

Fatal Attractions: Risk in the Nuclear Universe

Presented by

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Presented at

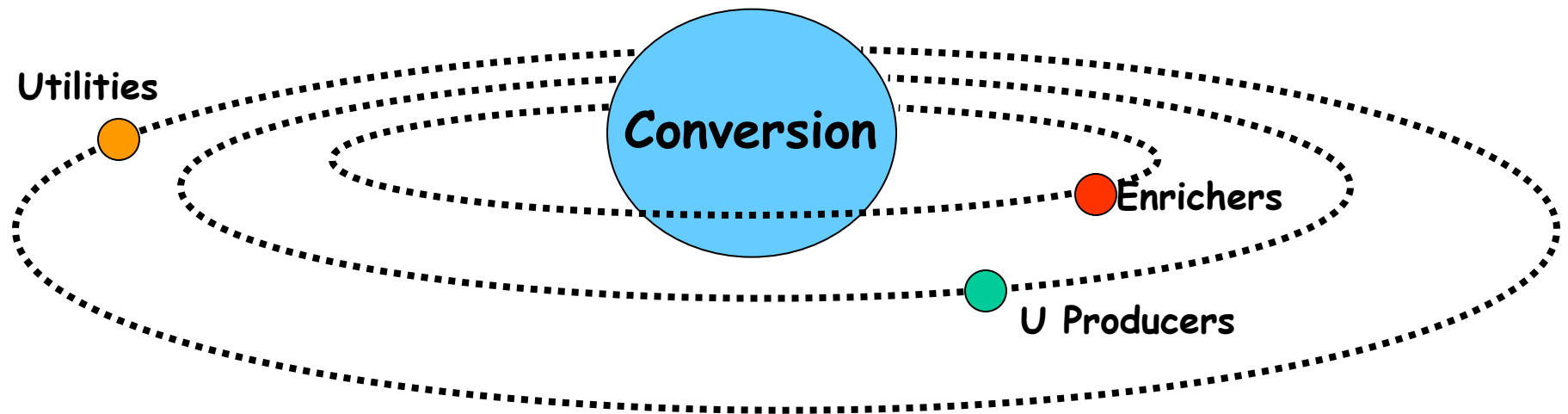
WNFM 29th Annual Meeting

and International Conference on Nuclear Energy

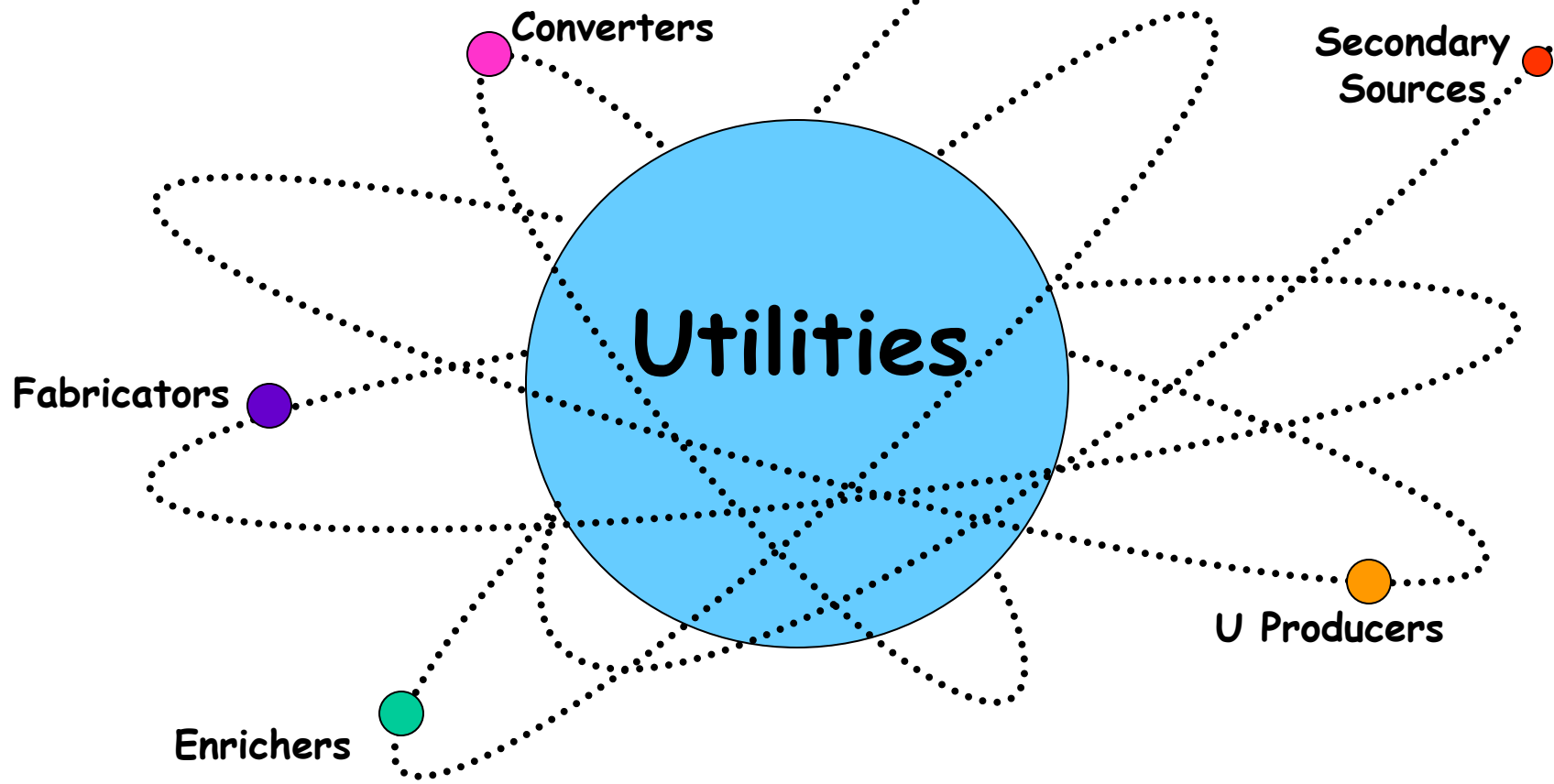
Berlin, Germany

June 2-4, 2002

The Nuclear Fuel Universe as Viewed by Converters



The Nuclear Universe as Viewed by a Casual Observer



"Get your facts first, and then you can distort them as much as you please."

Mark Twain

A decorative graphic consisting of a dotted grey line that forms a large, irregular shape on the left side of the slide. At the top of this shape is a solid pink circle.

“Planet Conversion” risks created by other “heavenly bodies” in our universe are:

- Utilities’ demand for fuel - Up or stagnant?
- Enrichers - When, and where, will new capacity be built?
- Secondary Supplies - Too much or too little?
- Will the “economic” pull and tug of other orbiting bodies allow converters to operate in a sustainable fashion?

A light blue circle with a jagged, crack-like line on its left side, partially overlapping the text.

Risks relating to Planet Conversion as perceived by the star in our universe, the **Utilities:**

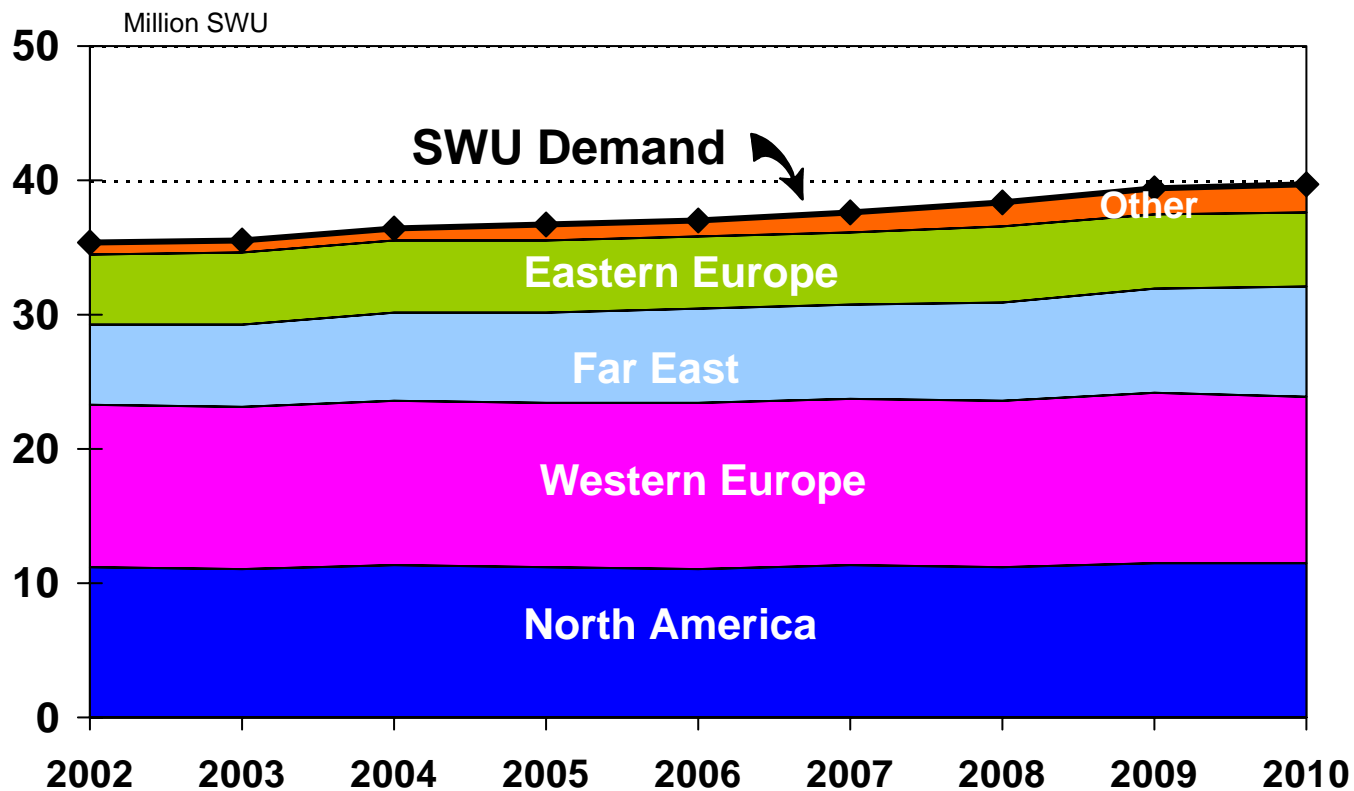
*(More accurately - “What Utilities Should
be thinking about concerning Conversion”)*

- Enrichers - When, and where, will new capacity be built?
- Secondary Supplies - Too much or too little?
- “Planet Conversion” is shrinking
- Significant quantities of secondary supplies controlled by primary producers
- Predictable costs - critical in a deregulated market

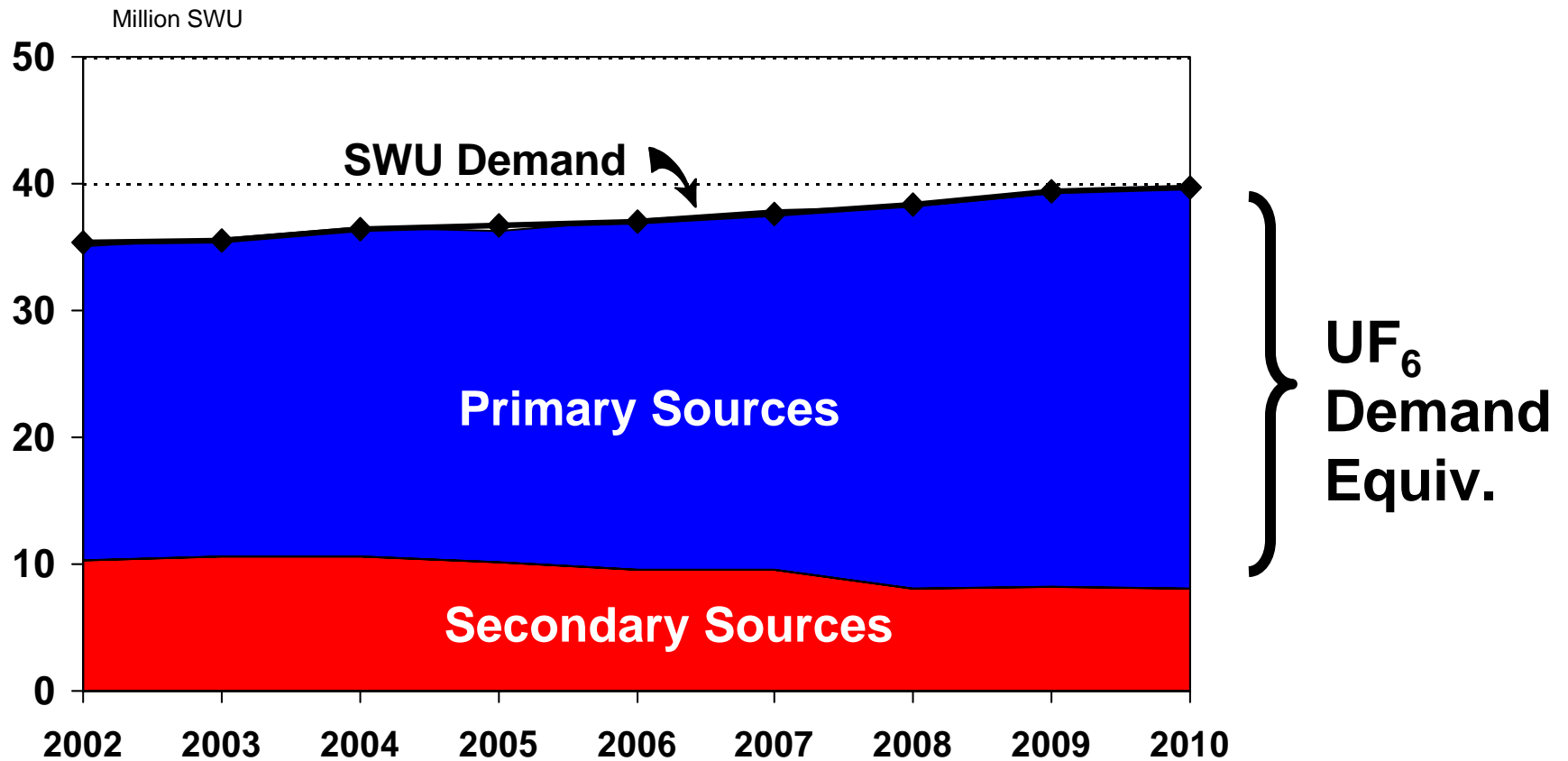
Utilities' Demand for Fuel - Up or Stagnant?

World SWU Requirements by Region

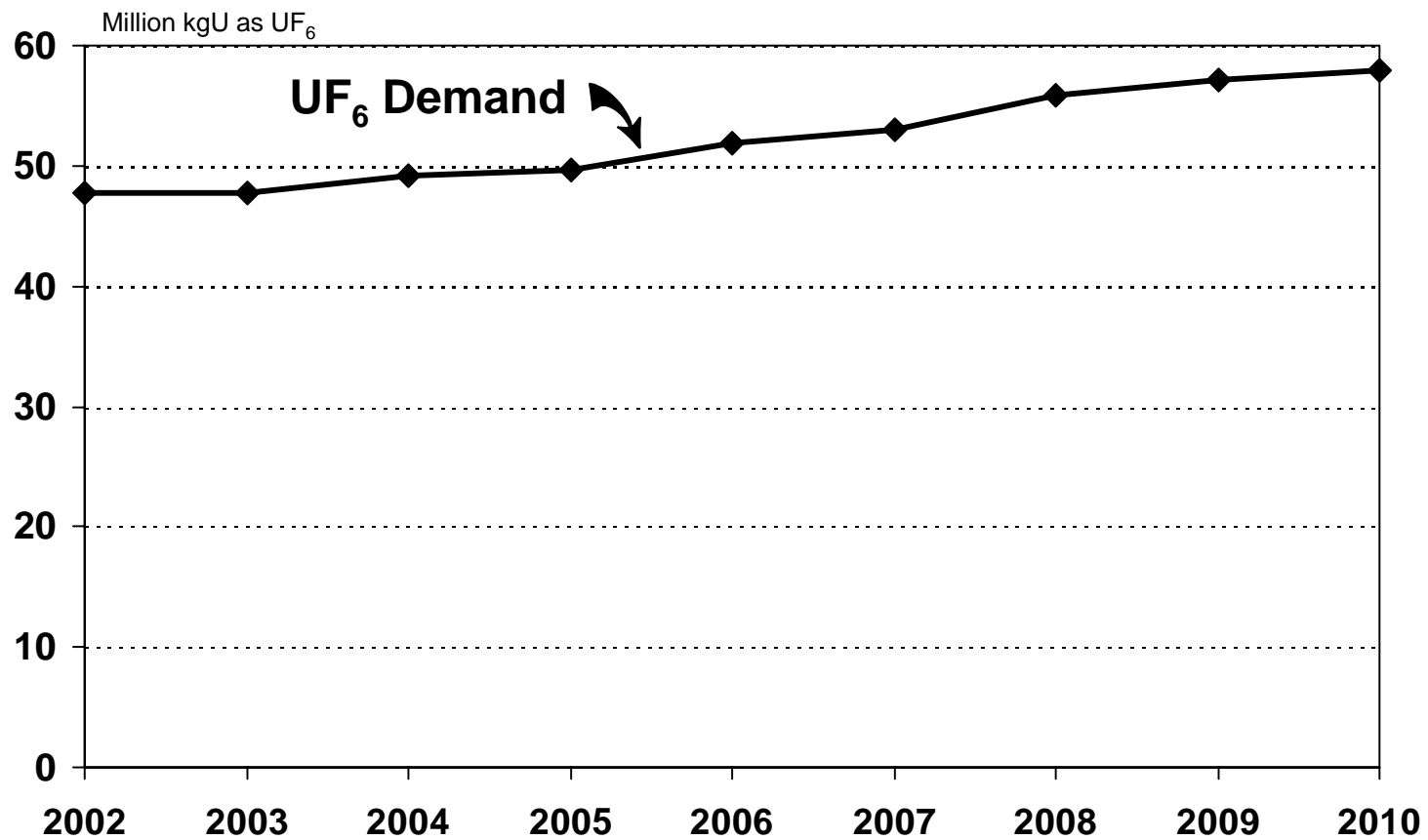
WNA Reference Scenario



World SWU Supply

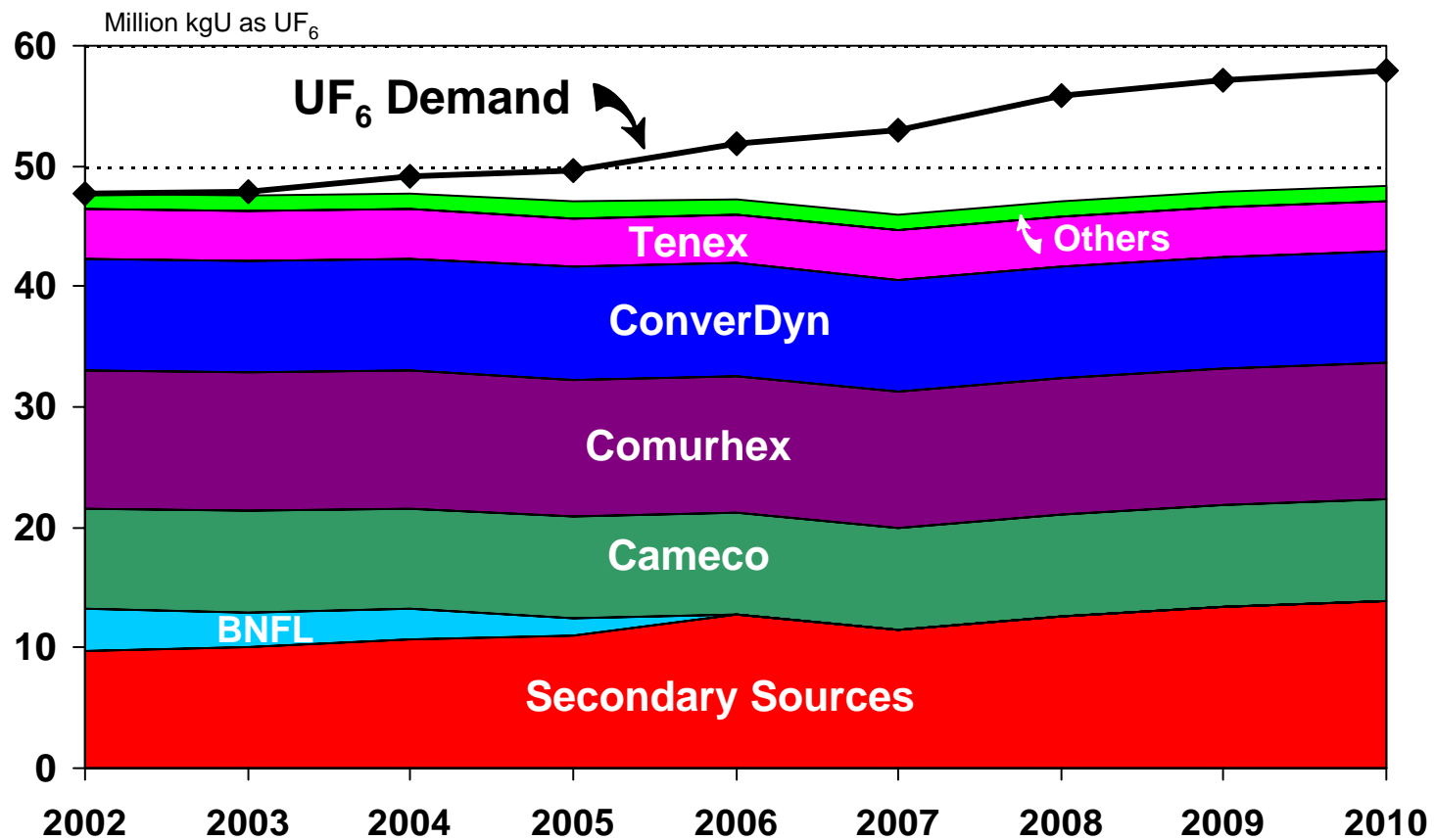


Enrichment UF₆ Feed Requirement



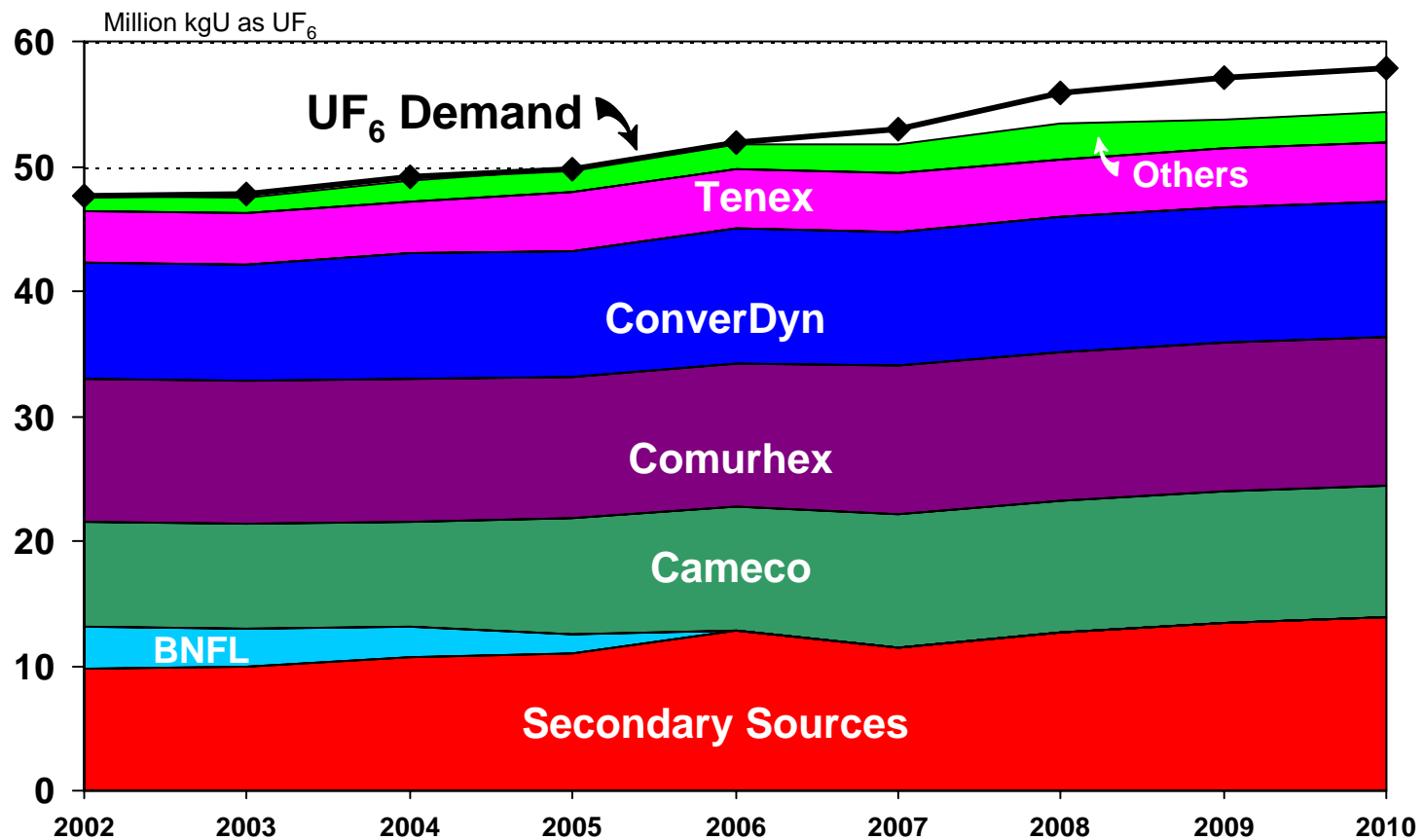
Enrichment UF₆ Feed Supply

Primaries at **Current Rates**



Enrichment UF₆ Feed Supply

Primaries **Expanding to Sustainable Levels** by 2007



Planet Conversion's Risk Issue: Utilities' demand for fuel - Up

- Current “most-likely” demand scenario supports a healthy future for converters.
- If demand increases, could facilities expand capacity?

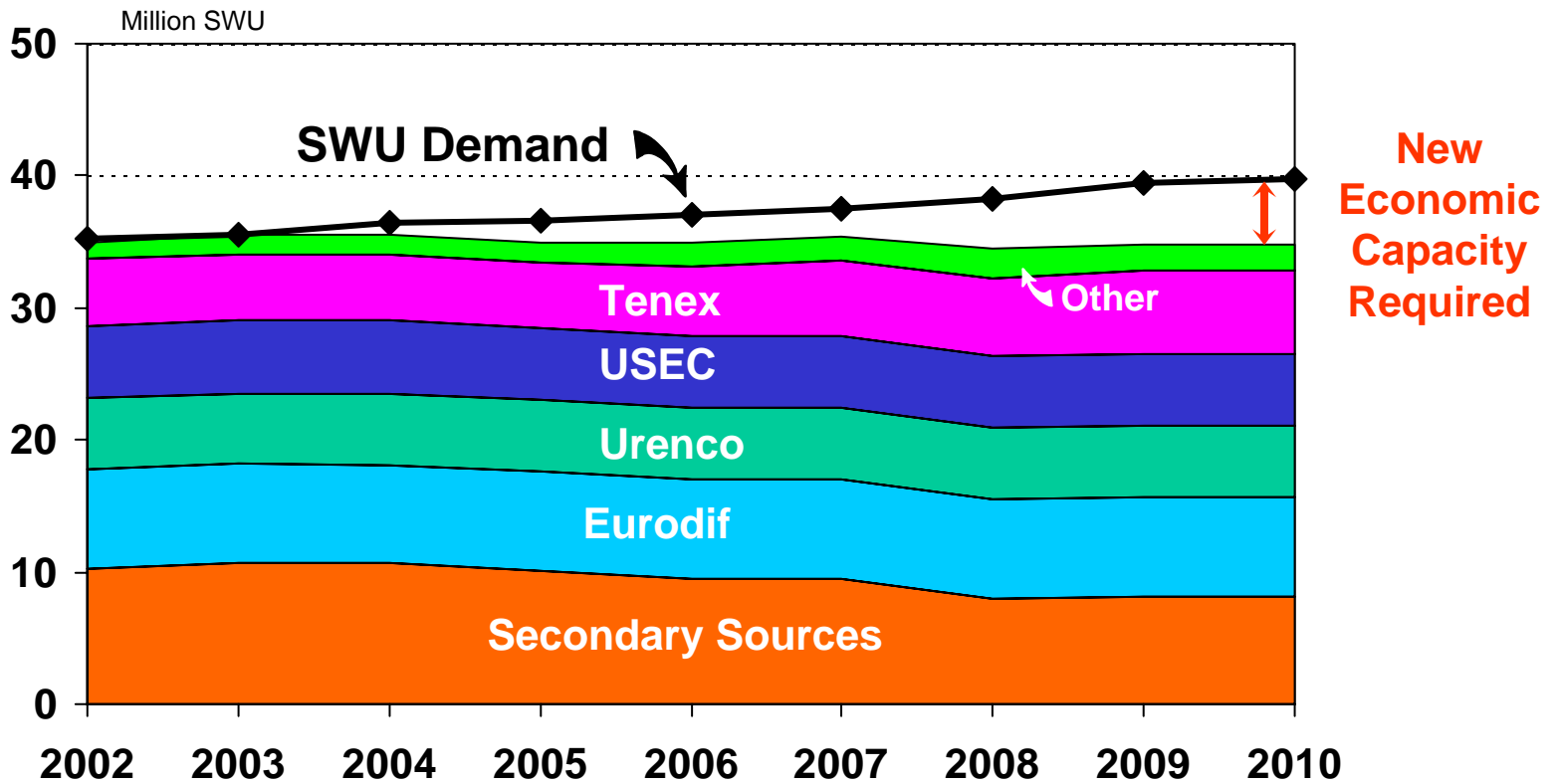
Star Utilities' Risk Issue: Utilities' demand for fuel - Up

- As demand increases, converters unlikely to expand capacity without sustained price incentive

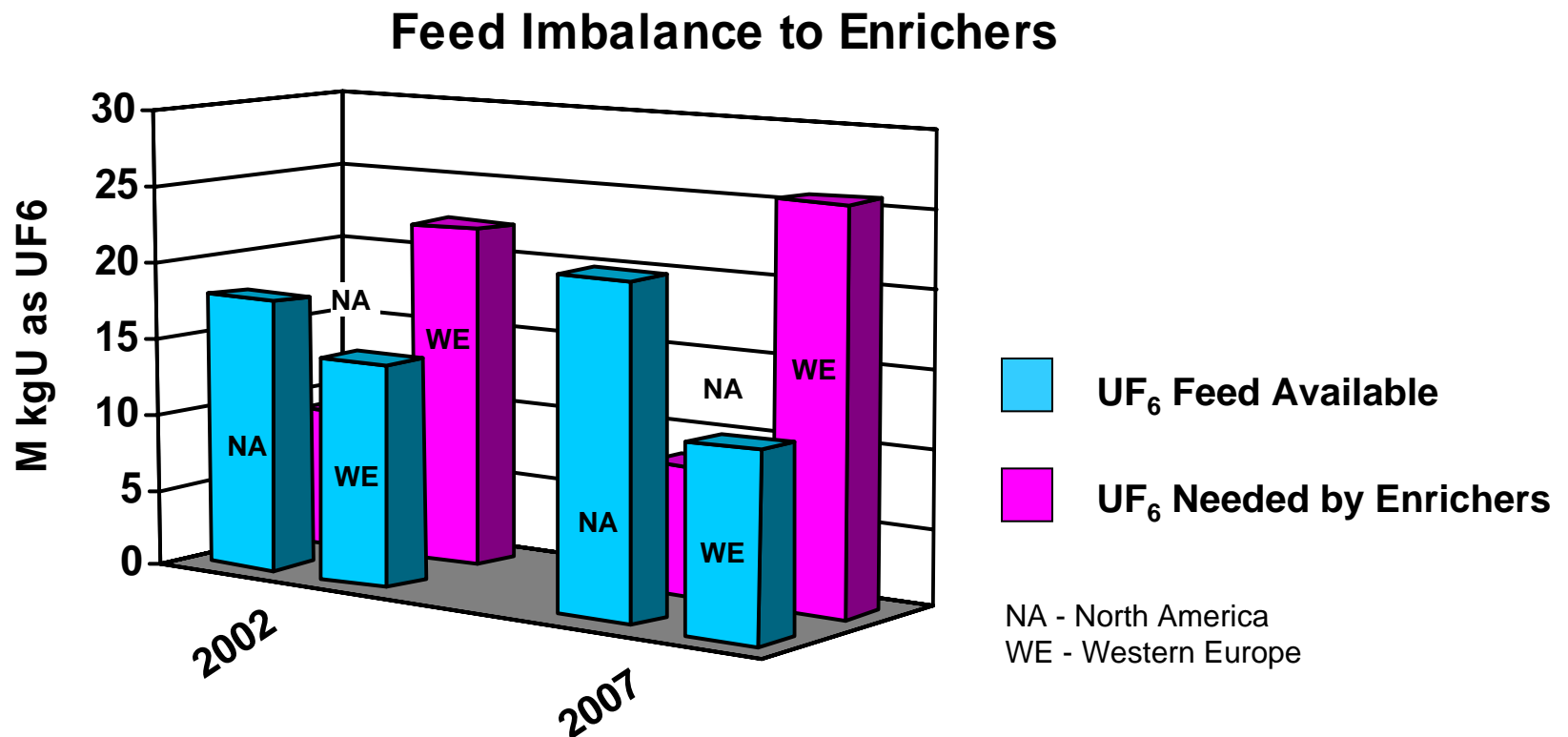
Enrichers - When, and where, will new capacity be built?

World SWU Supply/Demand

Primary enrichers at **current rates**



Conversion Imbalance with Planned Enrichment Expansion in Europe

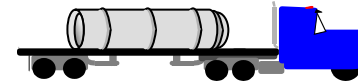


Physical Transport Comes of Age

Planet Conversion's Risk Issue:

Enrichers - When, and where, will new capacity be built?

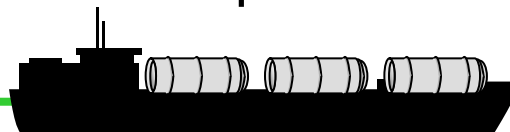
- Feed imbalance will give NA conversion more access to Europe
- Transportation issues
 - » TS-R-1 implementation
 - » increased cost - cylinder shipping requirements may double



Star Utilities' Risk Issue:

Enrichers - When, and where, will new capacity be built?

- TS-R-1 implementation
- Longer lead times required for trans-Atlantic shipping



Secondary Supplies - Too much or too little?

Secondary Sources

→ Russian HEU downblending

- with aggressive nuclear growth plans will Russia be willing to sell this national asset?
- would require changes in international policies and laws

→ Tails re-enrichment in Russia

- as Russia moves closer to a free market, how long will this be economically attractive?
- will Western tails of suitable origin be available?

Secondary Sources (cont.)

- **U.S. HEU made available**
 - **how long before it would actually enter the market?**
- **MOX usage**
 - **will usage increase, and if so, is there enough production capacity?**
 - **economics vs. uranium only**
- **Inventory made available**
 - **this is not a long term supply source.**

Star Utilities' Risk Issue:

Significant quantities of secondary supplies controlled by primary producers

- Market has appearance of multiple supply sources but key primaries control much of the secondary supply
- Some suppliers are also becoming competitors

“Planet Conversion” is Shrinking

BNFL

6500 mtpy - 2000

South Africa AEC

1400 mtpy - 1997

Sequoyah Fuels

10,500 mtpy - 1993

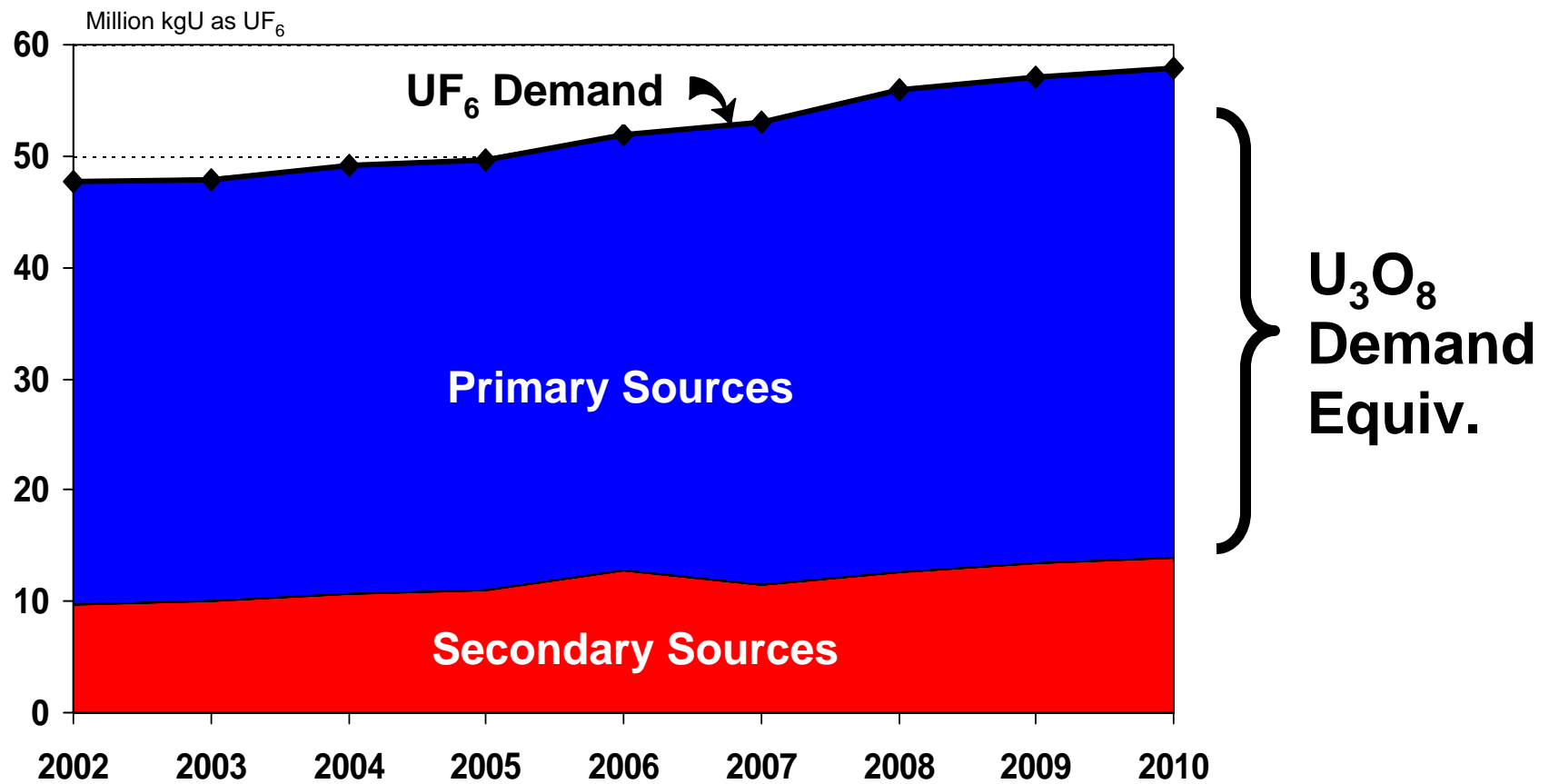
Predictable Costs - Critical in a Deregulated Market

Star Utilities' Risk Issue:
Predictable costs - critical in a deregulated market

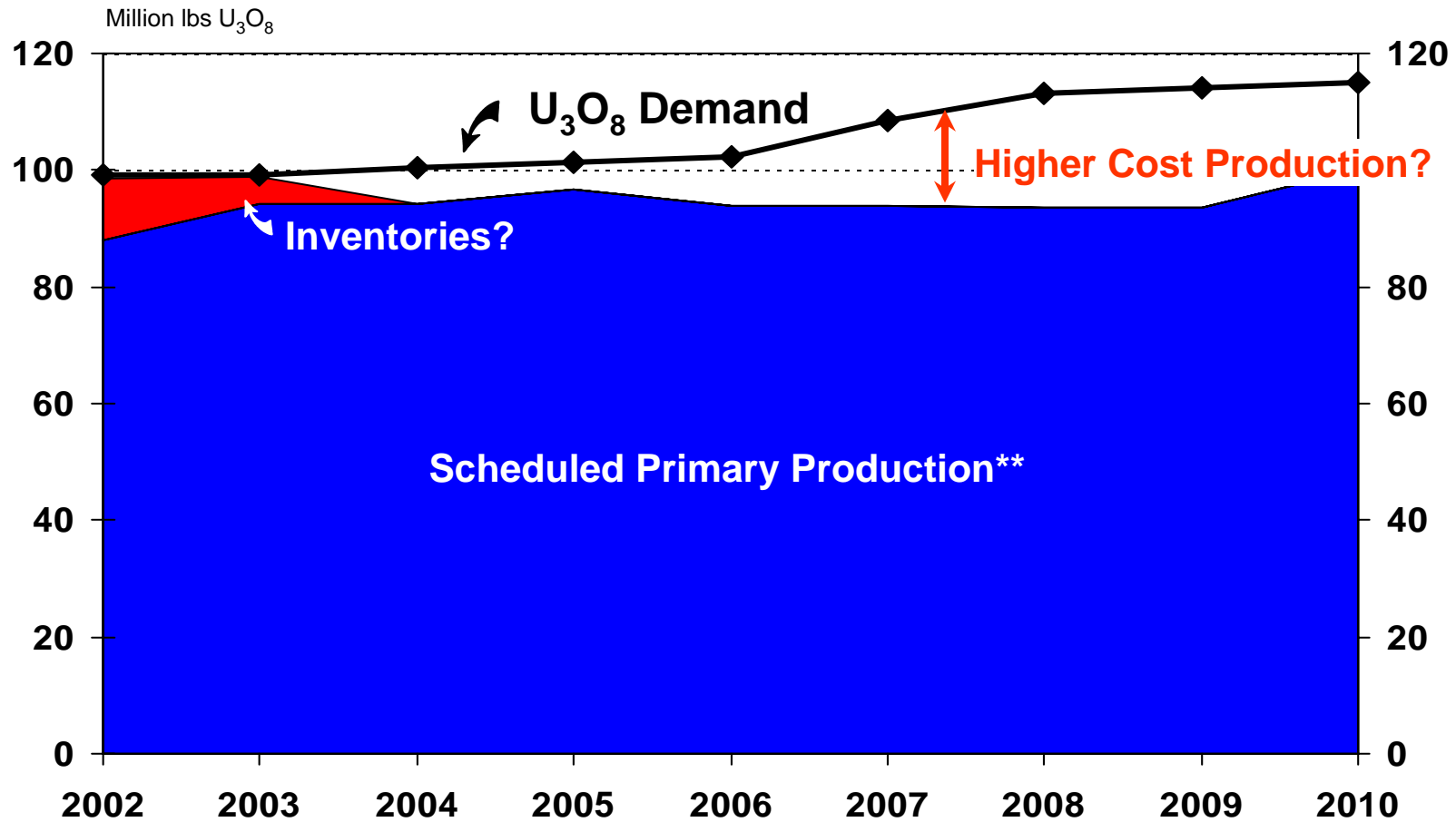
- Utilities looking to fill spot or near-term requirements may find low cost conversion “fully booked”
- Demand spikes from aligned reactor reloads may push prices up

How will the “economic” pull
and tug on U_3O_8 supplies
affect converters?

Enrichment UF_6 Feed Supply



Conversion U_3O_8 Feed Supply



** Scheduled Production reduced for CANDU and Magnox reactors

Conclusions

① Hink, you DO need primary conversion

- Reduction in primary conversion capacity has affected supply:
 - diversity
 - flexibility
 - assurance
- Control of HEU feed by primary converters
 - is this truly secondary supply?

② Primary conversion will be there for **ALL OF YOU**

→ Converters will produce at sustainable rates for the right incentives

**BUT you have to plan ahead
AND work closely with
converters**

"If we don't change our direction, we're likely to end up where we're headed."

Chinese proverb