



NUCLEAR PROLIFERATION
PREVENTION PROJECT



The University of Texas at Austin

Plutonium For Energy?

Explaining the Global Decline of MOX

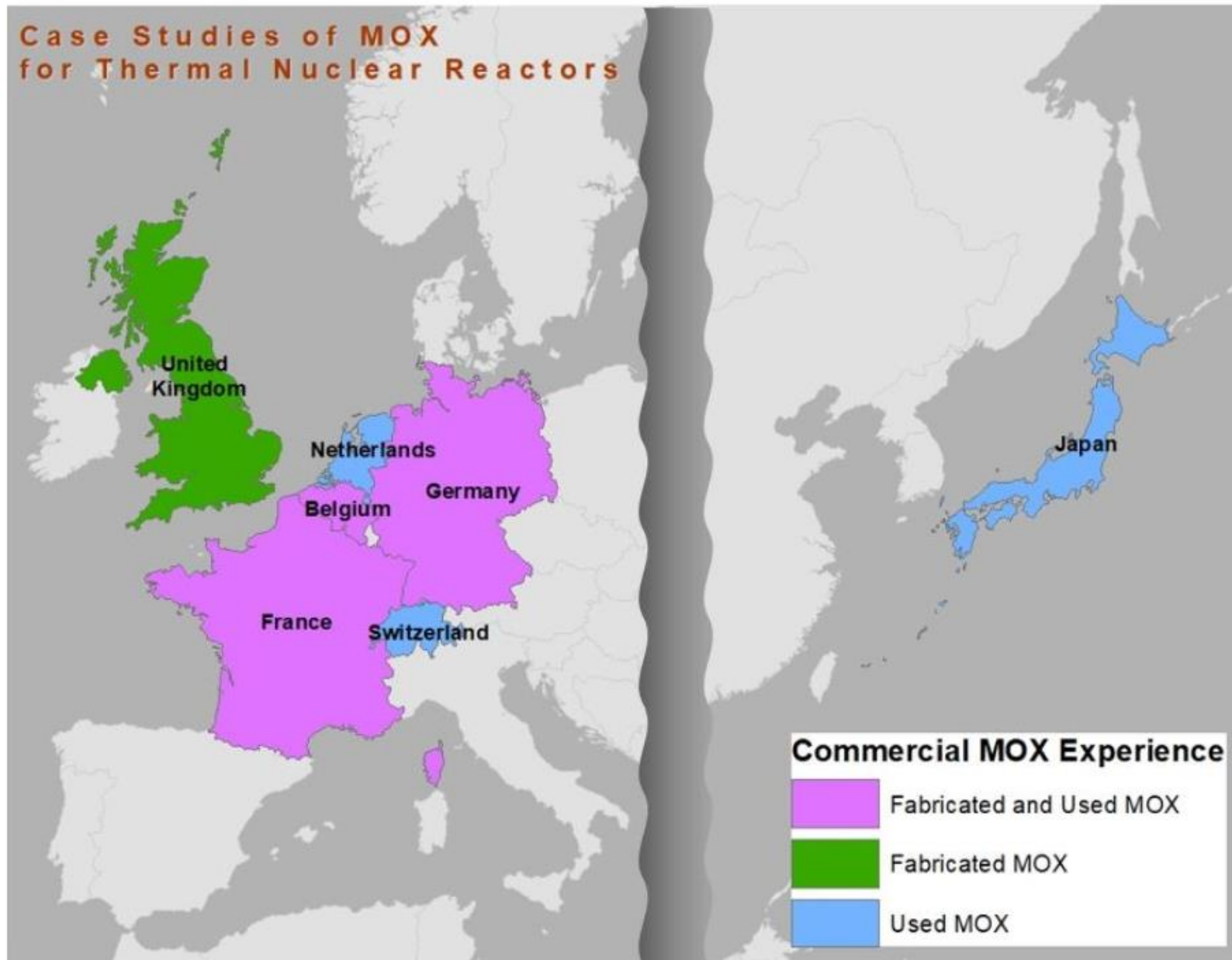
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Plutonium Stockpiles: Causes and Solutions
Vienna Center for Disarmament and Non-Proliferation
October 25, 2018

The NPPP engages in research, debate, and public education to ensure that civilian applications of nuclear technology do not foster the spread of nuclear weapons to states or terrorist groups.

www.NPPP.org

Case Studies of MOX for Thermal Nuclear Reactors



www.Pu4Energy.com



PLUTONIUM FOR ENERGY?



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Plutonium is a controversial fuel for nuclear power for three reasons: it can be used to make nuclear weapons, is carcinogenic, and costs a lot. Yet, relatively little information has been publicly available regarding the main use of this fuel around the world, in traditional (“thermal”) nuclear power reactors.

“Plutonium for Energy” is the first-ever comparative research project on “mixed oxide” (MOX) fuel – containing both plutonium and uranium – used in light-water nuclear power reactors. The project explores the manufacture and use of such MOX fuel in the seven main countries that have done so: Belgium, France, Germany, Japan, the Netherlands, Switzerland, and the United Kingdom. It examines the security, economic, safety, environmental, and public acceptance experience in each country. A primary aim is to inform ongoing decision-making in East Asia – including China, Japan, and South Korea – about whether to recycle plutonium for energy.

Plutonium for Energy?


Explaining the Global Decline of MOX



A Policy Research Project of the
LBJ School of Public Affairs
University of Texas at Austin



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Edited by Alan J. Kuperman



Decline of Commercial MOX for Thermal Reactors

Country	Produce MOX?	Use MOX?
Belgium	✗	✗
France	✓	✓
Germany	✗	↘
Japan		✓
Netherlands		↘
Switzerland		✗
UK	✗	

Key:

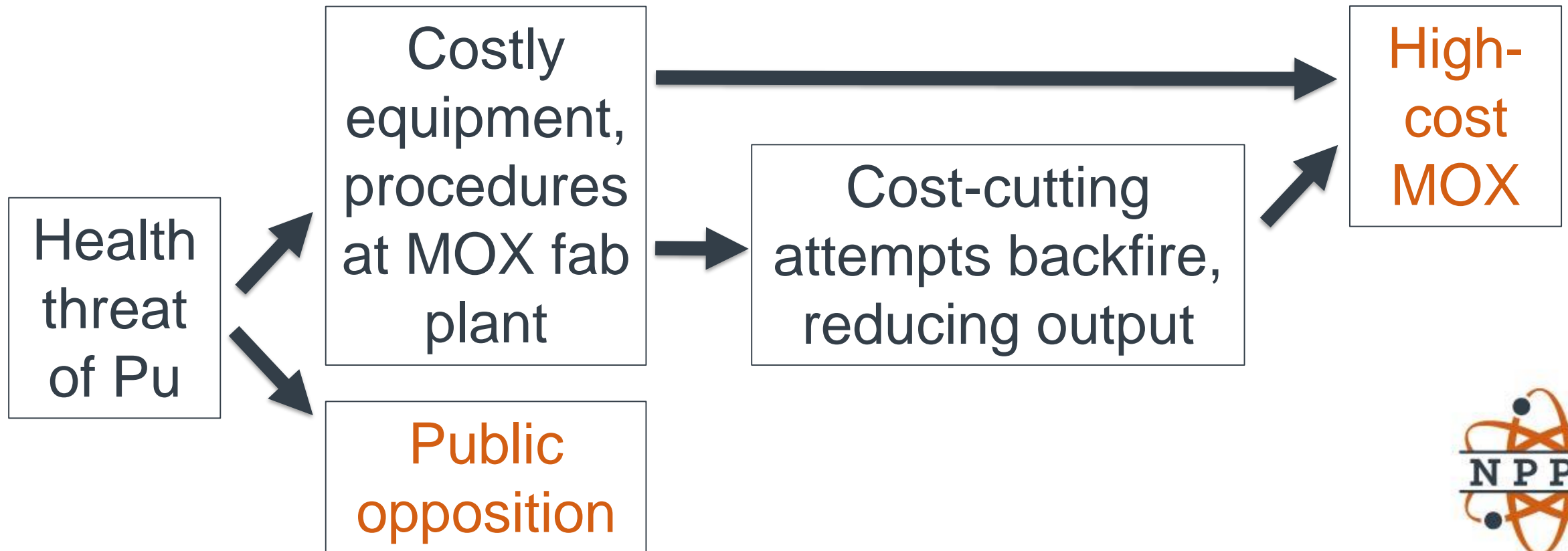
✗ = Ended

↘ = Phasing out

✓ = Ongoing



A Root Problem: Health Threat of Plutonium



MOX Fuel Costs Many Times More than LEU Fuel

- **Japan:** Currently pays 9 times as much for imported MOX fuel as LEU fuel.
 - Domestic production of MOX fuel would cost 12 times the price of LEU fuel, says JAEC.
- **The others** have paid 3 to 6 times as much for MOX fuel as LEU fuel.



Closed Fuel Cycle is Less Popular than Nuclear Energy

- Switzerland
- Belgium
- Japan
- Germany



Security Risks

- Fresh MOX fuel at **power plants**.
- **Shipments** of Fresh MOX fuel and PuO_2 .
- Reactor-grade plutonium of any isotopic mix can make **reliable nuclear weapons**.



Stockpiles of Unirradiated Plutonium

Flag	Tonnes
UK	110+
France	65
Japan	47



Lessons for States that are . . .

1. Planning to continue using thermal MOX: **France and Japan.**
2. Contemplating initiating thermal MOX: **USA, UK, China.**
3. Pursuing alternative technologies (e.g., FBR, pyro) to close the fuel cycle: **India, S. Korea, Russia, and China.**





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Thank you!

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