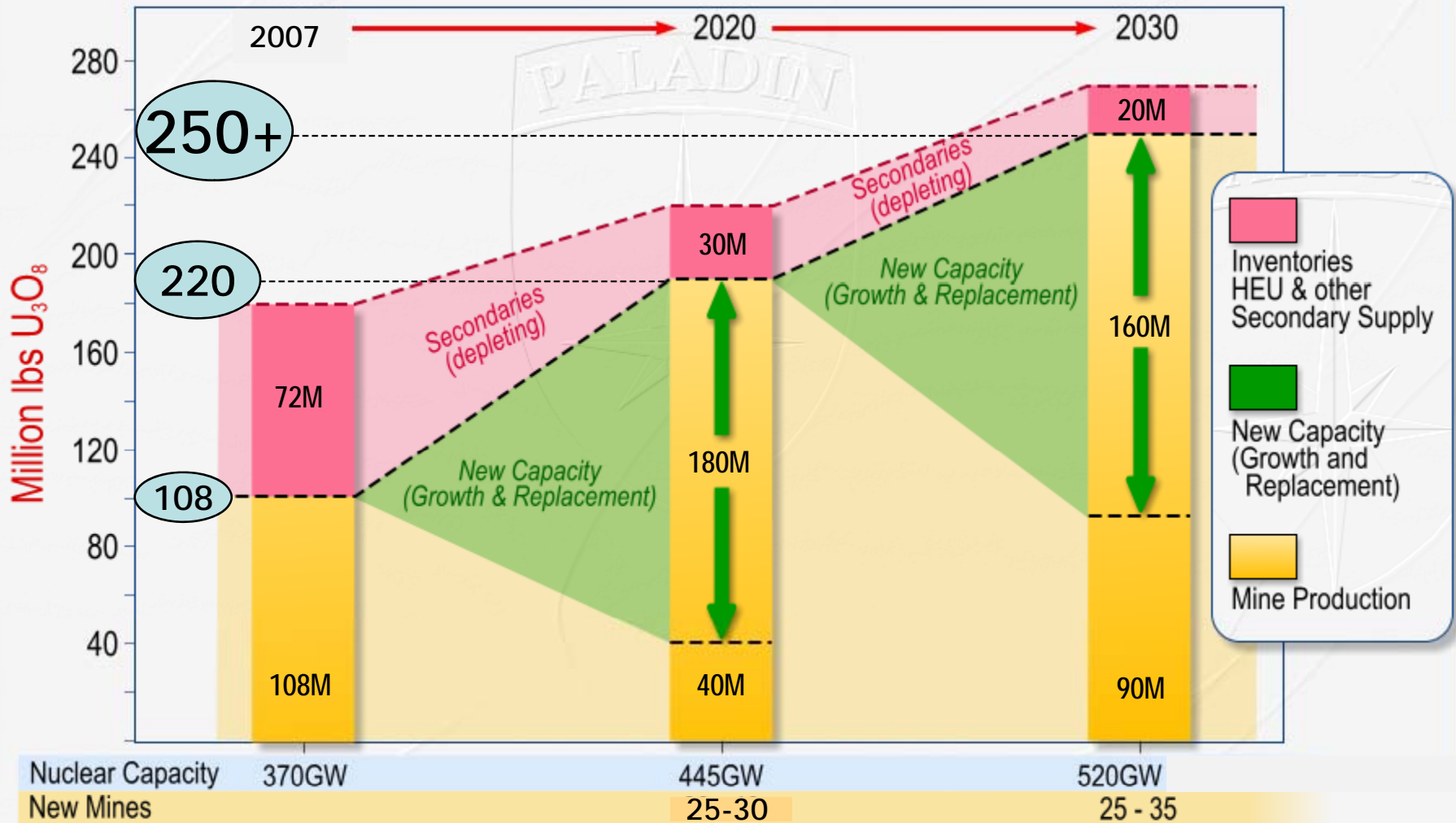
Need for additional “Tier-1” producers





# Building a New Mining Supply Industry

2007 to 2030 and beyond



Nuclear Capacity 370GW  
New Mines

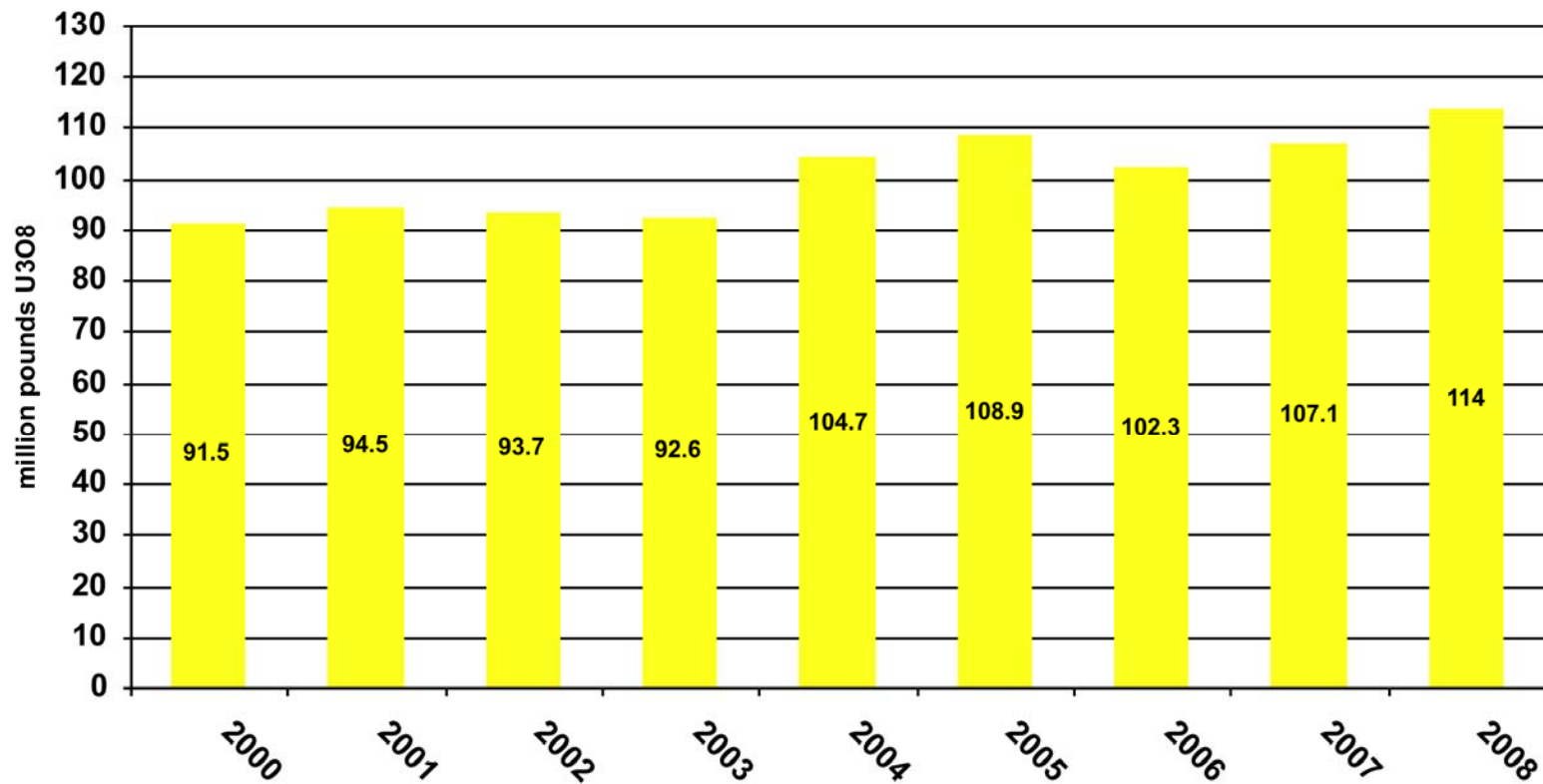
445GW  
25-30

520GW  
25 - 35

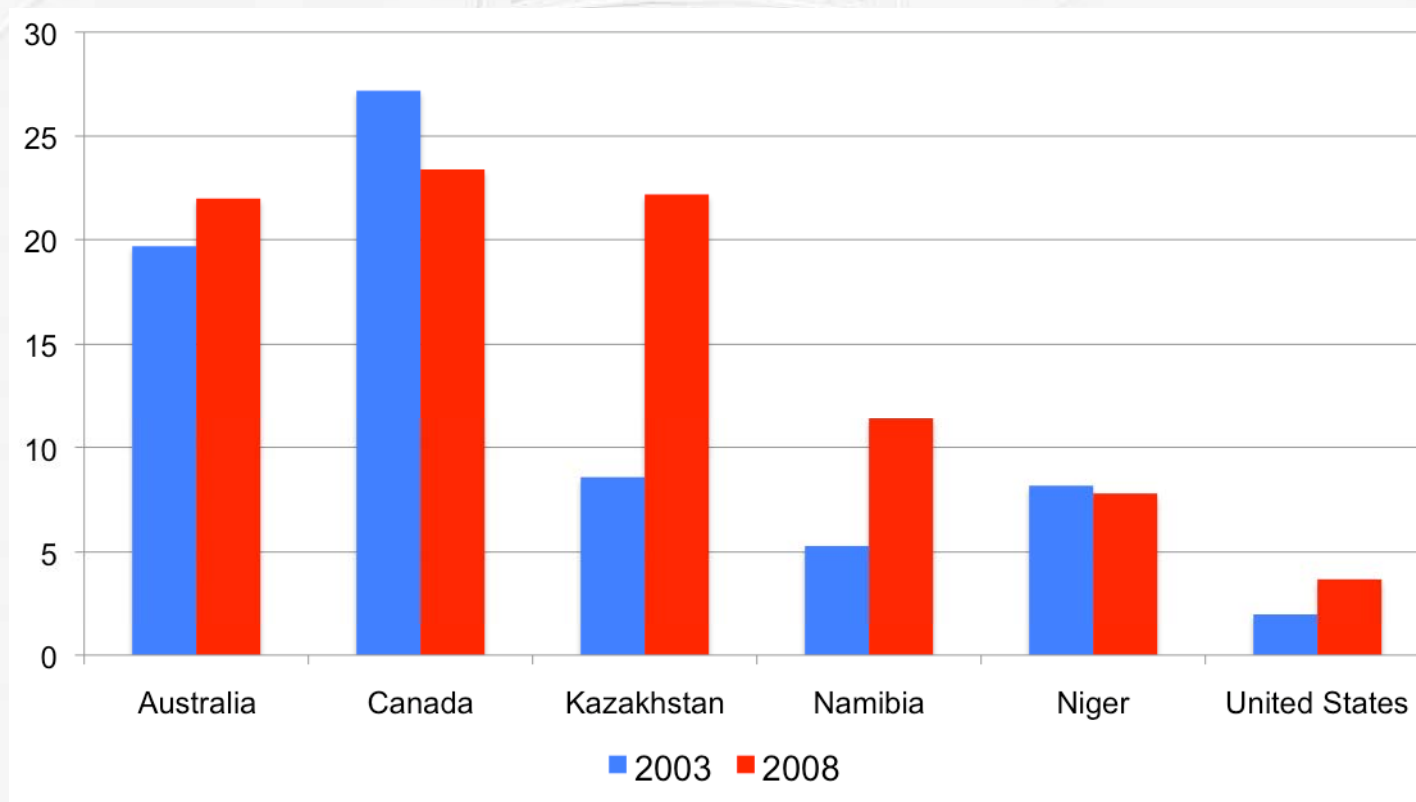
Huge discovery/development effort required  
(ADDITIONAL NEW DISCOVERIES ESSENTIAL TO MEET 2030/40 REPLACEMENT/GROWTH REQUIREMENTS)



# Global Uranium Production 2000-2008



# Uranium Production (2003 vs. 2008)



# Project Development Delays

- Cigar Lake development delay due to mine flooding (October 2006 / August 2008); Production start had been as early as 2007 but now 2013/2014 at earliest
- Olympic Dam expansion delay (start date pushed back from 2012/2013 to at least 2016)
- Midwest Mine (McClean Lake) shelved (expected start-up had been 2010)
- Equinox Minerals deferred uranium recovery plant at Lumwana Project (Zambia) (planned 2.0 million pounds  $U_3O_8$ /year beginning 2010)
- Kazatomprom lowered previous 2009 production forecast for Kazakhstan by 14%



# Uranium Production Supply Sector / Costs

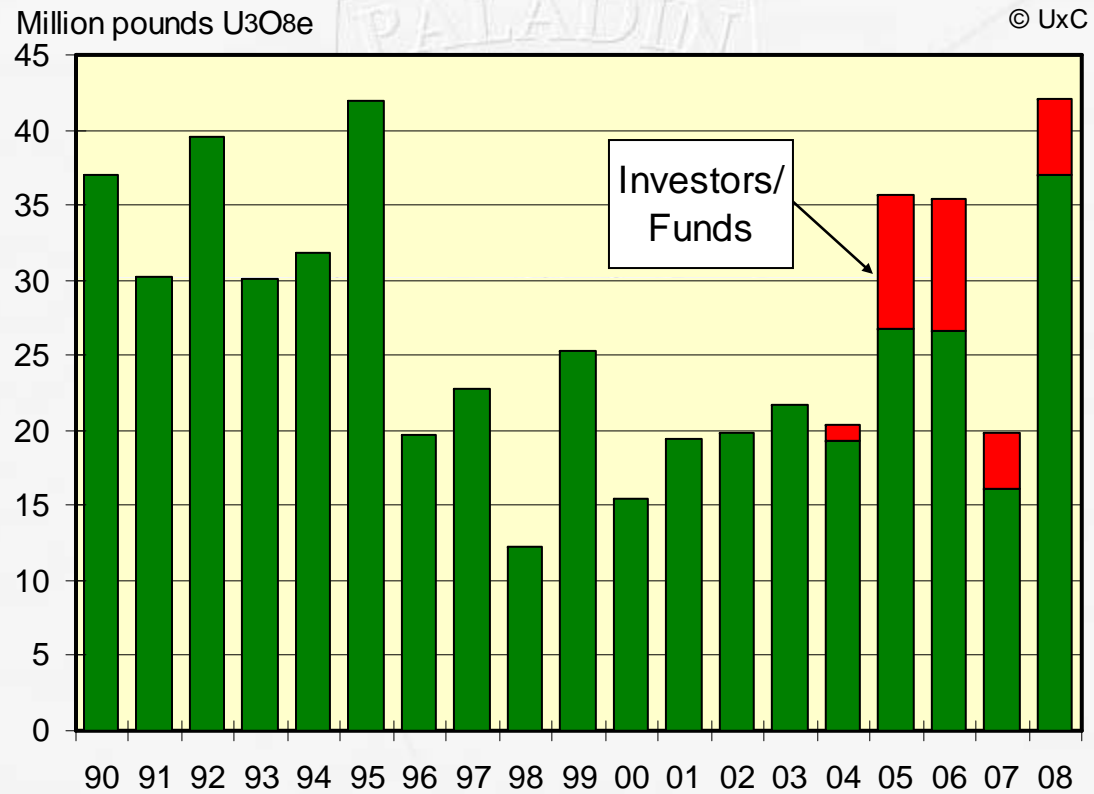
- Limited understanding of uranium production sector
  - Nuclear Utilities
  - Investment Community
  - Junior U Companies
- Development of uranium projects which were already well-defined (“low hanging fruit”)
- Production cost profile
  - Recent estimates of **total** uranium production costs at or above US\$60-70/pound  $U_3O_8$



# Uranium Prices and Market Factors



# U<sub>3</sub>O<sub>8</sub> Spot Volumes, 1990-2008



Source: *Uranium Market Outlook*, January 2009 Preliminary



# Participants – Spot / Near-Term Market

(Delivery Within 6-12 Months)

Nuclear Utilities

Uranium Producers

(e.g. Cameco)

Fuel Cycle Companies

(conversion/enrichment/fuel fabrication)

Trading Companies

(e.g. Nukem, Itochu)

Investment Funds (public)

(e.g. UPC, Nufcor Uranium)

Investment Funds (private)

(e.g. American Fuel Resources)

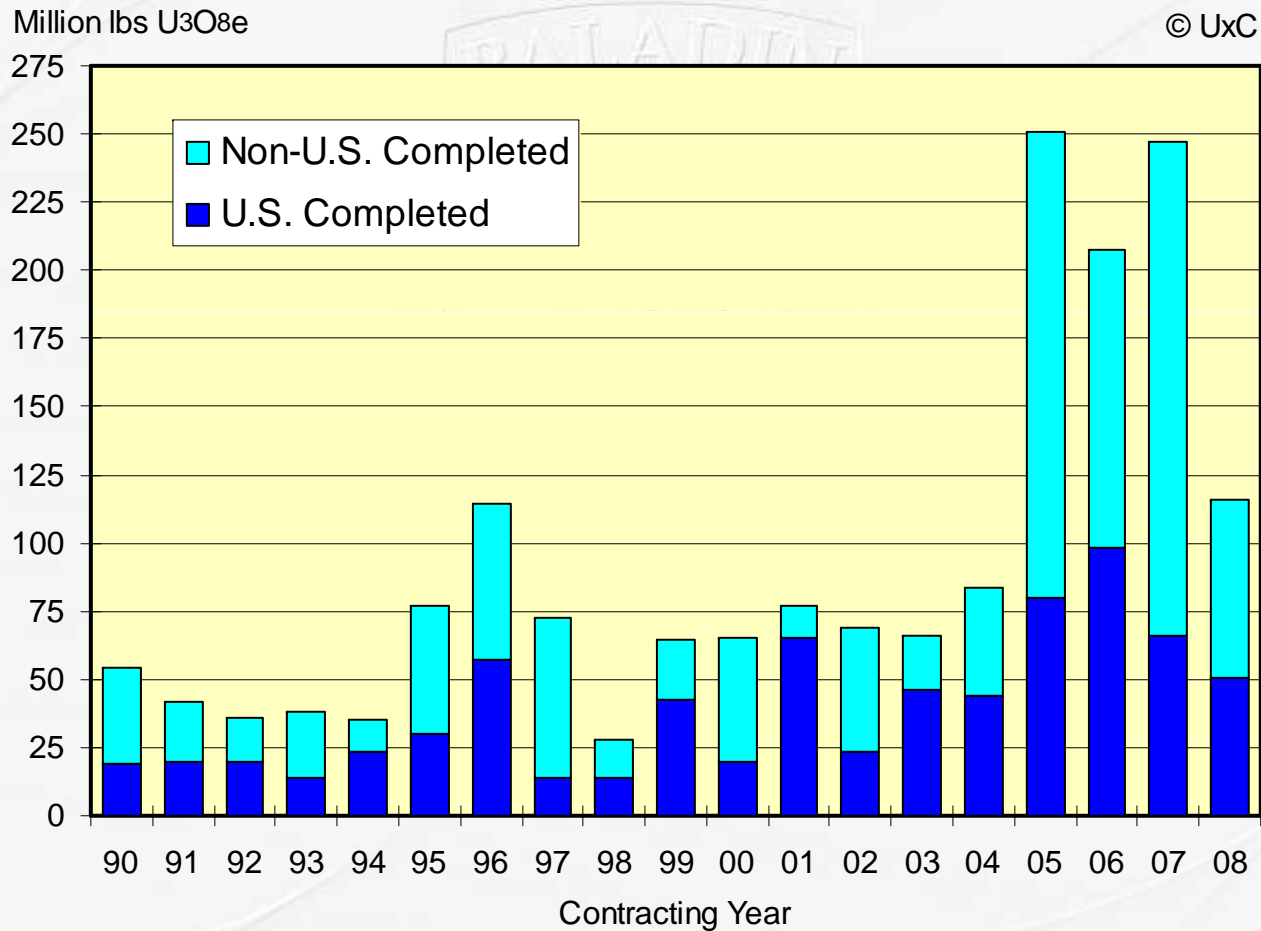
National Governments

(“Sovereign Stockpiling”)





# Utility LT $U_3O_8$ Contract Volume 1990-2008



Source: *Uranium Market Outlook*, January 2009 Preliminary



# Participants – Term Market

(Multi-Year Deliveries Beginning 2 - 3 Years Forward)

Nuclear Utilities

Uranium Producers

(e.g. Tier - 1 (Cameco) / Tier - 2 (Paladin))

Fuel Cycle Companies

(conversion/enrichment/fuel fabrication)

Trading Companies / Intermediaries

(e.g. Nukem, Itochu)

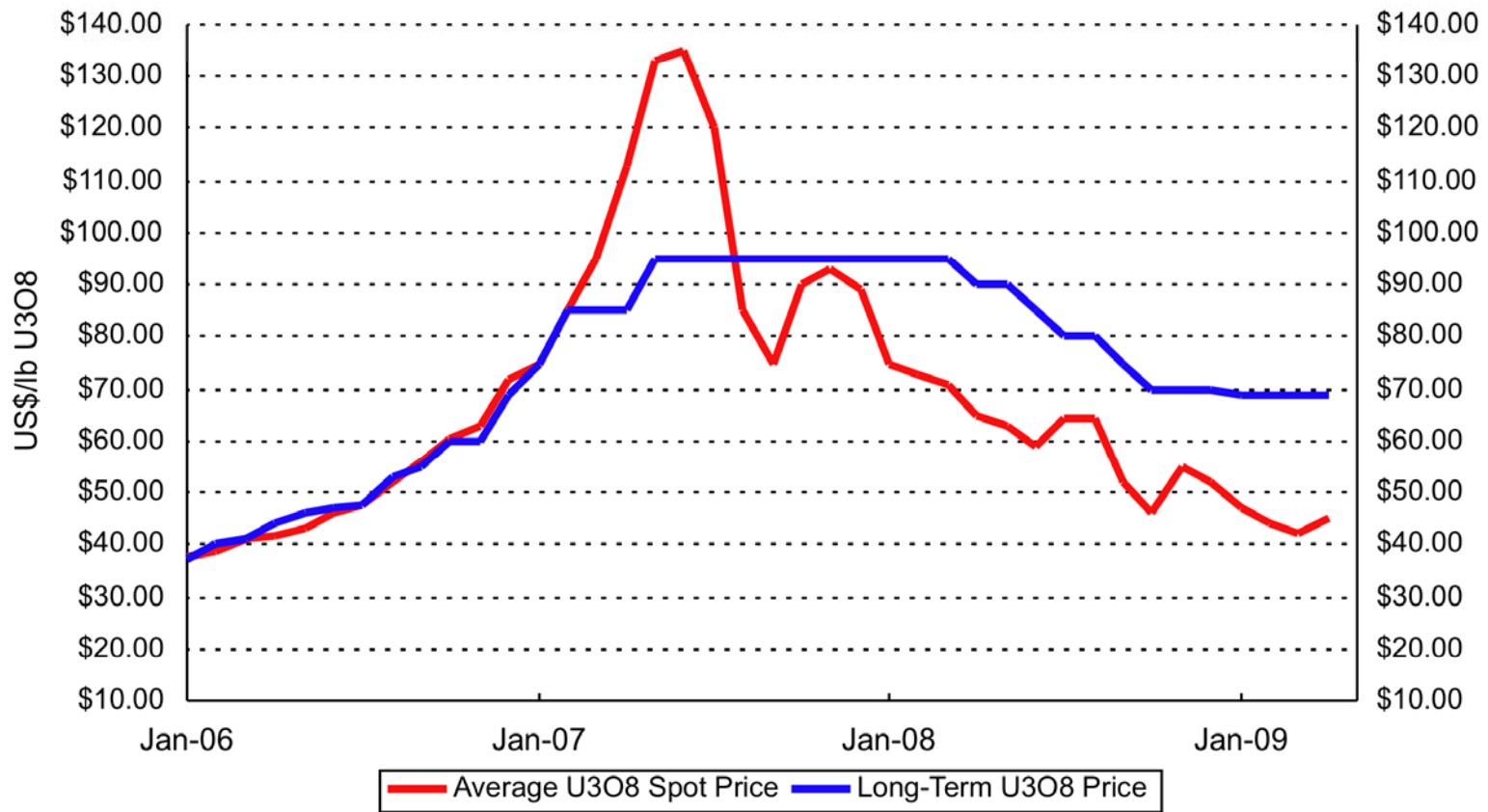
Investment Funds (private)

(e.g. American Fuel Resources)



# Uranium Price Trend

2006 - Present



# Commercial Terms and Conditions

- Delivery Periods
- Annual Delivery Volumes
- Delivery Locations (book transfer; physical)
- Origin (project-specific; country-specific; “open”)
- Force Majeure
- Interruption of Supply
- Payment Terms (including currency)
- Pricing Mechanisms



# Term Contract Pricing Mechanisms

- Base Price, subject to adjustment (economic indices; fixed escalator)
- Fixed (defined) Price
- Market Price at time of delivery
  - Spot and/or Long-Term Price
  - Floor (minimum) Price
  - Ceiling (maximum) Price
- Hybrid / Combination Price
  - Base/Fixed Price component
  - Market Price component
- Negotiated Price (annual?)



# Investment in Uranium Production

- 1970's - 1980's
  - Significant investment by Asia-Pacific, European and North American utilities
- Synatom - PowerTech
- Chubu Electric - Kazakhstan ISR
- Tokyo Electric/Toshiba/BOJ - UraniumOne
- Korea Electric Power - Denison Mines
- CGNPG / CNNC - UraMin (Areva); Kazakhstan ISR
- Mitsui - Honeymoon ISR (UraniumOne)
- Sumitomo - Church Rock (Strathmore); Kazakhstan ISR
- Nuclear Power Corporation of India (NPCIL) - ??



# Conclusions / Observations

