

**State University System
Education and General
2021-2022 Legislative Budget Request
Form I**

University(s):	Florida State University
Request Title:	Critical Electrical Infrastructure at the National High Magnetic Field Laboratory
Date Request Approved by University Board of Trustees:	Pending approval at September 10-11 Board of Trustees Meeting
Recurring Funds Requested:	-NONE-
Non-Recurring Funds Requested:	\$15,820,017.00
Total Funds Requested:	\$15,820,017.00
Please check the request type below:	
Shared Services/System-Wide Request	<input checked="" type="checkbox"/>
Unique Request	<input type="checkbox"/>

I. Description

Introduction

The National High Magnetic Field Laboratory (National MagLab) is the only lab of its kind in the United States and is the largest and highest powered magnet laboratory in the world. Headquartered at **Florida State University** (FSU) with sites at the **University of Florida** (UF) and Los Alamos National Laboratory, the National MagLab hosts 2,000 scientists from across the globe each year who leverage the power of high-field magnets to make discoveries today that will lead to the technologies of tomorrow.

Established 30 years ago through a visionary partnership between the State of Florida and the National Science Foundation (NSF), the National MagLab hosts a fleet of powerful magnets -including 17 world-record holders - that have helped facilitate more than 9,600 groundbreaking scientific publications. This research has helped scientists understand complex, new materials, find energy solutions, create a more sustainable planet, and cure diseases.

Aging Critical Infrastructure

The National MagLab's dominance in the realm of high magnetic field research is largely based on the unique capability to operate several world-record, high-field magnets at the FSU-based Tallahassee site. These magnets produce fields more than a million times stronger than the Earth's magnetic field - up to 45 tesla

continuously – with the help of strong and reliable scientific and industrial infrastructure.

The critical equipment that supplies electrical power to the National MagLab's FSU site is now more than 28 years old and at the end of its lifetime. This affects the reliability of the electrical power to the lab, putting the lab's reputation and leadership at risk, as well as our personnel and tens of millions of dollars of highly-specialized equipment.

The National MagLab's power needs have increased over the past two decades as our lab's stature has grown and are expected to continue to grow significantly over the next 5-10 years due to the construction of new magnets and an expansion to existing scientific and electrical equipment funded by our primary funder, the NSF – *upgrades which cannot be supported by the existing electrical power infrastructure.*

Electrical power is fed from the municipal power grid to the National MagLab via a pair of power feeds (2,000 ampere/12,500 volt AC) and a main switchgear (US1) consisting of circuit breakers, distribution lines and power quality balancing components. The electrical switchgear that powers the National MagLab is large in scale. When fully operational, the National MagLab draws more than 7% of the City of Tallahassee's power generation capacity through its electrical gear. More than 95% of the power used at the National MagLab flows through four 14.5 million watt power supplies to our massive magnets. *However, the original (US1) switchgear has reached its end of life and, having been constructed nearly 30 years ago, does not include modern protections against arc flash and other hazards.*

US1 Electrical Infrastructure Upgrade

The upgrade of the National MagLab's main electrical gear needs to achieve reliable and safe operations that will support the future increased electrical power demands. The upgrade is comprised of four major parts:

- (1) The replacement of the main National MagLab switch gear with modern-day equipment** that is operationally highly-reliable, increases personnel safety (via process automation, arc flash shielding, increased fault ratings), meets the increased power needs and is maintainable over the expected equipment life time of 30 years.
- (2) The replacement of the existing power quality balancing infrastructure** (capacitor bank) with a system that ensures high power quality, while also increasing the electrical power capacity, operational reliability, magnetic field stability, and longevity of tens of millions of dollars of scientific instrumentation powered by the US1 electrical infrastructure.
- (3) The replacement of the laboratory's 1992 diesel powered back-up generator** with a natural gas powered generator that can reliably sustain critical building infrastructure and unique scientific equipment during the extended power

outages which will be associated with the installation of the new US1 electrical infrastructure, as well as power interruptions due to thunderstorms and hurricanes that impact Tallahassee.

(4) The upgrade of the laboratory's networking infrastructure to enhance the speed, security and reliability of the MagLab computer network to accommodate the data requirements of state-of-the-art research and the new intelligent US1 electrical infrastructure.

The project can be realized within 24 to 30 months of the funds being made available. This effort includes a detailed engineering and construction planning phase executed by FSU and the National MagLab in collaboration with a private-sector electrical engineering firm, followed by installation of the equipment onsite.

Budget Estimate

FSU and the National MagLab have contracted and are collaborating with a private-sector engineering firm to perform a detailed engineering and feasibility study. The work has provided an informed conclusion on how the US1 electrical gear should be upgraded to achieve the most reliable and safest operations to support the National MagLab's increased electrical power demands for the next 30 years. This engineering team has worked with all relevant stakeholders and has prepared the proposed infrastructure upgrade plan.

The project cost includes engineering and detailed construction designs by an engineering firm, all necessary replacement equipment, and the installation and commissioning of the gear as well as the generator at our FSU-based site. Upgraded electrical and networking infrastructure functionality is also included in this cost estimate, i.e. additional safety features to reduce personnel exposure to high-power electrical equipment, power conditioning equipment to increase the capacity and improve the quality of the electrical power, and equipment to enhance the network connectivity at the National MagLab. The total estimated cost for the National MagLab's US1 electrical infrastructure upgrade is \$15,820,017.00.

Alignment with FSU Goals and the FSU 2020 University Accountability Plan

The National MagLab significantly contributes to FSU's strategic priorities and key initiatives, as well as many of its performance and preeminence metrics. This investment in critical equipment at the National MagLab addresses a need to replace aging infrastructure and modernize this world-unique facility to ensure that it is retained and continues to flourish in Florida.

Supporting this project will sustain the lab's ability to attract more than \$45 million annually in research investments from the National Science Foundation, Department of Energy, National Institutes for Health, Department of Defense, and other government and private funding sources, while bolstering FSU's

academic and research excellence goals on the path to becoming a **Top 10 public university**. Because this equipment investment fundamentally impacts the continued operation of the National MagLab, it also has important implications for **recruiting and retaining top-tier talent** across faculty, postdoc, and graduate student levels and for the lab's ability to **support the larger entrepreneurial ecosystem** both at the university and in the broader community. The National MagLab is also a critical training ground for educating thousands of students in diverse STEM fields, building a Florida-based workforce trained for **future high-tech jobs** or to launch their own **innovative entrepreneurial endeavors**.

II. Return on Investment

In addition to being a world leader in high magnetic field research, the National MagLab is a huge economic driver for the state, yielding \$325 million in economic activity each year for Florida. A recent study by the Center for Economic Forecasting and Analysis indicates that for every dollar of state money invested in the National MagLab, \$6.44 is generated in economic activity. The National MagLab is partnering with the Tallahassee Office of Economic Vitality to attract business to Florida via its campaign to establish Tallahassee as the "*Magnetic Capital of the World*". Finally, with reliable infrastructure, the National MagLab will continue to attract thousands of visiting scientists from around the world whose travel to our FSU and UF campuses annually generates \$20 million in sales and revenue in the Tallahassee and Gainesville tourism economies.

Over the next twenty years, economists estimate that the National MagLab will generate \$6.5 billion in economic output in Florida while generating nearly 54,000 jobs. Funding this electrical infrastructure upgrade positions the National MagLab to be more successful in future funding proposals from the NSF and other federal agencies, which would bring even more money and jobs to our state. This upgrade of the National MagLab's main electrical infrastructure will also ensure that Florida will maintain worldwide preeminence at the rapidly growing scientific frontiers of high magnetic field research for the next three decades.

III. Facilities *(If this issue requires an expansion or construction of a facility, please complete the following table.):* **None**

**2021-2022 Legislative Budget Request
Education and General
Position and Fiscal Summary
Operating Budget Form II**

University: Florida State University
Issue Title: Critical Electrical Infrastructure
at the National High Magnetic
Field Laboratory

	<u>RECURRING</u>	<u>NON- RECURRING</u>	<u>TOTAL</u>
<u>Positions</u>			
Faculty	0.00	0.00	0.00
Other (A&P/USPS)	0.00	0.00	0.00
	-----	-----	-----
Total	0.00	0.00	0.00
	=====	=====	=====
Salaries and Benefits	\$0	\$0	\$0
Other Personal Services	\$0	\$0	\$0
Expenses	\$0	\$0	\$0
Operating Capital Outlay	\$0	\$15,820,017	\$15,820,017
Electronic Data Processing	\$0	\$0	\$0
Financial Aid	\$0	\$0	\$0
Special Category (Specific)	\$0	\$0	\$0
_____	\$0	\$0	\$0
_____	\$0	\$0	\$0
_____	\$0	\$0	\$0
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Total All Categories	\$0	\$15,820,017	\$15,820,017
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