

Exceptional service in the national interest



Long Term Demand for Uranium

A Presentation For the Navajo Nation
Energy Advisory Committee

May 15, 2012

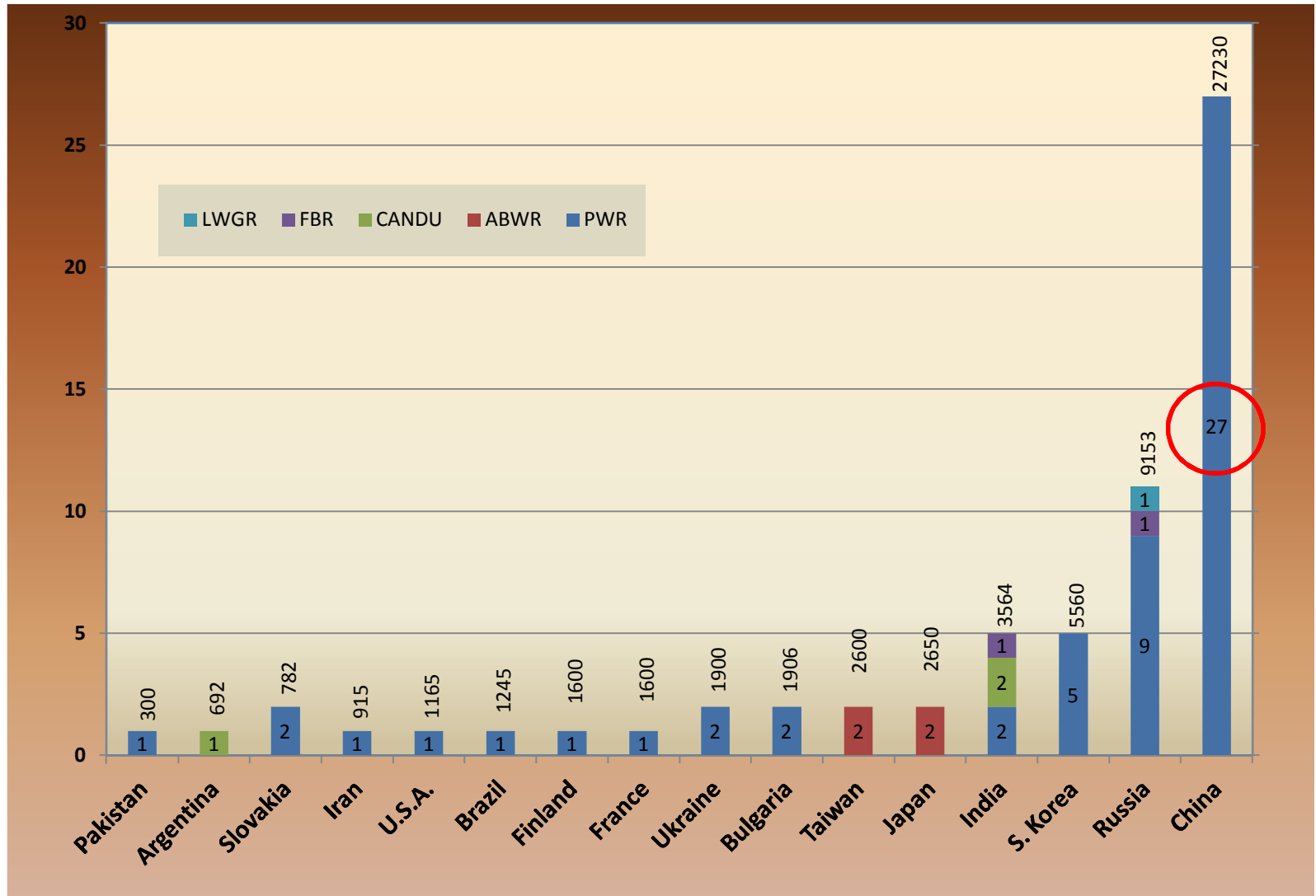


Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Uranium: Resources, Production and Demand

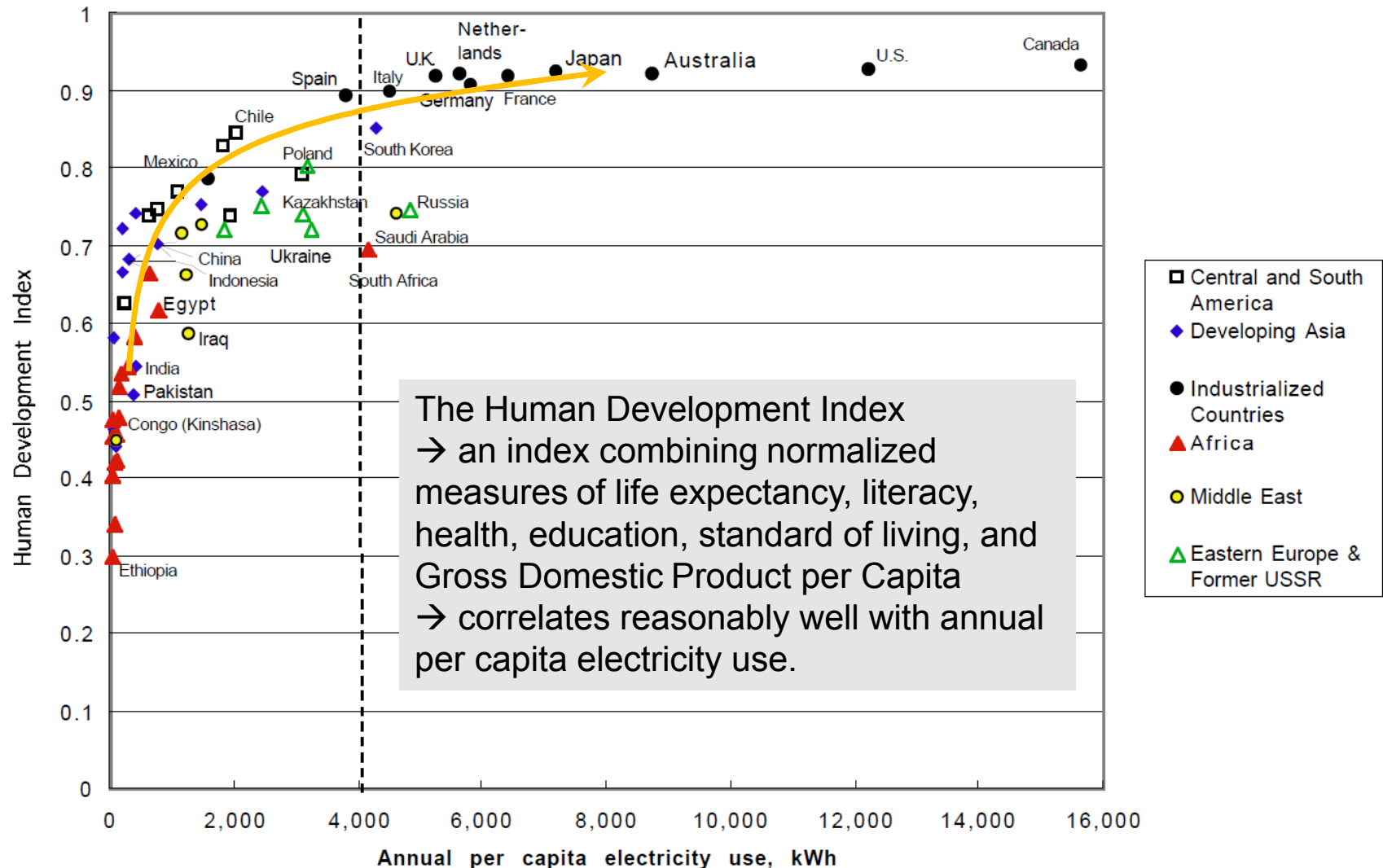
- Exploration:
 - Worldwide expenditures increased 133% from 2006 to 2008
- Resources:
 - Low –cost (less than \$130/kgU) Total Identified Resources (Reasonably Assured & Inferred) declined 1.2% from 2007 to 2009
 - High-cost Resources increased 15.5% from 2007 to 2009
 - Increase due to increased market price and mining costs
- Production:
 - Worldwide increase by 6% between 2007 and 2008; 11% from 2006
- Demand:
 - Worldwide, 438 commercial nuclear reactors in 2008, demanded 43,880 tU
 - Projected to increase 37% - 110% between 2009 & 2035

Worldwide Nuclear Units Under Construction



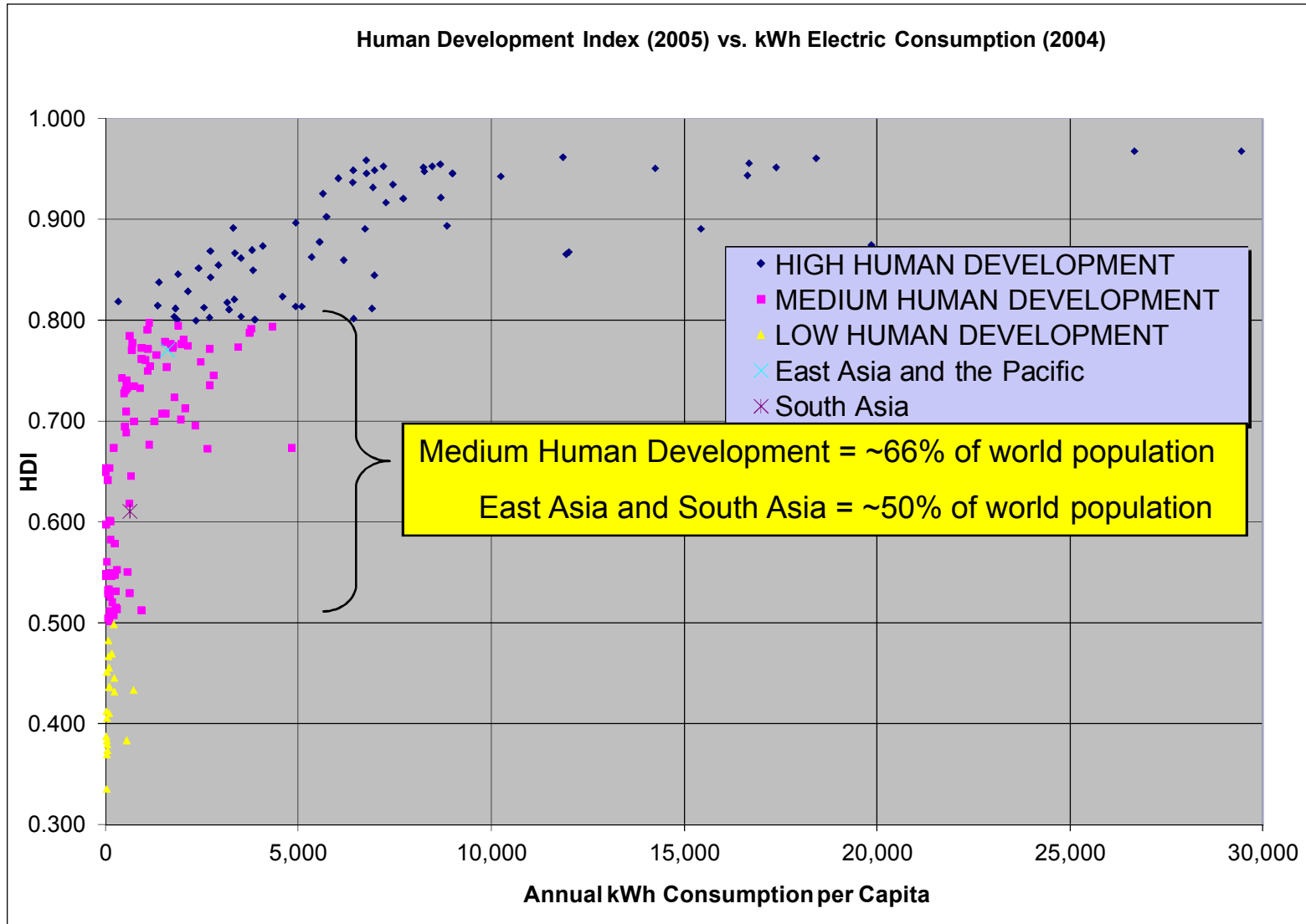
Source: IAEA PRIS database as of 1/11 (# of Units & MW)

Electricity Use and the Human Development Index



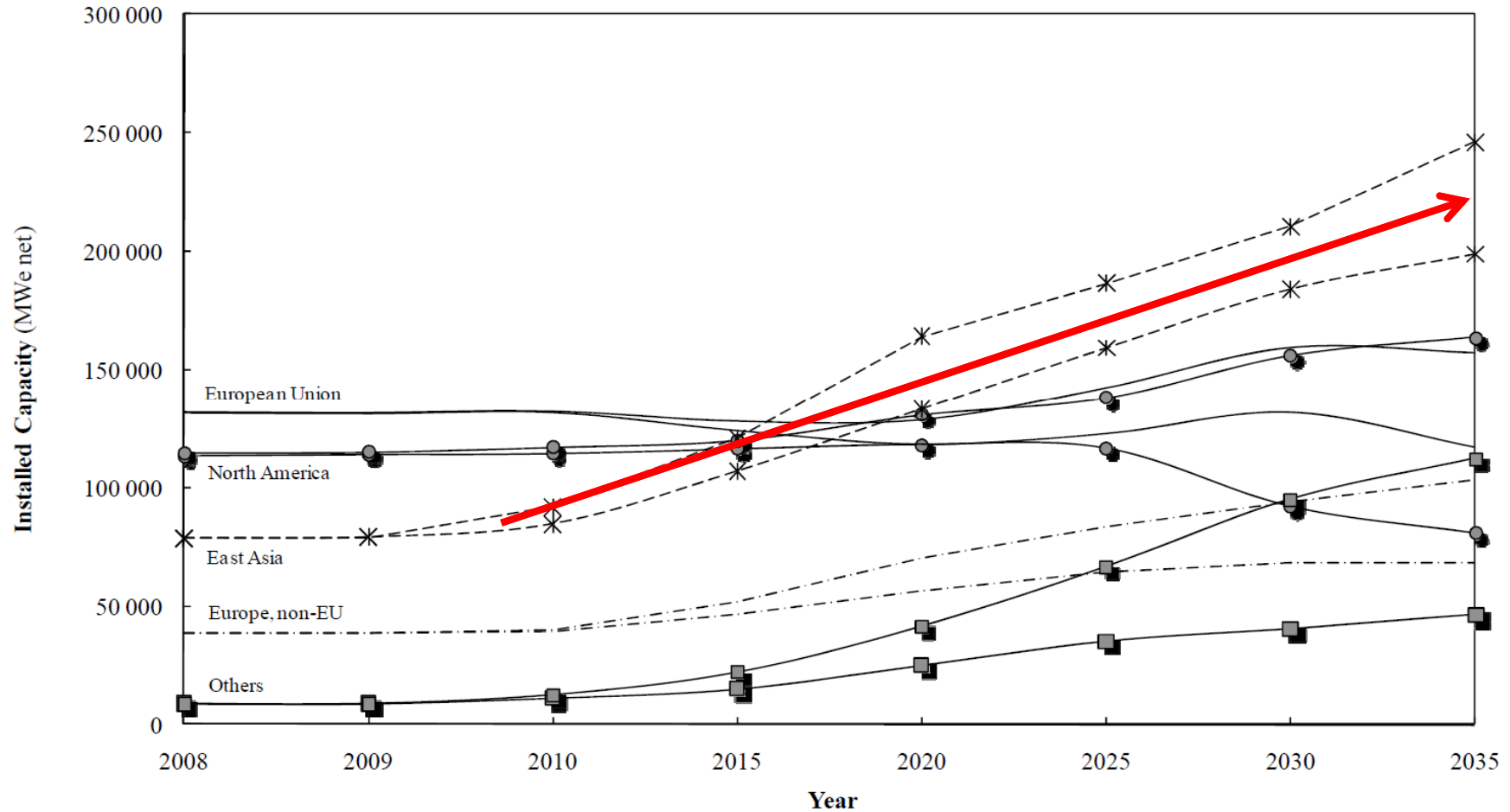
Source: Adapted from Pasternak, 2000.

Another Look: Potential Asian Influence on the Development of Nuclear Energy



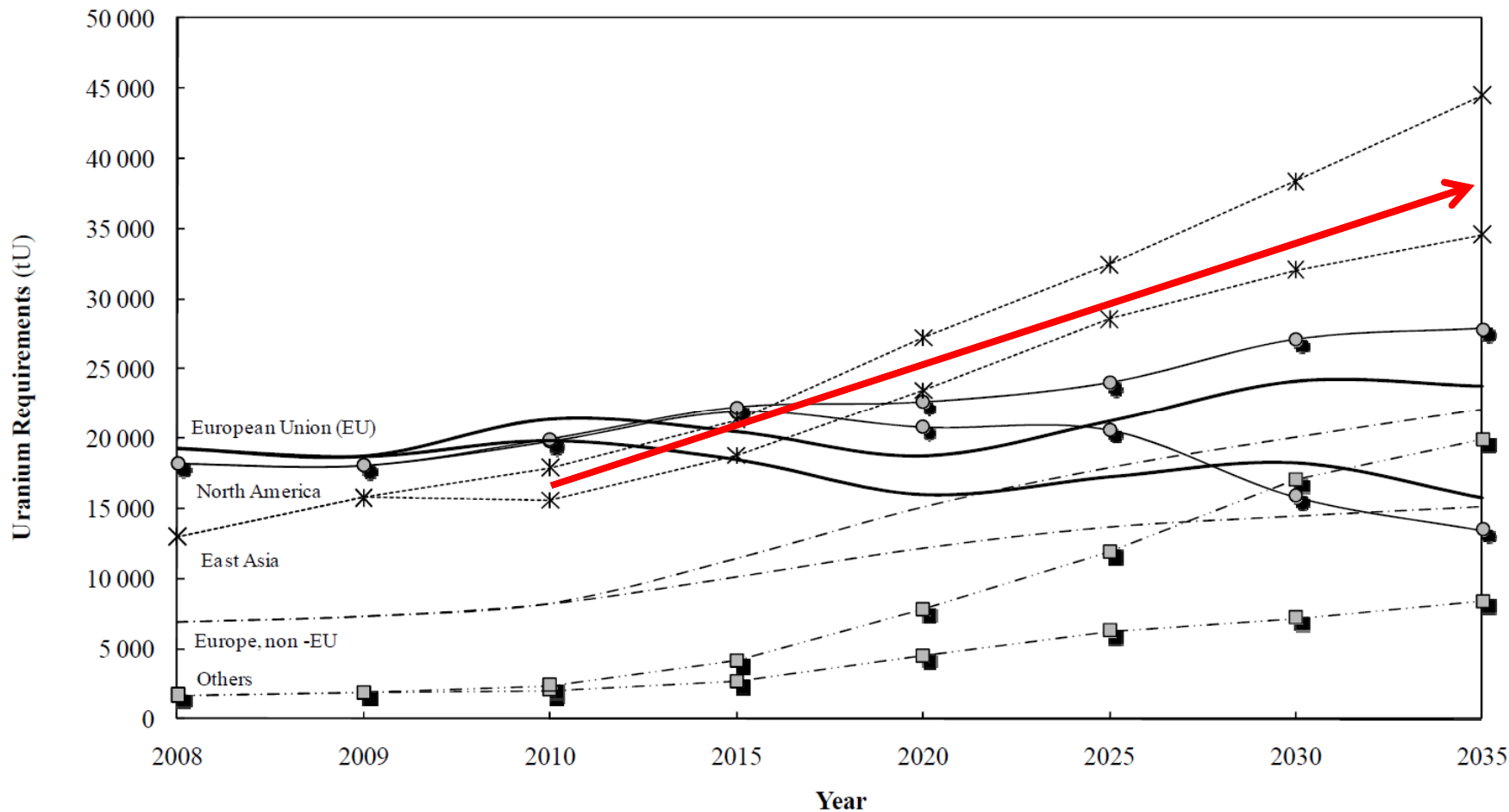
Source: Adapted from Pasternak, 2000.

Global Nuclear Energy Forecast: *East Asia Energy Demand Rising*



Source: Adapted from OECD/IAEA, 2010, Uranium 2009: Resources, Production and Demand

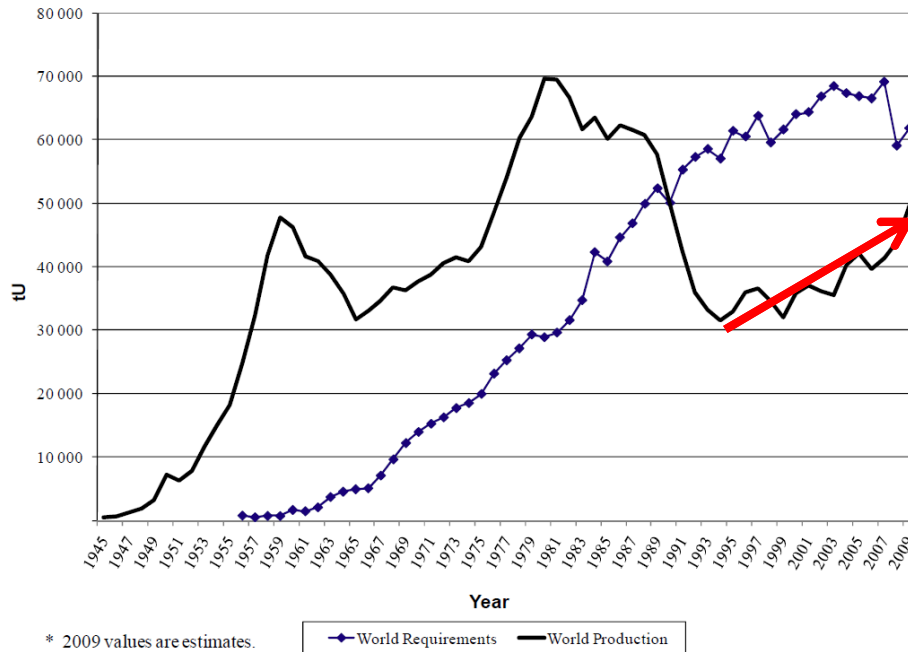
Global Uranium Requirements: *East Asia Requirements Rising*



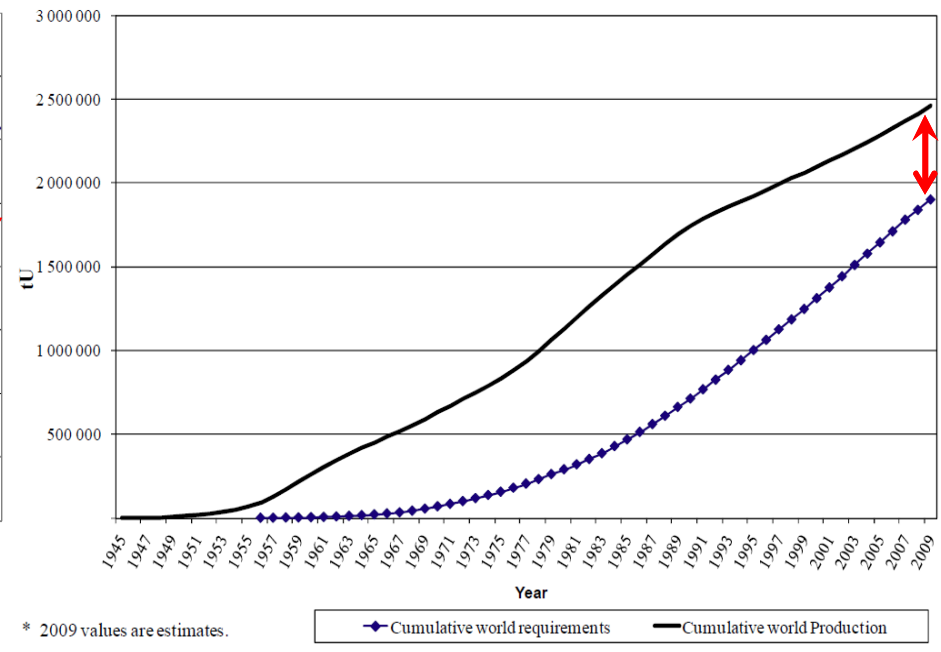
Uranium Production & Requirements

Annual Production Increasing
Cumulatively, still more Produced than Required
(1945-2009)

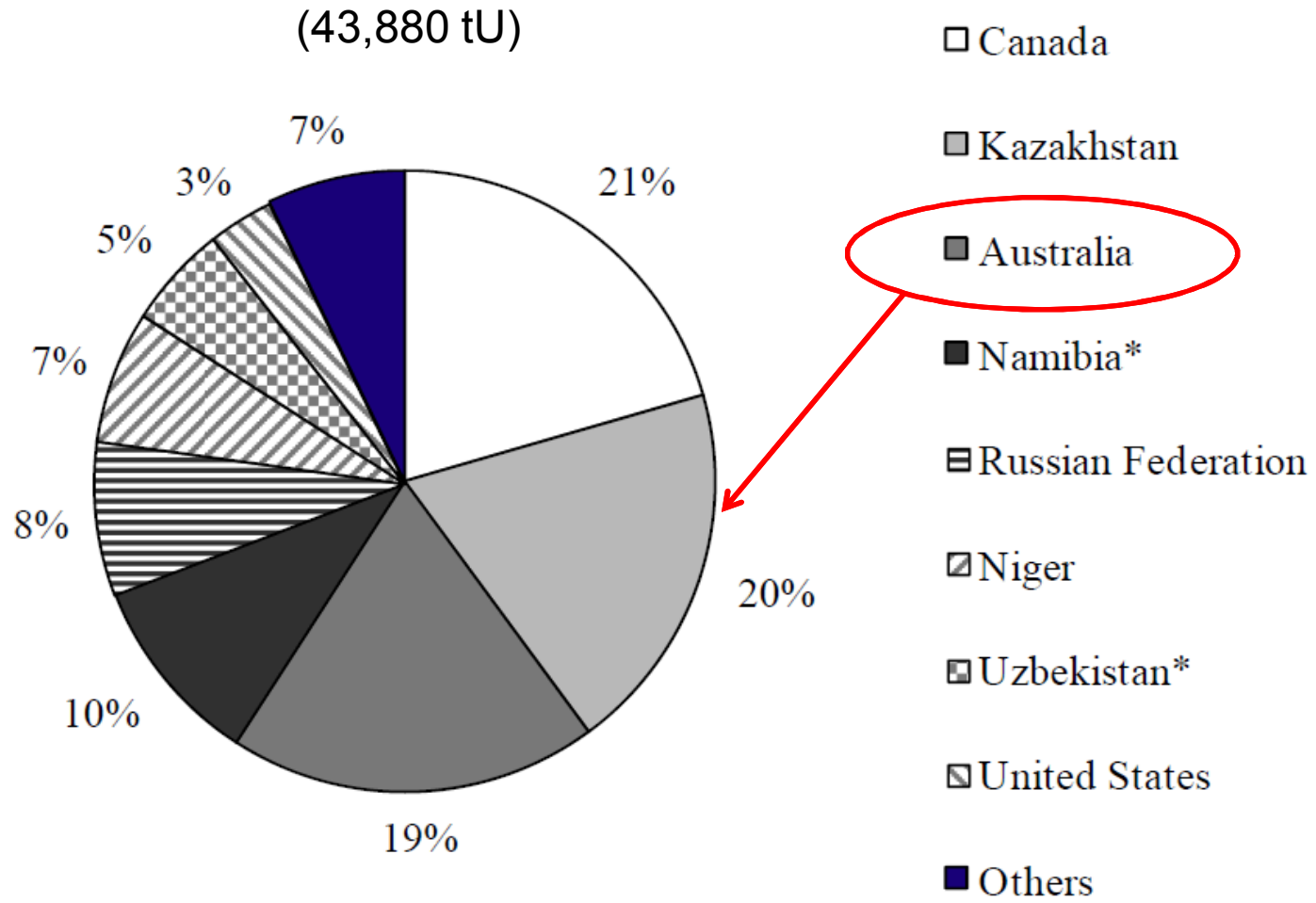
Annual



Cumulative

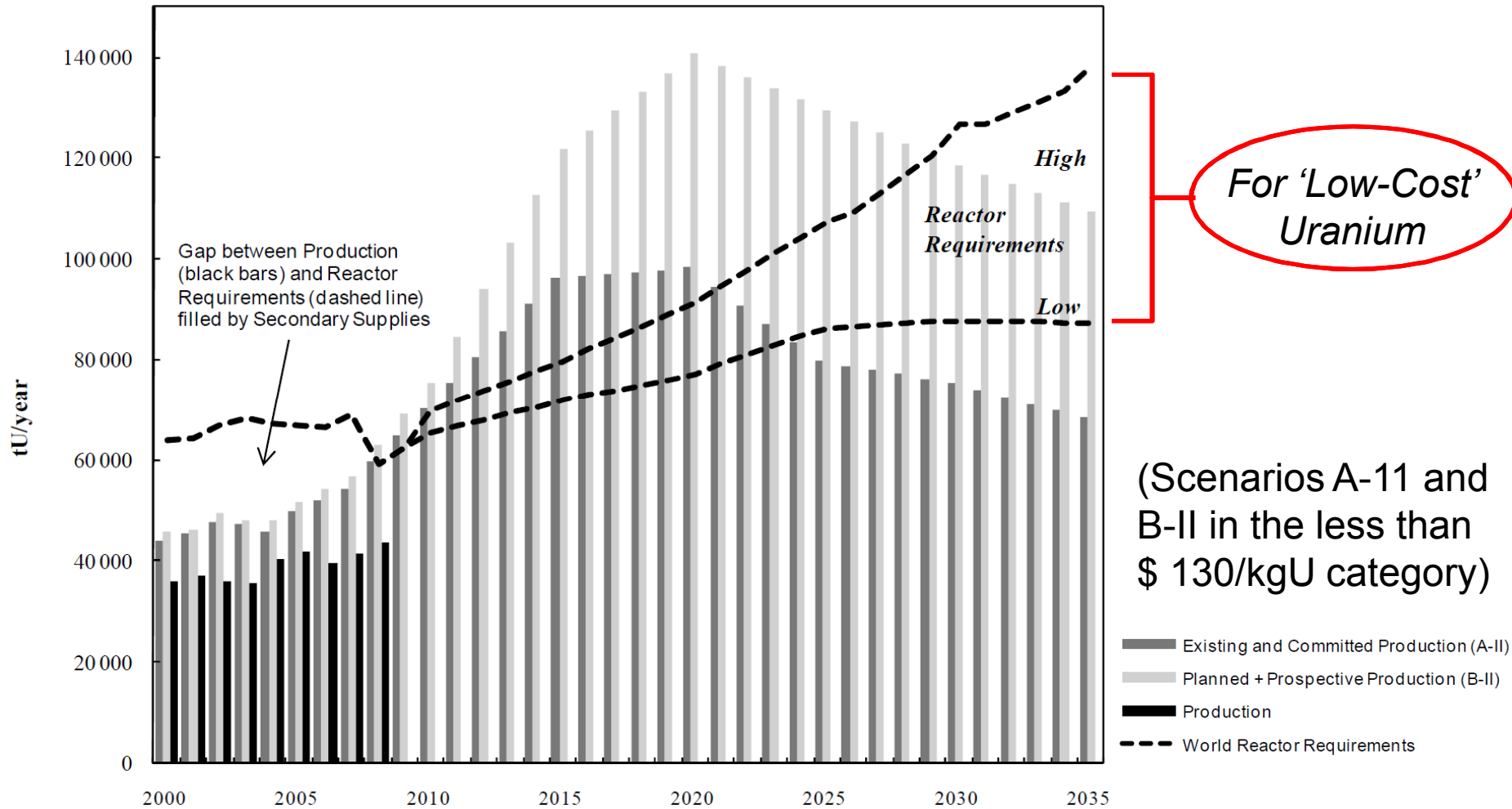


Uranium Production in 2008



Source: Adapted from OECD/IAEA, 2010, Uranium 2009: Resources, Production and Demand; * Secretariat estimate

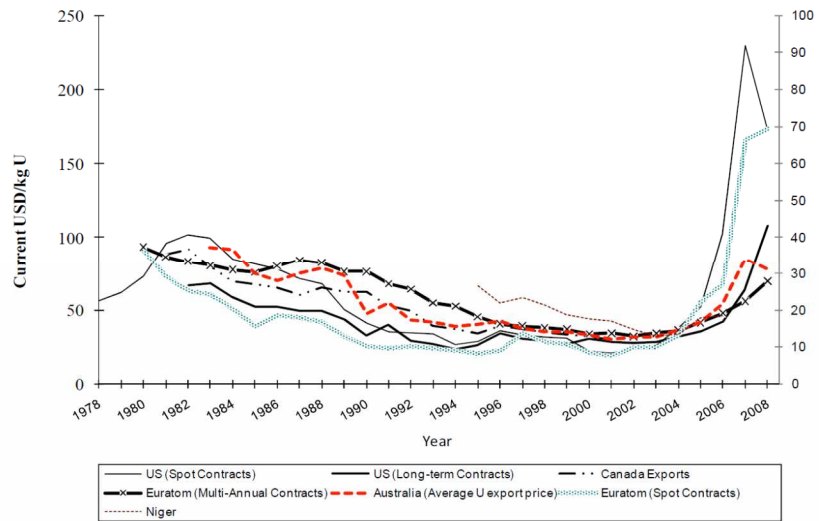
Projected Annual World Uranium Production & Reactor Requirements



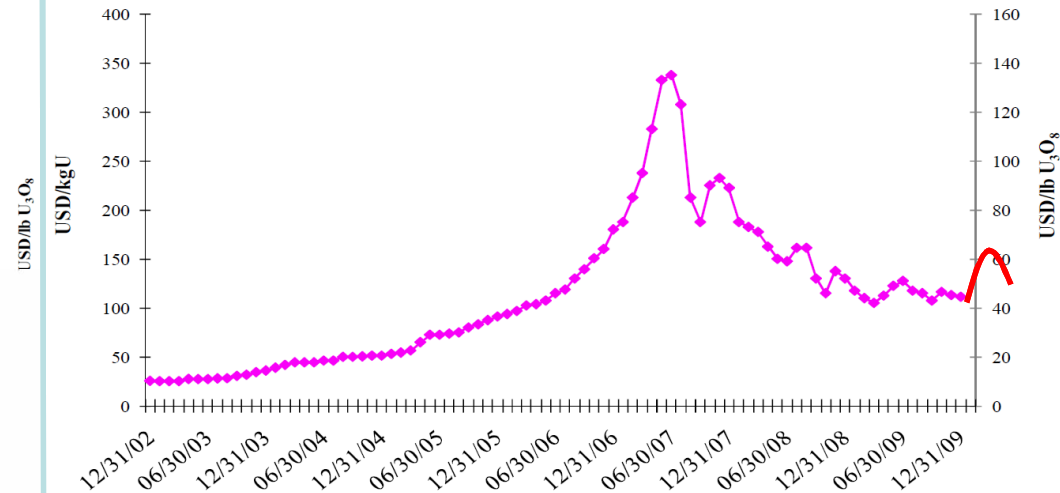
Source: Adapted from OECD/IAEA, 2010, Uranium 2009: Resources, Production and Demand

Uranium Price: Long term trends vs. shorter term fluctuations

Long Term Price Contracts (1978 – 2008)



More Recent Spot Price Dynamics (2001 – 2009+)

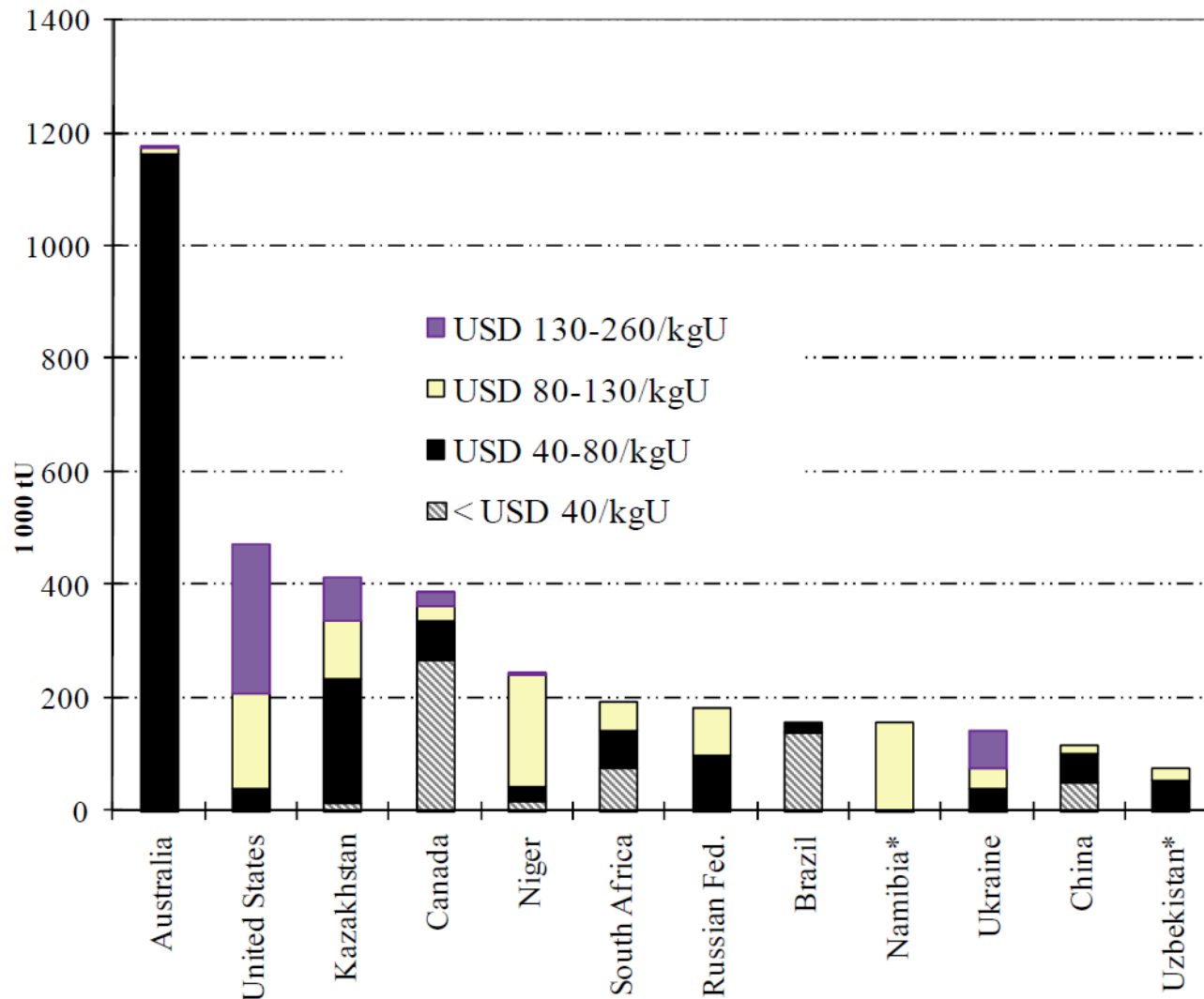


Source: Adapted from OECD/IAEA, 2010, Uranium 2009: Resources, Production and Demand

Source: Adapted from OECD/IAEA, 2010, NUEXO exchange value trend, Uranium 2009: Resources, Production and Demand.

Reasonably Assured Resources:

Relatively large potential supplies globally at low costs (<130\$/kgU)



Source: Adapted from OECD/IAEA, 2010, Uranium 2009: Resources, Production and Demand; * Secretariat estimate

Re-processed Uranium Production and Use

- Uranium recovery through reprocessing of spent fuel (RepU) done routinely in France and the Russian Federation
- It is a relatively costly endeavor, and largely an energy security issue, not a resource availability issue
- Reprocessing restarted in 2008 in the United Kingdom

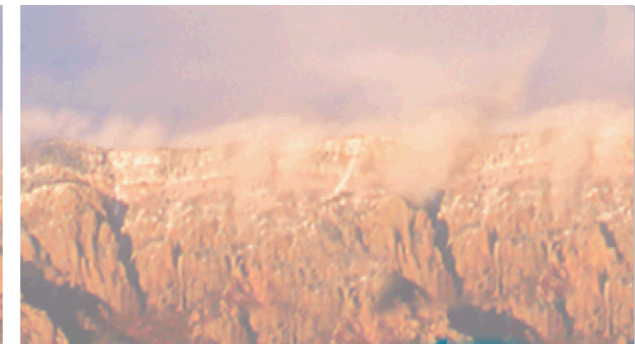
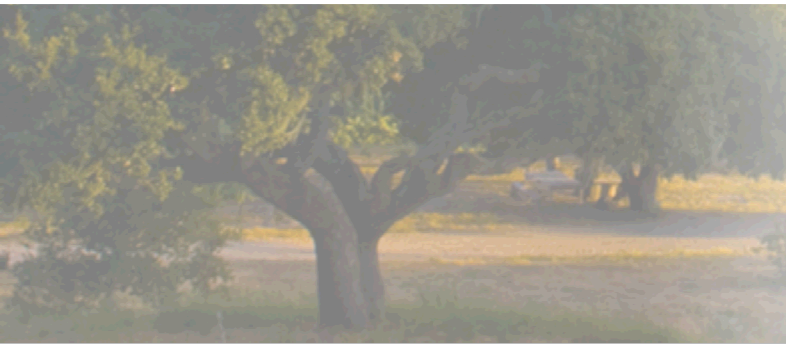
Re-processed Uranium Production and Use

- Available information indicates reprocessed Uranium Production and use represents less than 1% of projected world requirements annually
- Specific Mixed-oxide (MOX) fuel application represents about 1% of world annual uranium requirements

Highlights

- World Demand for Electricity
 - Expected to continue growing
- Nuclear
 - Base-load electricity, CO₂ Emissions issues, enhance energy security of supplies
- Uranium Resources
 - More than adequate to meet projected requirements (even high-case forecast to 2035) according to the OECD.
- Uranium Market
 - Strong market will be required for resources to be developed within the timeframe required to meet projected demand

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November 8, 2011



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Select References

- Organization for Economic Co-operation and Development (OECD), 2006, ***Forty Years of Uranium Resources, Production and Demand in Perspective.***
- Organization for Economic Co-operation and Development (OECD), 2009, ***Uranium 2009: Resources, Production and Demand.***