UNIVERSITY OF ALABAMA SYSTEM
BOARD RULE 415
BOARD SUBMITTAL CHECKLIST CRITERIA

BOARD SUBMITTAL CHECKLIST NO. 1
CAPITAL PROJECT - STAGE I SUBMITTAL /1
(General Project Information)

CAMPUS: The University of Alabama, Tuscaloosa, AL

PROJECT NAME: High Performance Computing and Data Center

MEETING DATE: August 31 - September 1, 2023

- ☑ 1. Board Submittal Checklist No. 1
- ☑ 2. Transmittal Letter to Chancellor from Campus President requesting project be placed on the agendas for the forthcoming Physical Properties Committee and Board of Trustees (or Executive Committee) Meetings
- ☑ 3. Proposed Board Resolution requesting approval of Stage I Submittal by the Board of Trustees
- ☑ 4. Executive Summary – Proposed Capital Project /2
- ☑ 5. Supplemental Project Information Worksheet – Exhibit "K", Board Rule 415
- ☑ 6. Campus map(s) showing project site

Prepared by: Joshua Bollinger

Approved by: Jim Leopard/ca

/1 Reference Tab 3F – Board Rule 415 Instructional Guide
/2 Reference Tab 3E – Board Rule 415 Instructional Guide

THE UNIVERSITY OF ALABAMA® | Office of the President

August 1, 2023

Chancellor Finis E. St. John IV
The University of Alabama System
500 University Boulevard East
Tuscaloosa, Alabama 35401

Dear Chancellor St. John:

I am pleased to send to you for approval under Board Rule 415 the attached documents for a Stage I submittal for the High Performance Computing and Data Center project.

The resolution requests authorization to establish a preliminary project scope, budget, and funding, as stipulated.

The item has been thoroughly reviewed and has my endorsement. With your concurrence, I ask that it be added to the agenda for The Board of Trustees at their regular meeting on August 31-September 1, 2023.

Sincerely,

Stuart R. Bell
President

Enclosure

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THE UNIVERSITY OF ALABAMA

RESOLUTION

APPROVAL OF THE PRELIMINARY PROJECT SCOPE AND BUDGET FOR THE HIGH PERFORMANCE COMPUTING AND DATA CENTER

WHEREAS, in accordance with Board Rule 415, The University of Alabama ("University") is requesting approval of a Stage I submittal for the High Performance Computing and Data Center ("HPC") project ("Project") to be located at 709 Johnny Stallings Drive; and

WHEREAS, the Project will provide numerous opportunities for students and faculty to engage in and experience a leading-edge computing technology environment and greatly enhance overall institutional research effectiveness, increasing the University's productivity and innovation in research, scholarship, and creative activities; and

WHEREAS, modeling and simulation on HPC resources are a critical factor in the success of research in science and engineering, and state-of-the-art simulation, such as hydrological modeling, requires computing resources far beyond what is available from UA's current HPC platforms; and

WHEREAS, the availability of Petascale-computational resources removes existing bottlenecks to the advancement of research requiring large-scale computational simulations, the training of complex Artificial Intelligence/Machine Learning models, and the development of new data science applications, and as a result, the Project will allow researchers to make scientific and engineering advances that are currently unavailable due to the University's limited computational capability; and

WHEREAS, the Project entails the construction of an approximately 40,000 GSF two-story HPC that will solidify and propel the advancement of the University's academic mission and research and development capabilities as an R1 institution; and

WHEREAS, the Project will include space for University staff offices and work areas as well as shell space for a future secure suite, and the facility will be designed to provide for efficient expansion of computing over time by providing an accessible structure and shell space for both compute and support infrastructure; and

WHEREAS, the Project will include the purchase of HPC equipment and will provide an appropriate environment for the operation thereof; and

WHEREAS, the proposed site is ideally located adjacent to Alabama Power Company high voltage transmission lines that will provide adequate and resilient capacity for current use and projected growth, which will require the University to contract with Alabama Power Company for service and to provide easements necessary to accommodate the substation location and service lines; and

WHEREAS, to mitigate the effects of continued industry lead time issues and to deliver the building as timely as possible, the Project will be separated into multiple packages: Package A – MV Infrastructure and Substation, Package B – Utility and Infrastructure, and Package C – Main Construction of Building and System, and will also include Owner Furnished Contractor Installed ("OFCI") Equipment; and

WHEREAS, the Project will be funded from a National Institute of Standards and Technology ("NIST") Grant in the amount of $44,550,000 (2023-NIST-CICGP-01), State of Alabama ETF Supplemental Appropriations in the amount of $46,000,000 (enacted SB-87), and University Central Reserves in the $5,450,000; and

WHEREAS, the Project Budget includes infrastructure associated with supporting Education and General Funded enterprise-level computing systems, and that scope of work will be funded with University Central Reserves; and

WHEREAS, the Project location and program have been reviewed and are consistent with the University Campus Master Plan, University Design Standards and the principles contained therein; and

WHEREAS, the preliminary budget for the Project is as stipulated below:

BUDGET:		PRELIMINARY
Package A - MV Infrastructure and Substation	$	1,287,551
Package B - Utility and Infrastructure	$	3,000,000
Package C - Main Construction of Building and Systems	$	35,000,000
Landscaping	$	200,000
Owner Furnished Contractor Installed (OFCI) Equipment	$	11,000,000
Owner Furnished HPC Equipment	$	25,000,000
Furniture, Fixtures, and Equipment	$	100,000
Security/Access Control	$	500,000
Telecommunication/Data	$	500,000
Contingency*	$	2,524,378
UA Project Management Fee**	$	1,855,417
Programming and Grant Preparation	$	375,000
Architect/Engineer Fee***	$	2,271,940
Commissioning Agent	$	700,000
Other (CMT, Surveys, inspections, advertisement, DCM review, Insurance)	$	1,400,000
Escalation****	$	10,285,714
TOTAL PROJECT COST	**$**	**96,000,000**

*Contingency is based on 5% of the cost of the Packages A-C, Landscaping, and OFCI Equipment.
**UA Project Management fee is based on 3.5% of the costs of the Packages A-C, Landscaping, OFCI Equipment, and Contingency.
***Architect/Engineer Fee is based on 4.5% of the cost of the Packages A-C, Landscaping, and OFCI Equipment.
****Escalation is based on an anticipated 12% for through the estimated bid date of September 2024.

NOW, THEREFORE, BE IT RESOLVED by The Board of Trustees of The University of Alabama that:

1. The Stage I submittal package for the Project is hereby approved.

2. The preliminary Project scope, budget, and funding as stipulated above are hereby approved.

BE IT FURTHER RESOLVED that Stuart R. Bell, President; Matthew M. Fajack, Vice President for Finance and Operations and Treasurer; or, those officers named in the most recent Board Resolution granting signature authority for the University be, and hereby are, authorized for and on behalf of the Board to execute all necessary agreements with Alabama Power Company or its affiliates required to execute the Project.

EXECUTIVE SUMMARY
PROPOSED CAPITAL PROJECT
BOARD OF TRUSTEES SUBMITTAL

MEETING DATE:	August 31- September 1, 2023
CAMPUS:	The University of Alabama, Tuscaloosa, Alabama
PROJECT NAME:	High Performance Computing and Data Center
PROJECT NUMBER:	008-23-3287
PROJECT LOCATION:	709 Johnny Stallings Drive, Tuscaloosa, AL
ARCHITECT:	To be determined

THIS SUBMITTAL:	**PREVIOUS APPROVALS:**
☒ Stage I	
☐ Stage II	
☐ Campus Master Plan Amendment	
☐ Stage III	
☐ Stage IV	

PROJECT TYPE	**SPACE CATEGORIES**	**PERCENTAGE**	**GSF**
☒ Building Construction	Laboratory Facilities	~ 1.5%	588
☐Building Addition	Office Facilities	~4.9%	1,958
☐Building Renovation	Special Use Facilities	~ 0.4%	147
☐Equipment	Central Service/ Support	~ 24.8%	9,941
	Residential Facilities	~2.7%	1,090
	Circulation Area	~12.5%	4,996
	Building Service Area	~ 0.5%	213
	Mechanical Area	~52.7%	21,067
	TOTAL	**100**%	40,000

BUDGET		**Preliminary**
Package A - MV Infrastructure and Substation	$	1,287,551
Package B - Utility and Infrastructure	$	3,000,000
Package C - Main Construction of Building and Systems	$	35,000,000
Landscaping	$	200,000
Owner Furnished Contractor Installed (OFCI) Equipment	$	11,000,000
Owner Furnished HPC Equipment	$	25,000,000
Furniture, Fixtures, and Equipment	$	100,000
Security/Access Control	$	500,000
Telecommunication/Data	$	500,000
Contingency*	$	2,524,378
UA Project Management Fee**	$	1,855,417
Programming and Grant Preparation	$	375,000
Architect/Engineer Fee***	$	2,271,940
Commissioning Agent	$	700,000
Other (Surveys, inspections, advertisement, DCM review, Insurance)	$	1,400,000
Escalation****	$	10,285,714
TOTAL PROJECT COST	**$**	**96,000,000**
Total Construction Cost per square foot $1,325		

*Contingency is based on 5% of the cost of the Packages A-C, Landscaping, and OFCI Equipment.

**UA Project Management fee is based on 3.5% of the costs of the Packages A-C, Landscaping, OFCI Equipment, and Contingency.

***Architect/Engineer Fee is based on 4.5% of the cost of the Packages A-C, Landscaping, and OFCI Equipment.

****Escalation is based on an anticipated 12% inflation through the estimated bid date of September 2024.

ESTIMATED ANNUAL OPERATING AND MAINTENANCE (O&M) COSTS:

(Utilities, Housekeeping, Maintenance, Insurance, Other)

40,000gsf x ~$24.90/sf	$	995,939
Total Estimated Annual O&M Costs*:	$	995,939

*Annual O&M Cost estimated for 2MW operating load in Year 1, increasing to 8MW by Year 6 at an estimated Annual O&M Cost of $3,423,379.

FUNDING SOURCE:

	Federal NIST Grant (2023-NIST-CICGP-01)	$	44,550,000
	State Appropriation (SB-87)	$	46,000,000
	UA Central Reserves	$	5,450,000
O&M Costs:	Recharge to the User and F&A recovered funds from ORED*	$	995,939

*Annual O&M Cost estimated for 2MW operating load in Year 1, increasing to 8MW by Year 6 at an estimated Annual O&M Cost of $3,423,379.

NEW EQUIPMENT REQUIRED

OFCI Equipment:*		$11,000,000
	Generators	
	Supervisory Control and Data Acquisition and Substation Switchgear	
	HVAC Equipment	
HPC Equipment		$25,000,000
	Total Equipment Costs:	**$36,000,000**

*identified long lead equipment as appropriate to efficiently deliver the project

PROJECT SCOPE:

The UA High Performance Computing and Data Center project, located at 709 Johnny Stallings Drive, Tuscaloosa, AL, will consist of new construction of an approximately 40,000 gross square feet ("gsf") building to serve the campus academic needs, the Office of Research and Economic Development (ORED), and strategic partners.

The Project will consist of the new construction of a 2-story space for the HPC equipment that will include people space for UA staff offices and work areas as well as shell space for a future secure suite. The facility will be designed to provide for efficient expansion of computing over time by providing an accessible structure and shell space for both compute and support infrastructure.

The building will have an aesthetic and massing to complement the surrounding architecture and promote education of next generation HPC systems to staff, students, and visitors. The project includes a dedicated chiller plant located adjacent to the new building and all necessary vehicular access for deliveries, service vehicles, and emergency vehicles.

The Project will include the purchase of HPC equipment and will provide an appropriate environment for the operation thereof.

The project will also include a new approximately 22,500 gsf electrical substation yard. The proposed site is ideally located adjacent to Alabama Power high voltage transmission lines, which will provide adequate and resilient capacity for current use and projected growth. As these lines also serve a nearby hospital, their operation and reliability are considered critical and would be addressed as a priority in case of a major outage. This will help ensure the continuity of operations for the facility and support an efficient cost of initial construction due to the close proximity.

The selected site aligns with the UA Master plan. The proposed site was chosen considering multiple factors, chiefly the availability of high capacity and resilient electrical service, availability and capacity of other support infrastructure and utilities and environmental resiliency. The site and layout will also consider any needed future expansion of the Capstone College of Nursing.

PROJECT STATUS		
SCHEMATIC DESIGN:	Date Initiated	Nov 2023
	% Complete	0%
	Date Completed	January 2024
PRELIMINARY DESIGN:	Date Initiated	Feb 2024
	% Complete	0%
	Date Completed	March 2024
CONSTRUCTION DOCUMENTS:	Date Initiated	Apr 2024
	% Complete	0%
	Date Completed	August 2024
SCHEDULED BID DATE:		September 2024

**N/A on Stage I Projects*

RELATIONSHIP AND ENHANCEMENT OF CAMPUS PROGRAMS

High Performance Computing ("HPC") plays a vital role in many scientific, industrial, and societal advancements due to the complexity of the questions and problems at hand. The creation of the UA Center for High Performance Computing ("Center") will utilize HPC resources to answer our biggest questions related to water, mobility, and power technologies. These areas also provide profound economic development opportunities for the state of Alabama. The Center will enable current and future UA researchers, students, and other scientists from around the state and world to collaborate with UA and partners to promote research & development, economic development, and talent and workforce development in areas critical to the future of the state of Alabama, water, and transportation.

The University of Alabama has become a nexus for water research with the colocation of strategic partners at the National Oceanic and Atmospheric Administration National Water Center and at the U.S. Geological Survey Hydrological Instrumentation Facility. These partners will benefit from the Center as we all seek to advance a new generation of improved products for effective decision making in protecting life and property related to water security, water excess, water scarcity, water potability, etc. The establishment of the Center will enable groundbreaking scientific discoveries translatable to operational water modeling. The Center will enable UA principal investigators and their partners to utilize new HPC tools and either widen or deepen their research foci. A new, dedicated HPC center with a focus on water will speed the timeliness and efficiency of moving research into operations as they develop new products, all while reducing production costs.

For mobility and power, our partners are universities in The University of Alabama System, industry in Alabama and K-12, community colleges, and other universities. The Center will be closely aligned with the Alabama Mobility and Power Center ("AMP Center"), a highly unique

and timely public-private partnership with state and national importance. The Center will allow and support the AMP Center to address problems transforming highway transportation as electric vehicles achieve mass deployment. These problems involve large scale network optimization that will enable overall management of energy distribution, routing of vehicles to optimize energy utilization, and analyses of network traffic to support cybersecurity of electric vehicles.

This project is a critical step in the advancement of the University's research and development capabilities as an R1 institution. Modeling and simulation on HPC resources are a critical factor in the success of research in science and engineering. State-of-the-art simulation, such as hydrological modeling, requires computing resources far beyond what is available from UA's current HPC platforms. This project will drive substantial innovation and effectiveness of research by:

- Supporting the University's role as national water and transportation leader through expanding the advanced computing capacity essential for state-of-the-art research in those critical Alabama centers of economic investment
- Enhancing existing programs in STEM fields such as chemistry and biochemistry; astrophysics and cosmology; geology, geography, and environmental engineering; biology, especially genomics analysis; chemical engineering, materials engineering, physics for materials properties analysis, design, and engineering; and psychology, especially for image analysis
- Providing a competitive advantage to the University in the procurement of federal and private industry grants and contracts
- Driving student workforce development in skills and knowledge essential for an agile 21st century Alabama workforce including software engineering, mobility and power technologies, hydrology and water security, Artificial Intelligence and Machine Learning, and computational sciences

The project greatly enhances overall institutional research effectiveness, increasing the University's productivity and innovation in research, scholarship, and creative activities. The availability of Petascale-computational resources removes existing bottlenecks to the advancement of research requiring large-scale computational simulations, the training of complex Artificial Intelligence/Machine Learning models, and the development of new data science applications. As a result, the project will allow researchers to make scientific and engineering advances that are currently unavailable due to the University's limited computational capability.
Furthermore, this project:

- Enhances efforts to recruit and retain outstanding and diverse research faculty and staff engaged in fields requiring advanced computing resources commensurate with leader-level R1 research institutions
- Helps attract and retain STEM students by engaging them in state-of-the-art computational research at a scale available only at leader-level research institutions
- Enhances the University's ability to engage in federal grants and contracts involving International Traffic Arms Regulation (ITAR) and Controlled Unclassified Information (CUI) security compliance requirements and other controlled research data and processes
- Will lead to peer-reviewed publications in a wide range of areas including those of interest to the Alabama public such as water management, mobility, and power technologies for electrical vehicles

This project affirms the University's commitment to increasing productivity and innovation in research, scholarship, and creative activities. The UA Center for High Performance Computing project aligns with existing university investments in facilities and programming for mobility and power technology, hydrology and water security, and computational sciences and engineering. Current investments include the establishment of UA's Research Institutes including Water, Transportation, Cybersecurity, and Life Sciences as well as existing capital projects such as the Smart Community and Innovation Building, the US Geological Survey Hydrologic Instrumentation Facility project, the Renovations for Materials Characterization Service and Support of Academic Programs, and the Gordon Palmer Data Center Renovation project.

Furthermore, this project

- Increases the geographic, educational, and societal reach of HPC research infrastructure within the state of Alabama by providing HPC educational and computational resources to researchers at other higher education institutions without significant HPC assets
- Broadens the diversity of participants using HPC in Alabama by providing opportunities for collaborations among researchers and students within and outside of the institution
- Advances the University's ability to provide a premier undergraduate and graduate education by offering students a global perspective characterized by outstanding teaching supported by the advanced research computing concepts and skills of their field

Attachment K to Board Rule 415

Supplemental Project Information Worksheet
Annual Capital Development Plan

FY: 2022 – 2023

Project Name:	High Performance Computing and Data Center
Project Address/Location:	709 Johnny Stallings Drive
University Project #:	008-23-3287
Campus:	The University of Alabama, Tuscaloosa, AL

1. Will this Project increase the current space inventory on campus or replace existing space?

☒ increase space inventory	.22	% increase	40,000	GSF
☐ replace space inventory		% replacement		GSF
☐ renovation of existing space only				GSF

2. If this Project will replace existing space inventory, how will vacated space be utilized or assigned after this Project is completed?

Comments:

Not applicable.

3. Is the proposed Project location consistent with the Campus Master Plan and University Design Standards and the principles contained therein?

☒ Yes ☐ No, A Campus Master Plan Amendment Is Required

If Campus Master Plan amendment required, explain:

The proposed site aligns with the Master Plan and was identified as a potential building location.

4. Provide information on classification of new space provided by this Project and latest utilization data on similar type space on campus.

Proposed New Space/Facilities					
Classification		Number (Spaces/Rooms)	Capacity (Persons)	Area (GSF)	Existing Space Utilization Data (See Notations)
100	Classroom Facilities			0	
200	Laboratory Facilities			588	
300	Office Facilities			1,958	
400	Study Facilities			0	
500	Special Use Facilities			147	
600	General Use Facilities			0	
700	Support Facilities			9,941	
800	Health Care Facilities			0	
900	Residential Facilities			1,090	
000	Unclassified Facilities			0	
WWW	Circulation Area			4,996	
XXX	Building Service Area			213	
YYY	Mechanical Area			21,067	

Data reported on latest fiscal year data available.
Utilization factor based on Scheduled Operating Hours at each Campus – outlined below in notations.

Comments/Notations:
The University currently has scattered HPC clusters across campus and some off-site locations. The facility will allow the University to consolidate these clusters in a more appropriate environment and to release the off-site locations.

5. How will this Project enhance existing/new programs and undergraduate/graduate enrollments?

Estimated new Funds from Tuition/Programs **$** TBD Yr.

Comment:
The University of Alabama has become a nexus for water research with the colocation of strategic partners at the National Oceanic and Atmospheric Administration National Water Center and at the U.S. Geological Survey Hydrological Instrumentation Facility. These partners will benefit from the Center as we seek to advance a new generation of improved products for effective decision-making in protecting life and property related to water security, water excess, water scarcity, water potability, etc. The establishment of the Center will enable groundbreaking scientific discoveries translatable to operational water modeling. The Center will enable UA principal investigators and their partners to utilize new HPC tools and either widen or deepen their research foci. A new, dedicated HPC center with a focus on water will

speed the timeliness and efficiency of moving research into operations as they develop new products, all while reducing production costs.

High Performance Computing ("HPC") plays a vital role in many scientific, industrial, and societal advancements due to the complexity of the questions and problems at hand. The creation of the UA Center for High Performance Computing ("Center") utilizes HPC resources to answer our biggest questions related to water, mobility, and power technologies. These areas also provide profound economic development opportunities for the state of Alabama. The Center will enable current and future UA researchers, students, and other scientists from around the state and world to collaborate with UA and partners to promote research and development, economic development, and talent and workforce development in areas critical to the future of the state of Alabama, water, and transportation.

6. Has a facility user group been established to provide input for planning, programming, and design purposes? ☒ Yes ☐ In-Progress

If yes, list key members of user group:
D. Jay Cervino, Executive Director, Research Computing and Networks, OIT
Mike Gremillion, Director, Global Water Security Center, Alabama Water Institute
Nathaniel Booth, Sr Advisor, Office of the Chief Operating Officer, USGS
Collin Rich, Director, Office for Research & Technology Agreements
Jeremy Pate, Director of Digital Innovation, Alabama Transportation Institute
Janice Gordon, Supervisory Computer Scientist, Advanced Research Computing, USGS
Lauren Wilson, Assistant Vice President for Research, ORED
Mike Shelton, Deputy CIO, CTO, OIT
Greg McKelvey, Executive Director, Maintenance and Operations and Energy Management
Dwight Stewart, University Staff Mechanical Engineer
Sam Chen, Director of Building Automation and Recommissioning
Tim Leopard, Senior Associate Vice President for Campus Development

7. Source(s) of funding for Total Project Development Costs.

Source(s)	New Funds (FY2023)	Reserves	Status /7
Tuition			
Student Fees			
Investment Income			
Auxiliary Income • External • Internal			

Education Sales/Services • External • Internal			
Direct Grants	$44,550,000		Pending
Gifts			
Bonds			
Existing Net Assets		$5,450,000	Pending BOT approval
Other (State Appropriation)	$46,000,000		Approved
Totals	**$90,550,000**	**$5,450,000**	

/7 Approved, allocated, pending

Comments:
The total project cost is proposed to be $96,000,000.

8. Estimate of operations and maintenance (O&M) costs for the initial occupancy year and projections for succeeding five (5) year period.

Operations and Maintenance (O&M) Annual Costs Projections			
Expense	**FY 2022 Base Data** /8	**First Full /YR** Occupancy FY2027	**Successive Five (5) Year Projections** /9
Maintenance	$49,145	$68,127	$416,150
Elevator Service	$17,006	$23,575	$144,009
Building Repairs	$16,381	$22,709	$138,716
Building Services	$81,880	$132,589	$693,335
Electric, Natural Gas, Steam	$745,444	$745,444	$9,318,056
Chilled Water			
Water and Sewer	$74,270	$74,270	$453,672
Insurance	$6,552	$9,083	$55,482
Safety Support	$4,410	$6,113	$37,346
Operations Staff Support Funding	$846	$1,173	$7,166
Other – Supply Store expenses			
Totals	**$995,939**	**$1,083,087**	**$11,263,936**

/8 Latest Fiscal Year Data used as Base Year for Projections
/9 Combined Costs for next Five (5) Years of Occupancy: 2028-2032

Comments: HPC load growth increases from 2MW to 8MW from year 1 to year 6

9. Source of funds for projected ongoing operations and maintenance (O&M) costs for this project.

Source(s)	Occupancy Yr /9 (FY 2027)	Future Years /10	Status /7
Tuition			
Student Fees			
Investment Income			
Auxiliary Income • External • Internal			
Educational Sales & Services • External • Internal			
Direct Grant(s)			
Reallocated Funds /11			
Gifts			
Other (HPC Grants)	**$1,083,087**		**$11,263,935**
Total/YR	**$1,083,087**		**$11,263,935**

/9 Initial Full Yr of Occupancy
/10 Next Five (5) Yrs Occupancy
/11 Funds Reallocated from other sources
/7 Approved, allocated, pending

Comments:
Recharge to Users and F & A recovered funds from ORED

10. Are development expenditures for this Project being used to reduce the current deferred maintenance/facilities renewal liabilities for the Campus?

$ **0** **0** % of Total Development Costs

Comments:

11. What other development alternatives were considered in the planning process for this Project? /13

Comments:
The project team considered three on-premises and off-premises alternatives to developing on-campus data center facilities capable of supporting advanced high-performance computing (HPC) clusters and other specialized research computing spaces. First, the project team evaluated expansion of UA's current enterprise data center located in Gordon Palmer. In 2020, UA conducted a study with RSP Engineering firm (Washington, D.C.) to refit the Gordon Power data center enough to accommodate expansion of HPC systems. The study found that the footprint of the academic building and limitations on power and cooling infrastructure made this expansion financially and technically unfeasible. The project team also considered expanding UA's presence at our DC BLOX HPC colocation space in Birmingham, Alabama. While DC BLOX currently leases UA enough space to accommodate our existing small HPC clusters, the facility is not currently capable of supporting premier-class HPC systems that R1 institutions use for computational science and engineering, AI/ML, and advanced research. A colocation facility also does not provide the associated research spaces that are important to UA from a competitive funding perspective: a data visualization lab and restricted-access sensitive information compartments. The proposed campus HPC data center would be able to accommodate both. UA also considered investment in vendor-supported cloud HPC platforms, including Amazon Web Services, Microsoft Azure, and Google Cloud. Industry and academic research have identified that HPC systems in the cloud are more expensive in total cost of use than purchased or leased on-campus systems. The project team confirmed these industry findings through a comparative study of vendor and on-premises HPC options. By developing on-premises HPC facilities on campus, UA becomes a desirable destination for research faculty, students, and visiting researchers. New facilities will also open opportunities for UA to participate in global research consortiums and private industry partnerships, which support the economic advancement of the state of Alabama.

12. Explain how the project will promote adequacy of campus facilities in relation to the University's Mission and scope of programs and/or services:

Comments:
High-performance computing (HPC) systems require the support of megawatts of commodity power, high-capacity cooling systems, and other specialized equipment and infrastructure to run. Data centers supporting premier-class HPC systems also provide specialized research computing spaces, such as data visualization labs and restricted-access compartments for sensitive information research, which provide faculty at R1 institutions a competitive edge in acquiring research funding. UA's enterprise campus data center in Gordon Palmer, and its leased space at DC BLOX in Birmingham, Alabama, are unable to accommodate UA's vision for growing the research mission. The current on-campus and off-campus leased facilities do not offer the power, cooling, and other specialized infrastructure needed to run these advanced premier-class HPC computing systems. They

also do not have the infrastructure available for data visualization labs and restricted-access sensitive information compartments. A new on-campus HPC data center would allow UA to remediate this current deficit in available facilities for research. With a new facility dedicated to campus research computing, UA would be able to expand advanced HPC resources available to campus researchers and students significantly. Primarily, the new center would allow UA facilities to support one or more premier-class HPC systems. These advanced computing clusters would help meet UA's growing research computing demand from faculty and students as well as attract new researchers and students to campus. Completion of this project will affirm UA's commitment to increasing productivity and innovation in research, scholarship, and creative activities. A new HPC center project also aligns with existing university investments in facilities and programming for transportation mobility and power technology, hydrology and water security, and computational sciences and engineering. Those current investments include the establishment of UA's Research Institutes of Transportation, Water, and Life Sciences as well as existing capital projects such as the Smart Community and Innovation Building, the US Geological Survey Hydrologic Instrumentation Facility project, and the Renovations for Materials Characterization Service and Support of Academic Programs.

13. How does the project correlate to the University's strategic goals?

Comments:
This project is a critical step in the advancement of the University's research and development capabilities as an R1 institution. Modeling and simulation on HPC resources are a critical factor in the success of research in science and engineering. State-of-the-art simulation, such as hydrological modeling, requires computing resources far beyond what is available from UA's current HPC platforms. This project will drive substantial innovation and effectiveness of research by:

• Supporting the University's role as national water and transportation leader through expanding the advanced computing capacity essential for state-of-the-art research in those critical Alabama centers of economic investment

• Enhancing existing programs in STEM fields such as chemistry and biochemistry; astrophysics and cosmology; geology, geography, and environmental engineering; biology, especially genomics analysis; chemical engineering, materials engineering, physics for materials properties analysis, design, and engineering; and psychology, especially for image analysis

• Providing a competitive advantage to the University in the procurement of federal and private industry grants and contracts

• Driving student workforce development in skills and knowledge essential for an agile 21st century Alabama workforce including software engineering, mobility and power technologies, hydrology and water security, Artificial Intelligence and Machine Learning, and computational sciences

The project greatly enhances overall institutional research effectiveness, increasing the University's productivity and innovation in research, scholarship, and creative activities. The availability of Petascale-computational resources removes existing bottlenecks to the advancement of research requiring large-scale computational simulations, the training of complex Artificial Intelligence/Machine Learning models, and the development of new data science applications. As a result, the project will allow researchers to make scientific and engineering advances that are currently unavailable due to the University's limited computational capability.

Furthermore, this project:
• Enhances efforts to recruit and retain outstanding and diverse research faculty and staff engaged in fields requiring advanced computing resources commensurate with leader-level R1 research institutions

• Helps attract and retain STEM students by engaging them in state-of-the-art computational research at a scale available only at leader-level research institutions

• Enhances the University's ability to engage in federal grants and contracts involving ITARS, CUI, and other controlled research data and processes

• Will lead to peer-reviewed publications in a wide range of areas including those of interest to the Alabama public such as water management, mobility, and power technologies for electrical vehicles

This project affirms the University's commitment to increasing productivity and innovation in research, scholarship, and creative activities. The UA Center for High Performance Computing project aligns with existing university investments in facilities and programming for mobility and power technology, hydrology and water security, and computational sciences and engineering. Current investments include the establishment of UA's Research Institutes including Water, Transportation, Cybersecurity, and Life Sciences as well as existing capital projects such as the Smart Community and Innovation Building, the US Geological Survey Hydrologic Instrumentation Facility project, the Renovations for Materials Characterization Service and Support of Academic Programs, and the Gordon Palmer Data Center Renovation project.

Furthermore, this project
• Increases the geographic, educational, and societal reach of HPC research infrastructure within the state of Alabama by providing HPC educational and computational resources to researchers at other higher education institutions without significant HPC assets

• Broadens the diversity of participants using HPC in Alabama by providing opportunities for collaborations among researchers and students within and outside of the institution

• Advances the University's ability to provide a premier undergraduate and graduate education by offering students a global perspective characterized by outstanding teaching supported by the advanced research computing concepts and skills of their field

14. Which of the six University of Alabama system Core Principles does this project support?

Comments:

- Work to help lead a unified approach to improving the economy, opportunities, and comprehensive health care for all citizens of Alabama.
- Elevate the status, stature, and influence of the University of Alabama System so that we can call individuals devoted to UA, UAB, UAH, and the UAB Health System to unite for common purposes.

15. What would be the immediate impact on campus programs and enrollment if this project is not approved?

Comments:

If the HPC Data Center project is not approved, the University of Alabama (UA) will continue to be at a competitive disadvantage to recruit and retain research faculty, graduate students, and undergraduate students relative to other Carnegie Classification R1 research institutions. High-performance computing (HPC) systems are an essential advanced computational resource for researchers in STEM fields (e.g., computational chemistry, genomics, materials engineering), Artificial Intelligence (AI), Machine Learning (ML), as well as big data visualization and modeling. Lack of these computational resources, due to existing insufficient campus facilities to support HPC systems, limit faculty research agendas and makes UA less competitive for government and private industry funding. Failing to approve this project will also limit graduate and undergraduate student opportunities to gain experience in emerging high-value workforce skills in AI, data visualization, and computational STEM research methods.

UA's existing campus data center facilities are unable to support the power, cooling, and other specialized infrastructure necessary to operate advanced, premier-class, HPC systems available at many other R1 research institutions. Consequently, UA is unable to provide premier-class HPC computing resources on campus. Prospective research faculty and graduate students who require HPC for their research agendas are unlikely to find UA as attractive an option as other R1 institutions with adequate HPC facilities and resources. UA will be more challenged to recruit and retain these researchers and graduate students compared to its R1 peers. Additional HPC Data Center specialized spaces such as data visualization labs and restricted-access sensitive information compartments would allow researchers and graduate students to compete for funds that other R1s without these spaces cannot, such as government projects with sensitive technology and data requirements.

Likewise, most R1 universities provide undergraduate students instruction in emerging high-value workforce skills which rely on advanced HPC systems, such as computational STEM research methods, AI/ML, geographic information systems (GIS), and big data visualization and modeling. These new skills are driving the economic advancement of

public institutions and private industry in the 21st century across Alabama and beyond. The lack of adequate HPC facilities on campus limits UA's ability to develop instruction in these competitive workforce skills compared to its peers. Prospective undergraduates seeking to learn these skills may opt for an alternative where instruction and HPC resources are available.

UA's lack of adequate HPC data center facilities limits its ability to grow as an R1 institution. Not funding this project risks holding UA at a competitive disadvantage when recruiting and retaining research faculty and students. It also makes faculty less competitive for external funding opportunities. Funding this project advances the University's research mission by offering researchers world-class campus HPC resources and facilities. Funding this project also helps UA to meet its teaching mission to provide students with a premier education by offering them opportunities to gain experience in critical computational workforce skills supported by the experience of UA's researchers.

HIGH PERFORMANCE COMPUTING AND DATA CENTER

LOCATION MAP