Lightbridge

White Paper

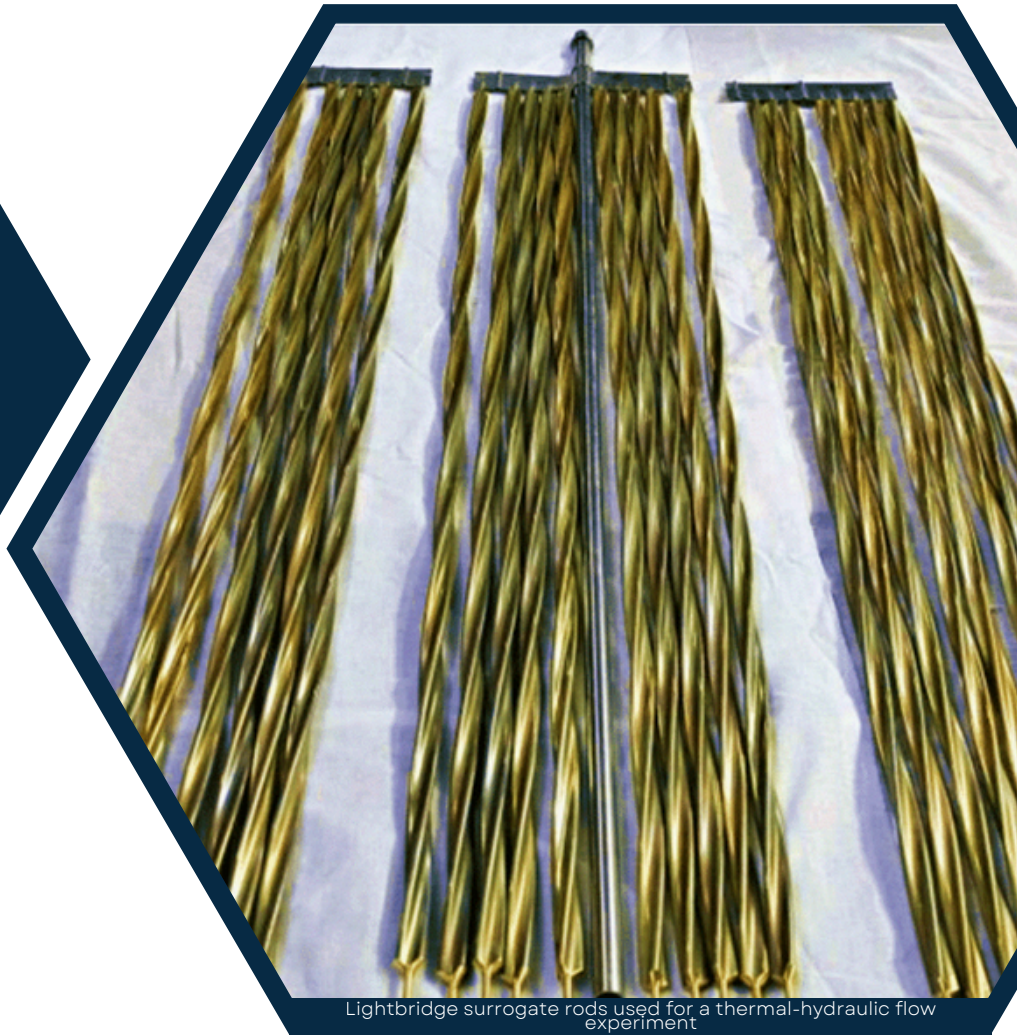
Dispositioning Weapons-Grade Plutonium Using Lightbridge Fuel

October 2025

About Lightbridge

Lightbridge Corporation (NASDAQ: LTBR) is focused on developing advanced nuclear fuel technology essential for delivering abundant, zero-emission, clean energy and providing energy security to the world. The Company is developing Lightbridge Fuel™, a proprietary next-generation nuclear fuel technology for existing light water reactors and pressurized heavy water reactors, significantly enhancing reactor safety, economics, and proliferation resistance. The Company is also developing Lightbridge Fuel for new small modular reactors (SMRs) to bring the same benefits plus load-following with renewables on a zero-carbon electric grid.

Lightbridge has entered into two long-term framework agreements with Battelle Energy Alliance, LLC, the United States Department of Energy's (DOE) operating contractor for Idaho National Laboratory (INL), the United States' lead nuclear energy research and development laboratory. DOE's Gateway for Accelerated Innovation in Nuclear (GAIN) program has twice awarded Lightbridge to support the development of Lightbridge Fuel over the past several years. Lightbridge is participating in two university-led studies through the DOE Nuclear Energy University Program at Massachusetts Institute of Technology and Texas A&M University. An extensive worldwide patent portfolio backs Lightbridge's innovative fuel technology. Lightbridge is included in the Russell 2000® Index and the Russell 3000® Index. For more information, please visit www.ltbridge.com.



Lightbridge surrogate rods used for a thermal-hydraulic flow experiment

Unlocking the Value of Surplus Plutonium for a Secure Energy Future

A Smart Business Proposition for U.S. Energy Independence

On May 23rd, 2025, the President signed Executive Orders directing the Secretary of Energy to halt the surplus plutonium “dilute and dispose” program and replace it with a plan to process surplus plutonium for use as fuel in advanced nuclear technologies. Lightbridge's metallic fuel technology represents the optimal solution to meet the President's directive while providing significant economic value to America's nuclear energy resurgence.

The Business Case: Turning Surplus into Strategic Value

The United States possesses approximately 34 metric tons of surplus weapons-grade plutonium–material that is in excess of defense requirements. Rather than viewing this as waste to be buried, we should recognize it for what it is: a highly valuable energy resource that can fuel America's growing advanced reactor fleet, particularly small modular reactors (SMRs) requiring high-assay low-enriched uranium (HALEU) and plutonium-based fuels.

With over 20,000 plutonium pits currently stored at the Pantex facility, there is ample surplus material available for civilian energy production without compromising national defense requirements. Converting this surplus into reactor fuel creates multiple benefits:

- **Generates economic value** from material that would otherwise require costly long-term storage
- **Provides fuel supply security** for the burgeoning SMR industry
- **Supports the President's directive** to reinvigorate America's nuclear energy sector
- **Produces clean, reliable electricity** from existing stockpiles

Why Previous Approaches Failed: Learning from the MOX Experience

The Department of Energy previously attempted to address plutonium disposition through a Mixed Oxide (MOX) fuel facility at the Savannah River Site. That project consumed years of time and money and (literally billions of dollars) before ultimately being cancelled due to massive cost overruns and schedule delays. The MOX approach proved to be technically complex, prohibitively expensive, and ultimately unworkable at scale.

Lightbridge's metallic fuel technology offers decisive advantages over MOX, addressing the key factors that led to the previous project's failure.

Feature	Lightbridge's Metallic Fuel	MOX Fuel
Plutonium Consumption	High (5.5x MOX)	Low
Cost	Lower	High
Risk	Lower	High
SMR Compatibility	Excellent	Limited

Technical Superiority

- **5.5x more efficient:** A peer-reviewed study published in Nuclear Technology [1]demonstrates that Lightbridge fuel consumes 5.5 times as much plutonium per fuel rod as MOX, enabling faster disposition at lower cost.
- **Simpler fabrication:** Metallic fuel manufacturing is less complex than MOX fuel fabrication, reducing technical risk and cost.
- **Proven development pathway:** Lightbridge is already executing a fuel qualification program at Idaho National Laboratory with DOE support.

Lightbridge's Proven Track Record and Current DOE Support

Lightbridge metallic fuel is being developed for use in commercial nuclear reactors, where our uranium-based metallic alloy fuels offer significant economic, operational, and safety benefits. In addition to our uranium-based alloys, Lightbridge's patented fuel technology and manufacturing processes also include plutonium-based fuel alloys.

Lightbridge is currently executing a fuel qualification program with fabrication and testing activities at Idaho National Laboratory, where the U.S. DOE provides support through access to facilities, staff, and high-enriched uranium. DOE further supports Lightbridge uranium-based fuel development through two ongoing Nuclear Engineering University Program (NEUP) projects at MIT and Texas A&M University, evaluating the use of Lightbridge fuel in Small Modular Reactors.

[1] https://www.tandfonline.com/doi/full/10.1080/00295450.2022.2145836

The plutonium variants of our fuel technology require additional research and development to reach the same maturity level.

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