



**Lightbridge**

**2023**

**Annual Report to  
Stockholders**



# Directors and Officers

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## Board of Directors

### **AMBASSADOR THOMAS GRAHAM JR.**

Chairman of the Board

### **SWETA CHAKRABORTY, PH.D.**

Chief Executive Officer  
We Don't Have Time U.S.

### **JESSE FUNCHES**

Former Chief Financial Officer U.S.  
Nuclear Regulatory Commission

### **SHERRI GOODMAN**

Vice-Chair U.S. State Department  
International Security Advisory Board

### **SETH GRAE**

President and Chief Executive Officer

### **DANIEL B. MAGRAW**

Senior Fellow and Professorial Lecturer,  
Foreign Policy Institute at the Johns  
Hopkins School of Advanced  
International Studies

### **MARK TOBIN**

Chief Financial Officer  
Camp Construction Services

## Executive Officers

### **SETH GRAE**

President and Chief Executive Officer

### **LARRY GOLDMAN, C.P.A.**

Chief Financial Officer & Corporate Secretary

### **ANDREY MUSHAKOV, PH.D.**

Executive Vice President –Nuclear Operations

# Corporate Information

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## **CORPORATE HEADQUARTERS**

Lightbridge Corporation  
11710 Plaza America Drive  
Suite 2000  
Reston, Virginia 20190 USA

## **INVESTOR RELATIONS**

Copies of Lightbridge's 2023  
Annual Report on Form 10-K are  
available at no charge. Please  
direct requests and other  
investor relations questions to:

Lightbridge Corporation  
Attn: Investor Relations  
11710 Plaza America Drive  
Suite 2000  
Reston, Virginia 20190 US  
+1 347-947-2093  
IR@ltbridge.com

## **TRANSFER AGENT AND REGISTRAR**

Computershare Trust Company  
350 Indiana Street  
Golden, Colorado 80401 USA  
+1 800-962-4284

## **AUDITORS**

BDO USA, LLP  
Philadelphia, Pennsylvania

## **OUTSIDE LEGAL COUNSEL**

Hogan Lovells U.S. LLP  
Washington, D.C.

## **STOCK EXCHANGE LISTING**

Nasdaq Capital Market  
Symbol: LTBR

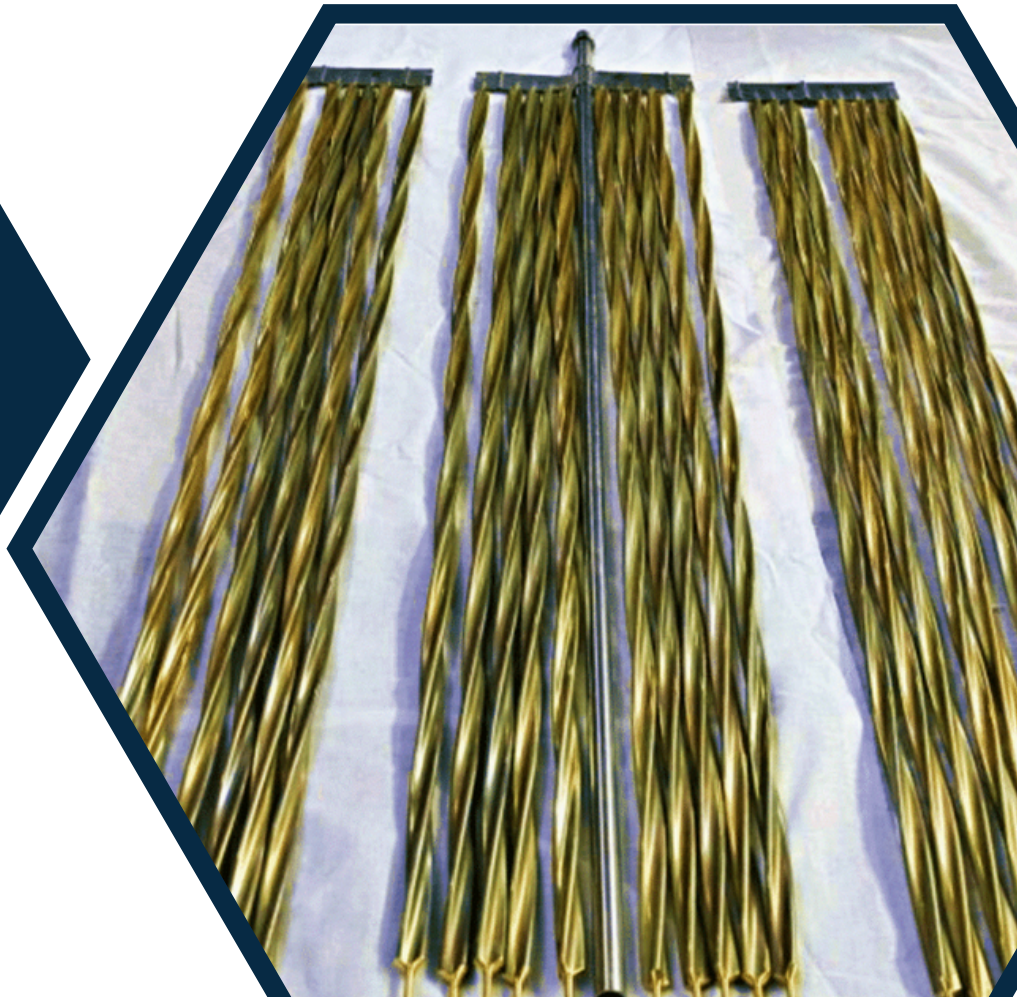
## **2024 ANNUAL MEETING**

Friday, April 19, 2024  
11:00 a.m. ET  
Online Access:  
[www.virtualshareholdermeeting.com/LTBR2024](http://www.virtualshareholdermeeting.com/LTBR2024)

# 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 Microcap® Index. For more information, please visit [www.ltbridge.com](http://www.ltbridge.com).



# CEO Letter to Stockholders



To our Valued Shareholders,

I am pleased to present an overview of Lightbridge’s progress in 2023, a brief description of a standard framework for keeping track of progress on nuclear fuel development efforts that we are adopting going forward, and key upcoming fuel development milestones that we expect to accomplish over the next 2-3 years. I will also summarize key highlights from COP28, which I attended.

## **Key Milestones and Achievements in 2023**

***Strengthening our Leadership Team:*** We welcomed Sherri Goodman and Dr. Scott Holcombe to our team. Ms. Goodman, a recognized national security expert, joined Lightbridge as an independent director, bringing invaluable insights into the intersection of energy and national security. As our new Vice President of Engineering, Dr. Holcombe brings extensive expertise in nuclear fuel and materials development and management of interdisciplinary teams of engineers and subject matter experts, further bolstering our nuclear fuel technology leadership.

***Agreement with Centrus Energy:*** We announced an agreement with Centrus Energy to conduct a front-end engineering and design (FEED) study for a Lightbridge Pilot Fuel Fabrication Facility (LPFFF) in Piketon, Ohio. Centrus hosts the only U.S.-based production facility for high assay low enriched uranium (HALEU),



**From left to right: Daniel B. Poneman, Centrus CEO, Seth Grae, President & CEO of Lightbridge**

(HALEU) partnering with the U.S. Department of Energy (DOE) on the site. The key objective of the FEED study is to determine the scope of work, cost and schedule estimates, and identify key risk factors for establishing an LPFFF. The results from this study will form the basis for a decision on the way forward for establishing an LPFFF for manufacture of commercial-size fuel rods for demonstrating and licensing Lightbridge Fuel in commercial reactors. The LPFFF could potentially be expanded to a full commercial-scale facility.



**From left to right: Dr. Constantin Paunoiu, Director of Institutul de Cercetări Nucleare Pitești, and Dr. Andrey Mushakov, Lightbridge's Executive Vice President, Nuclear Operations**

**Engineering Study for CANDU Reactors:** We announced an agreement with Institutul de Cercetări Nucleare Pitești, a subsidiary of Regia Autonoma Tehnologii pentru Energia Nucleara (RATEN ICN), to perform an engineering study to assess the compatibility and suitability of Lightbridge Fuel for use in CANDU reactors. Key areas for assessment include mechanical design, neutronics analysis, and thermal-hydraulic evaluations. The study will identify any critical parameters for further evaluation and design. The findings will guide future economic evaluations and support navigating potential regulatory-licensing-related issues. Due to the unique design and operating conditions of CANDU reactors, we believe this type of reactor may offer an opportunity for faster time to market.

**Collaborative Research and Development Initiatives:** We announced a research study with Texas A&M University, NuScale Power, and Structural Integrity Associates as part of the DOE Nuclear Energy University Program (NEUP) R&D Awards. This project focuses on thermal-hydraulic modeling and testing and aims to increase the understanding of the overall performance of Lightbridge Fuel under simulated normal and off-normal conditions in NuScale's SMR. This follows a similarly structured NEUP study with the Massachusetts Institute of Technology announced in 2022 that focuses on neutronics modeling and safety evaluation of Lightbridge Fuel in a NuScale SMR.



**Lightbridge's James Fornof, Vice President of Program Management (first from the left) and Dr. Scott Holcombe, Vice President of Engineering (fourth from the left) are joined by Prof. Yassin A. Hassan, Director of the Center for Advanced Small Modular and Micro Nuclear Reactors (CASMR) at Texas A&M University (third from the left)**

**Enhanced Plutonium Disposition:** We announced that a recently published peer-reviewed technical paper[1] on the disposition of weapons-grade plutonium revealed that, based on computer simulations, a Lightbridge-designed fuel rod significantly outperforms traditional mixed-oxide (MOX) fuel in consuming plutonium, consuming approximately 5.5 times more plutonium per fuel rod than MOX fuel, making the Lightbridge-designed rods well-suited for consuming excess weapons-grade plutonium.

## Technology Readiness Level Framework

Lightbridge is adopting the Technology Readiness Level (TRL) system to illustrate the progress of its fuel development efforts. The TRL system, originally developed by NASA[2] and widely recognized across various industries, including the OECD Nuclear Energy Agency provides a standardized framework for assessing and communicating the maturity of a particular technology. This framework encompasses a scale from 1 to 9, with TRL 1 representing the initial concept or theoretical stage, and TRL 9 denoting a technology that has been proven in its operational environment. Utilizing the TRL system allows Lightbridge to map the development of its nuclear fuel technology against a clear, standardized metric, enabling stakeholders to gauge progress in a structured and transparent manner.

Structural Materials	Manufacturing Processes	Fuel and Cladding							
Full-scale components + full-scale fabrication		Multiple Assemblies (core reloads)	→					TRL 8-9	
Full-scale components, prototypes	Full-scale fabrication process	Lead Test Rods or Lead Test Assemblies	→				TRL 7	TRL 8	
Subcomponents, prototypes	Bench-scale fabrication	Rodlets	→	TRL 4	TRL 5	TRL 5-6	TRL 6		
Samples	Lab-scale fabrication	Samples and rodlets	→	TRL 4	TRL 4	TRL 4	TRL 5	TRL 5	
				Fundamental property studies	Out-of-pile testing	In-pile testing in representative conditions*	In-pile testing in transient and/or off normal conditions**	In-pile testing in prototypic conditions. (fuel/cladding: first in MTR, then LTRs in commercial NPPs)*	Operation in commercial NPPs (fuel/cladding: first LTAs, then reloads)

\* Can potentially be done on limited scale in NPPs

\*\* Not likely to be able to be done in NPPs since the necessary conditions may be outside the approved/licensed operating domain

**Figure 1: Adapted from the OECD-NEA FIDES-II Strategic Plan 2023, page 7[3]. Illustration of the general progression of Technical Readiness Level for innovative fuel and cladding, structural materials, and manufacturing processes, starting with investigations of fundamental properties and ending with use of full-scale fuel assemblies and components in NPPs.**

Currently, Lightbridge Fuel is positioned at TRL 4-5, indicating a significant phase in our development process. At this stage, Lightbridge Fuel has moved beyond theoretical research (TRL 1-3) and entered into the realm of validation in a laboratory environment (TRL 4) and initiation of validation in representative operating conditions (TRL 5). This signifies that the core principles underlying Lightbridge Fuel have been successfully demonstrated through calculations, in a number of laboratory experiments, and in test reactor proof-of-concept experiments, where our efforts are now focused on verifying the technology's performance under conditions that closely simulate operational scenarios. This is a pivotal transition from conceptual designs and laboratory tests to in-reactor testing in representative and actual conditions the fuel will experience in commercial reactors. This phase is critical for demonstrating our fuel's design, materials, performance, and for identifying any potential challenges, allowing for adjustments and enhancements before advancing to system prototype demonstration in operational environments (TRL 6-7).

Achieving TRL 4-5 is an important milestone which validates the Lightbridge Fuel design thus far and sets the stage for subsequent development steps, moving us closer to commercialization and widespread adoption of our advanced nuclear fuel (TRL 8-9).

### **Key Upcoming Fuel Development Milestones Anticipated over the Next 2-3 Years**

Applying the TRL framework to the upcoming fuel development milestones illustrates how each goal aligns with different TRL levels:

- Expand our fuel development team to build in-house modeling and simulation capabilities in neutronics, thermal-hydraulics, fuel performance, and transient analyses (supports TRL levels 4-9);
- Continue to execute our ongoing work at Idaho National Laboratory leading to casting and extrusion of unclad fuel material samples using enriched uranium and their subsequent insertion for irradiation testing in the Advanced Test Reactor (supports late stages of TRL level 4; the experimental data would feed into model development and validation described above);
- Complete the Engineering Study for the use of Lightbridge Fuel in CANDU reactors in collaboration with RATEN ICN (this corresponds to activities pre-TRL level 4 to confirm feasibility of using Lightbridge Fuel in another type of reactor, i.e., CANDU pressurized heavy water reactor);
- Complete the FEED study for an LPFFF in collaboration with Centrus Energy (supports TRL levels 5-8); and
- Commence manufacturing efforts relating to co-extrusion of clad rodlets for loop irradiation testing (supports late stages of TRL level 4 and TRL levels 5-7).

### **COP28 Takeaways and Tripling Nuclear Capacity by 2050**

Significantly, for the first time, at COP28 nuclear energy was recognized alongside other clean energy sectors in the negotiations' final statement, marking the broader acceptance of nuclear as a key component of the global decarbonization strategy. The conference was a confluence of government officials, industry leaders, and environmental activists, each bringing their perspectives to the table.

COP28 served as a platform for announcing a significant commitment by the United States and over 20 other nations to triple nuclear energy globally by 2050. To meet this highly ambitious commitment of tripling nuclear power by 2050 assumes maintaining the operation of the current roughly 400 large nuclear reactors worldwide—93 of which are in the United States. Additionally, it necessitates the construction of approximately 800 more large reactors, which would signify an unprecedented expansion in nuclear power infrastructure. If the focus shifts towards small modular reactors, the numbers required could soar into the thousands, potentially exceeding 10,000 units, depending on their capacity.

As the nuclear sector gears up for an unprecedented expansion, we believe the demand for more efficient, safer, and economically viable nuclear fuel technology will surge, positioning Lightbridge Fuel as an important player in this growing nuclear capacity and its massive addressable market. Lightbridge Fuel's anticipated benefits, such as enhanced safety, improved performance, economic benefits due to power uprate and fuel cycle extension features, and load following opportunities can offer an attractive fuel technology option to existing and future water-cooled reactors.

## **Conclusion**

We are focused on further advancing our technologies, expanding our market presence, and continuing our collaborations with industry and academic partners. Our ongoing research and development efforts and strong intellectual property portfolio position us favorably in an industry set to expand dramatically throughout the world.

I want to thank our shareholders, employees, partners, and vendors for your continued support. We will keep you apprised of our progress and key developments.

Sincerely,

A handwritten signature in cursive script, appearing to read "Seth Grae".

Seth Grae  
President and Chief Executive Officer  
Lightbridge Corporation





# Lightbridge

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