Enriched Uranium as a Strategic Resource

Daniel B. Poneman

President & CEO

World Nuclear Association Symposium

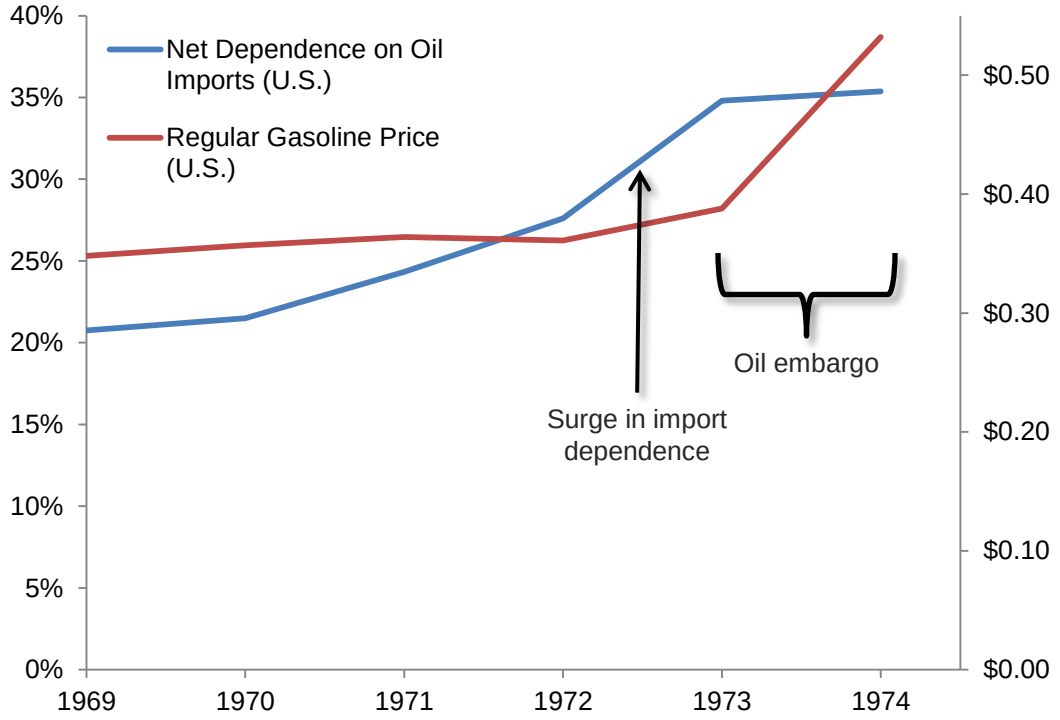
September 15, 2016

Forward-Looking Statements

Disclaimer: Our commentary and responses to your questions may contain forward-looking statements, including our outlook for the remainder of the year, and Centrus undertakes no obligation to update any such statement to reflect later developments. Factors that could cause actual results to vary materially from those discussed today include changes in the nuclear energy industry, pricing trends and demand in the uranium and enrichment markets and their impact on our profitability, the competitive environment for our products and services, the impact and potential extended duration of the current supply/demand imbalance in the market for low-enriched uranium, risks related to trade barriers and contract terms that limit our ability to deliver LEU to customers, risks related to actions that may be taken by the U.S. government or other governments that could affect our ability or the ability of our sources of supply to perform under contract obligations, including the imposition of sanctions, restrictions or other requirements, as well as those provided in our most recent Annual Report on Form 10-K and subsequent reports as filed with the SEC.

Industry / Market Data: Industry and market data used in this presentation have been obtained from industry publications and sources as well as from research reports prepared for other purposes. We have not independently verified the data obtained from these sources and cannot assure you of the data's accuracy or completeness.

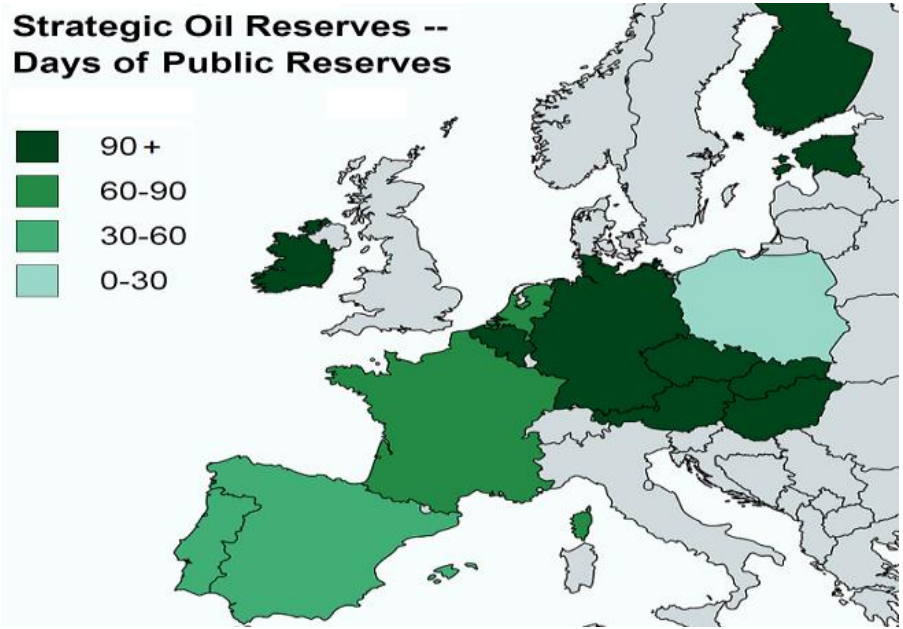
Dependence on Oil Imports…and the 1973 Oil Crisis



Centrus
Fueling the Future of Nuclear Power

Response: Establish IEA & Create Strategic Reserves

- International Energy Agency established in November 1974
  - Facilitates global cooperation, consultation, and transparency
  - Requires 90 days worth of imports to be set aside as strategic reserves (public & industry held)



IEA members outside of Europe: the United States, Japan and Korea all have substantial (90+ days) publicly held oil reserves.

Source: IEA data

Other Examples:

United States, Strategic National Stockpile: $7 billion of medicine & supplies kept at secure locations in case of public health emergency/terrorist attacks.

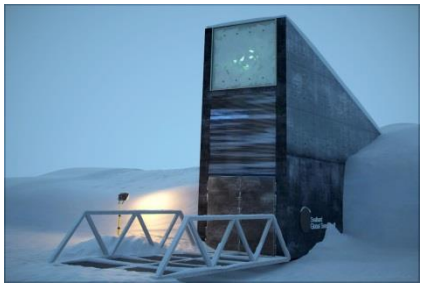
Saudi Arabia, Briman Strategic Water Reservoir: $200 million facility holds 2 billion liters of drinking water.

China, Rare Earth Metals: 20,000 ton stockpile – key to defense, energy & electronics

United States, National Defense Stockpile: $1.5 billion worth of strategic materials/minerals

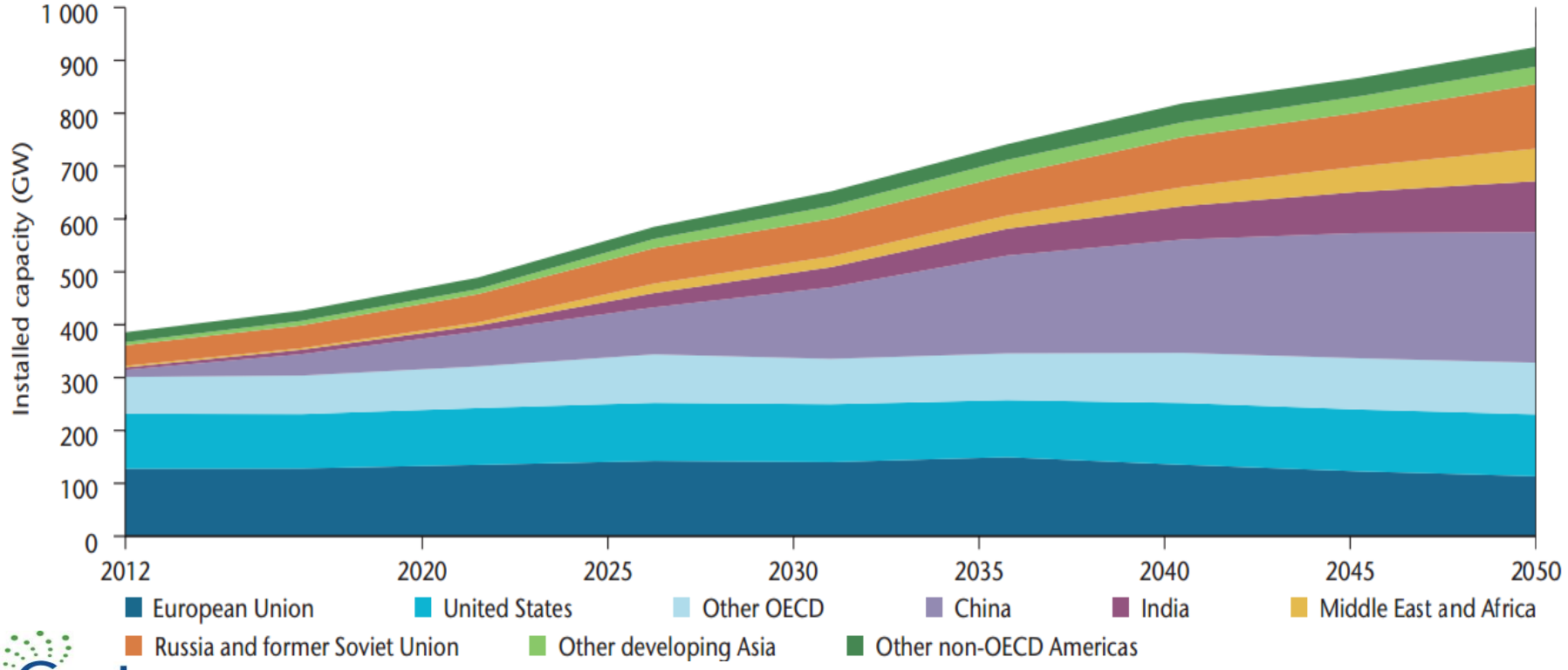
West Africa, Regional Food Security Reserve: 1 million tonnes of food by 2020

Norway, Svalbard Global Seed Vault: 4000 plant species to restart food production in case of natural or man-made disasters



Centrus
Fueling the Future of Nuclear Power

IEA 2DS: Nuclear Must More than Double by 2050



Centrus
Fueling the Future of Nuclear Power

Nuclear Key to Energy Security

Existing

Under Construction

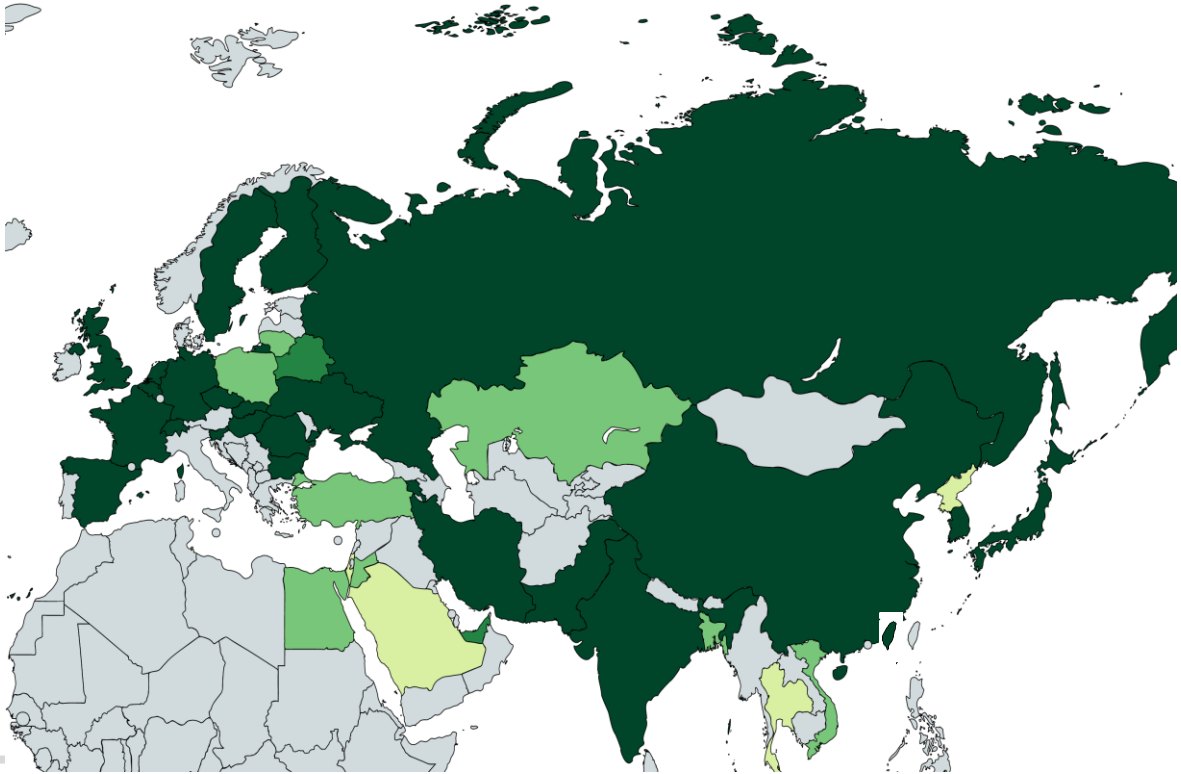
Belarus
UAE

Planned

Bangladesh	Jordan	Poland
Egypt	Kazakhstan	Turkey
Indonesia	Lithuania	Vietnam

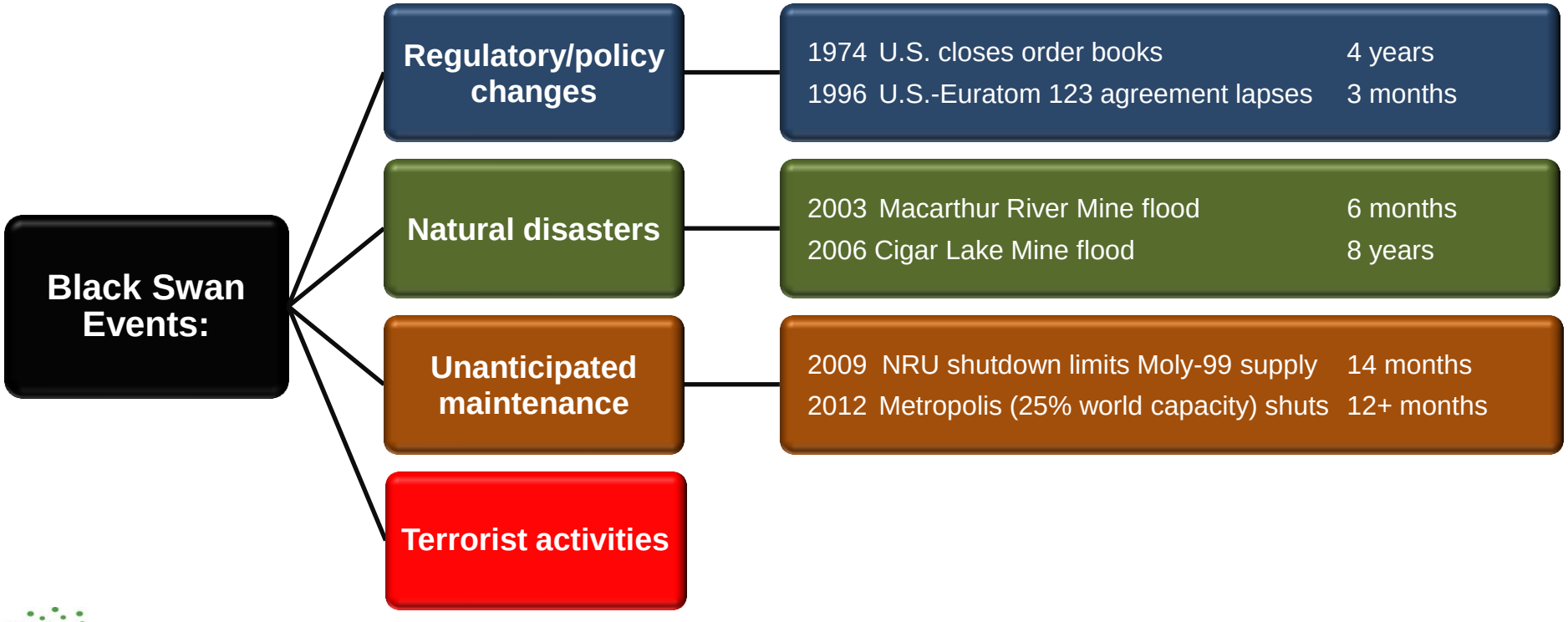
Proposed

Chile	North Korea
Israel	Saudi Arabia
Malaysia	Thailand



Centrus
Fueling the Future of Nuclear Power

Assessing the Possible Supply Risks:



Centrus
Fueling the Future of Nuclear Power

Recommendation: Governments Should Create Strategic LEU Reserves

- **Energy security:** Supply disruption is a low probability, high impact event. Why take the risk?
- **Non-proliferation:** LEU banks remove risks of supply disruption, reducing pressure on countries to pursue new enrichment programs.
- **Strategic:** Helps sustain a capability with vital national importance.

What Might a Reserve Look Like?

- Governments could establish reserves held as:
  - Fabricated fuel, or
  - Virtual reserves held at converters/fabricators overseas, or
  - Enriched uranium product at international repositories
- Reserves should be maintained consistent with IAEA standards & oversight
- Supplement existing fuel banks. While useful, they are small:

U.S. – 6 reloads IAEA – 3 reloads Russia – 6 reloads

Centrus
Fueling the Future of Nuclear Power

Why/When to Create a Reserve?

- Commodity is key to national security 
- Supply subject to factors beyond nation's control 
- Domestic demand greatly outstrips domestic production capacity 
- Strategic industry is under stress 
- Opportunity to fill reserve at low market prices 

Centrus
Fueling the Future of Nuclear Power

How Should We Think About a Reserve?

- The IEA requires a 90 day oil reserve, roughly 25% of annual imports
- For argument's sake, apply that model and use the United States as an example:
  - Roughly 68% of U.S. nuclear fuel is imported, or 1.36 million kg LEU
  - 25% of annual imports = 340,000 kg LEU (~17 reactor reloads)
  - Rough order of magnitude acquisition cost ~ $350 million

Storing LEU vs. Storing Oil

	Cost	Footprint
Strategic Petroleum Reserve **(25% annual imports)**	$7 billion to build $21 billion to fill $200 million/yr to operate	60 underground caverns 2000 feet deep 4,000,000,000 ft^3
Strategic LEU Reserve **(25% annual imports)**	$350 million to fill $2 million/yr to operate	Fits inside here: 

Centrus
Fueling the Future of Nuclear Power

Size Matters:

- Here is one of four sites that comprise the U.S. Strategic Petroleum Reserve
- A 340,000 kg LEU reserve would fit inside the red dot

Centrus
Fueling the Future of Nuclear Power

Bottom Line

- Governments would be wise to invest in strategic LEU reserves, just as they have already done for oil, medicine, food and critical materials.

- Oil reserves cost 50-100 times more to build, fill and operate. An LEU reserve would be a bargain.

- Advances energy security, national security, and non-proliferation objectives.


Centrus
Fueling the Future
of Nuclear Power