October 28, 2024

Independent Modeling Studies from MIT and SIA and Results from Previous Testing Presented at TopFuel 2024 Conference Further Validate that Lightbridge Fuel™ has Safety Advantages Over Current Nuclear Fuel

RESTON, Va., Oct. 28, 2024 (GLOBE NEWSWIRE) -- Lightbridge Corporation ("Lightbridge") (Nasdaq: LTBR), an advanced nuclear fuel technology company, today shares insightful findings from three technical papers presented at the TopFuel 2024 Conference in Grenoble, France. These papers, produced by Massachusetts Institute of Technology (MIT), Structural Integrity Associates (SIA), and Lightbridge further validate the enhanced safety and performance of Lightbridge Fuel™, particularly its improved performance under extreme conditions.

Key Findings from the MIT Study
MIT's study, supported by a U.S. Department of Energy Nuclear Energy University Programs (DOE NEUP) grant, simulated the performance of Lightbridge Fuel in NuScale's Small Modular Reactor (SMR).

Dr. Koroush Shirvan, Atlantic Richfield Career Development Professor in Energy Studies at Nuclear Science and Engineering Department at MIT, commented, "The results from our analysis of Lightbridge Fuel in the NuScale VOYGR small modular reactor have shown promising safety and performance benefits. Compared to conventional fuel, Lightbridge Fuel demonstrated improved thermal-hydraulic margins, lower operating temperatures, and greater potential for power uprates, which contributes to enhancing reactor economics. Our collaboration with Lightbridge furthers the development of innovative nuclear fuel technologies critical to reducing cost of future nuclear power plants."

The MIT findings confirm that Lightbridge Fuel operates at significantly lower temperatures compared to traditional fuel, with improved safety margins that can enable power uprate opportunities while maintaining safe operation of the fuel. The study emphasized Lightbridge Fuel's potential for power uprates, enabling reactors to generate more power safely.

According to the MIT study, the main advantages of Helical Cruciform Fuel (HCF), aka Lightbridge Fuel, over cylindrical fuel are:

1. **Increased Heat Transfer Area**: HCF has a 35% larger heat transfer area, which enhances heat removal efficiency.
2. **Lower Operating Temperature**: Due to the high thermal conductivity of the U-50Zr (uranium-50 weight percent zirconium) alloy, HCF operates at a lower temperature,

reducing the mobility of fission gases and improving fuel performance.
3. **Higher Critical Heat Flux (CHF) Margin**: The larger heat transfer area and improved flow mixing in HCF channels result in a higher CHF margin, allowing for potential power uprate.
4. **Self-spacing Design**: HCF rods support each other at every twist pitch, eliminating the need for spacer grids and reducing pressure drop.
5. **Reduced Irradiation-induced Swelling**: The higher zirconium content in HCF reduces swelling and the likelihood of fission gas release compared to U-rich U-Zr alloys.
6. **Lower CRUD Formation Potential**: Lower wall temperatures and void fractions in HCF channels imply less CRUD (Chalk River Unidentified Deposits) formation.

These advantages make HCF a promising option for improving the performance and safety of small modular reactors (SMRs).

The full MIT paper can be found by clicking HERE or visiting https://www.ltbridge.com/news-media/technical-articles.

Key Findings from the SIA Study

SIA conducted a study under a DOE GAIN Regulatory Research Grant, evaluating Lightbridge Fuel in a Pressurized Water Reactor (PWR) under both normal and accident conditions. The study concluded that Lightbridge's metallic fuel is safer than conventional UO_2 fuel, particularly in accident conditions, with significantly lower peak cladding and peak fuel temperatures and where the calculations showed that cladding stresses were not sufficient to damage the cladding.

Dr. Wenfeng Liu, the principal investigator of this study from SIA, noted, "Our study of Lightbridge Fuel in pressurized water reactors under both normal and accident conditions confirmed significant safety enhancements over traditional uranium dioxide fuel. The fuel's lower operating temperatures and reduced cladding oxidation, particularly under loss-of-coolant conditions, underscore the potential of Lightbridge Fuel to improve reactor safety and operational reliability. We're excited to contribute to advancing a technology that could play a key role in the future of nuclear power."

According to the SIA study, in accident conditions, metallic fuel [Lightbridge Fuel] demonstrates several advantages over UO_2 fuel:

1. **Lower Peak Cladding Temperature (PCT)**: Metallic fuel exhibits significantly lower peak cladding temperatures compared to UO_2 (uranium dioxide) fuel during loss of coolant accidents (LOCA). For example, in various simulated conditions, the peak cladding temperature for metallic fuel was consistently lower than that for UO_2 fuel.
2. **Shorter Duration at High Temperatures**: Metallic fuel spends less time at high temperatures during accident scenarios, which reduces the risk of cladding oxidation and failure.
3. **Reduced Cladding Oxidation**: Due to the lower temperatures and shorter high-temperature durations, the cladding oxidation for metallic fuel is expected to be lower than for UO_2 fuel.
4. **Cladding Stresses not Sufficient to Damage Cladding**: Although cladding stresses can increase due to fuel thermal expansion during rapid power changes, the stresses in metallic fuel are not significant enough to cause cladding damage.
5. **Enhanced Safety Margins**: The overall lower temperatures and reduced oxidation contribute to enhanced safety margins, making metallic fuel a safer alternative in

accident conditions.

In summary, the Lightbridge metallic fuel offers improved safety performance over UO_2 fuel in accident conditions by maintaining lower temperatures and reducing oxidation.

The full SIA paper can be found by clicking HERE or visiting https://www.ltbridge.com/news-media/technical-articles.

Summary of the Lightbridge paper presented at the TopFuel 2024 Conference
Lightbridge presented an overview of some of the company's previous fuel development activities, including results from an experimental test, previously conducted in an overseas test reactor, where its metallic fuel rodlets endured approximately 24 hours in dryout conditions during irradiation. While conventional nuclear fuel would have experienced severe structural degradation that could have led to the loss of coolable geometry, Lightbridge Fuel maintained its structural integrity and coolable geometry, demonstrating an exceptional level of safety and durability. This physical test confirms the fuel's resilience in certain loss-of-flow accident scenarios.

Scott Holcombe, Ph.D., Vice President of Engineering at Lightbridge Corporation, highlighted the significance of these findings: "What really stood out to me was the flow blockage incident previously experienced in a test reactor environment where our fuel samples were subjected to over 24 hours without proper water flow—an extreme situation that would typically result in severe degradation for conventional fuel resulting in a loss of coolable geometry. In contrast, the Lightbridge Fuel sample maintained its structural integrity and its coolable geometry under these extreme conditions. The fuel's performance under these accident conditions highlights the robustness and resilience of our design. This irradiation experiment is one of the key reasons we're confident in the future applications of Lightbridge Fuel."

As reflected in the paper, a number of studies and experiments have been conducted on Lightbridge Fuel over the years to confirm its performance and potential benefits:

1. **Neutronics Studies**:

   - Detailed calculations using MCNP-6 and DRAGON to model the fuel's geometry and performance.
   - Evaluations in various reactor configurations (e.g., Westinghouse AP-1000, AREVA EPR, standard Westinghouse-type four-loop 1,100-MWe PWR) to assess reactivity control, power uprates, and fuel cycle costs.

2. **Thermal-Hydraulics Studies**:

   - Analytical studies to determine heat flux, coolant flow rates, and heat transfer coefficients.
   - Subchannel calculations using the SC-1 code to develop correlations for Departure from Nucleate Boiling Ratios.
   - Experimental tests on dummy fuel rods to verify hydraulic resistance, critical power, and vibration characteristics.

3. **Safety Analyses (for VVER-1000 reactors)**:

   - Simulations using codes like KANAL, RELAP5, RECOL, and TIGR-1 to analyze various operational occurrences and design basis accidents.

- Comparisons of peak cladding temperatures and cool-down times between Lightbridge Fuel and standard UO2 fuel.

4. **Fuel Performance Studies**:

   - Development of performance models using ANSYS to evaluate temperatures, strains, and swelling.
   - Access to a database of performance data from similar uranium-zirconium alloy fuels used in icebreaker ships.

5. **Irradiation Tests**:

   - Proof-of-concept irradiation tests in the IR-8 research reactor to assess fabrication-related faults and performance under irradiation.

6. **Fabrication Development**:

   - Co-extrusion of fuel rods using surrogate materials and investigation of ingot casting techniques.
   - Ongoing fabrication development at Idaho National Laboratory.

These studies have confirmed the expected performance of Lightbridge Fuel and provided a basis for continued development and future regulatory licensing.

The full Lightbridge paper can be found by clicking HERE or visiting https://www.ltbridge.com/news-media/technical-articles.

Lightbridge is now preparing for in-reactor testing of its coupon fuel samples at Idaho National Laboratory (INL) under its Strategic Partnership Project (SPP) agreement. The Advanced Test Reactor (ATR) at INL will provide critical data to further validate these safety and performance benefits, which will be instrumental as Lightbridge continues toward regulatory licensing and commercial deployment.

For more information, visit Lightbridge's Technical Articles section on their website, where the full papers from TopFuel 2024, along with summaries prepared by Lightbridge are available: https://www.ltbridge.com/news-media/technical-articles.

About Lightbridge Corporation
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 operating contractor for Idaho National Laboratory, the United States' lead nuclear energy research and development laboratory. DOE's Gateway for Accelerated Innovation in Nuclear 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 Microcap® Index. For more information, please visit www.ltbridge.com.

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Forward Looking Statements

With the exception of historical matters, the matters discussed herein are forward-looking statements. These statements are based on current expectations on the date of this news release and involve a number of risks and uncertainties that may cause actual results to differ significantly from such estimates. The risks include, but are not limited to: Lightbridge's ability to commercialize its nuclear fuel technology; the degree of market adoption of Lightbridge's product and service offerings; Lightbridge's ability to fund general corporate overhead and outside research and development costs; market competition; our ability to attract and retain qualified employees; dependence on strategic partners; demand for fuel for nuclear reactors; Lightbridge's ability to manage its business effectively in a rapidly evolving market; the availability of nuclear test reactors and the risks associated with unexpected changes in Lightbridge's fuel development timeline; the increased costs associated with metallization of Lightbridge's nuclear fuel; public perception of nuclear energy generally; changes in the political environment; risks associated with war in Europe; changes in the laws, rules and regulations governing Lightbridge's business; development and utilization of, and challenges to, Lightbridge's intellectual property; risks associated with potential shareholder activism; potential and contingent liabilities; as well as other factors described in Lightbridge's filings with the Securities and Exchange Commission (the "SEC"). Lightbridge does not assume any obligation to update or revise any such forward-looking statements, whether as the result of new developments or otherwise, except as required by law. Readers are cautioned not to put undue reliance on forward-looking statements.

A further description of risks and uncertainties can be found in Lightbridge's Annual Report on Form 10-K for the fiscal year ended December 31, 2023, and in its other filings with the SEC, including in the sections thereof captioned "Risk Factors" and "Forward-Looking Statements", all of which are available at http://www.sec.gov/ and www.ltbridge.com.

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This press release was published by a CLEAR® Verified individual.

Source: Lightbridge Corporation