

Capital Budget Request

Equip Virginia Tech Carilion Research Institute: Technology Package	
Overview	
Agency	Virginia Polytechnic Institute and State University (208)
Project Code	none
Project Type	Stand-alone Equipment Acquisition
Biennium	2018-2020
Budget Round	Amended Bill
Request Origin	New Project
Project Location	Roanoke Area
Facility/Campus	VT Roanoke Center
Source of Request	Agency Request
Infrastructure Element	Equipment
Contains significant technology costs? No	
Contains significant energy costs? No	
Project will be used by other than a state or local governmental entity? No	
Agency Narrative	
<p>Agency Description</p> <p>The second building of Virginia Tech-Carilion Research Institute (VTCRI) is under construction through a proven public-private partnership of the Commonwealth, Virginia Tech (VT), and Carilion Clinic (CC). The new 139,000 gross square foot building is scheduled to open April, 2020. The capital project is appropriated in Chapter 759 (2016), Item 1.B, under the title Construct VT Carilion Research Institute Biosciences Addition.</p> <p>In preparation for the building opening in spring 2020, Virginia Tech and the Carilion Clinic assembled faculty, administrative, and staff leaders from multiple colleges and disciplines in Blacksburg and Roanoke to plan the future phases of growth of the Academic Health Center (AHC), based on the successful model of VTCRI. This capital project request is in accordance with the governor's stated priorities of health care and economic development.</p> <p>Through a two year intensive due diligence process, this team developed a plan for continued focus and growth of several key areas of accomplishment including neuroscience, cardiovascular science, cancer, and immunology/infection. These areas represent growing strengths and rich connectivity between VTCRI, faculty and students from multiple VT colleges in Blacksburg and the national capital region (NCR), and physicians at our clinical partner Carilion Clinic, who are now faculty at VT in our ninth college, the Virginia Tech-Carilion School of Medicine.</p> <p>As part of the due diligence process, the team developed a pro forma business plan to identify the necessary start up and ongoing expenses associated with populating the second Academic Health Center building in Roanoke with additional leading biomedical research teams. The pro forma is based on experience filling the first building, covers the personnel, equipment, and operations necessary to reach the full operating potential of the second building and create strong synergies and efficiencies with the groups and facilities in the first building.</p> <p>The total operating startup costs (beyond the \$91.7 million capital project) for the new programs, research teams, and laboratory cores is estimated to be \$205 million over a seven year period (FY2021-FY2027). The \$205 million of costs includes \$58 million in biomedical research laboratory instrumentation and technology, \$89 million in personnel and payroll, and \$58 million in research and other operations.</p> <p>As with the operating startup costs for the first building, the resource plan to support the seven-year, \$205 million of costs calls for a strong partnership and a combination of resources. The partnership includes Virginia Tech, Carilion Clinic, research grants, private philanthropy, local government, and state government.</p> <p>Under this plan, state government is asked to provide approximately one quarter of the funding, particularly \$48 million of the biomedical research laboratory instrumentation and technology. The \$48 million would be spread over seven fiscal years, decreasing from a maximum of \$18 million in FY2020 to \$400,000 in FY2027. Virginia Tech, Carilion Clinic, research grant support, private philanthropy, and local government would provide the remaining \$157 million of operating funding over the seven year period.</p>	

The \$18 million of technology for the five core laboratory facilities is requested as a one-time General Fund capital appropriation in fiscal year 2020. The core laboratory technology is required to attract leading talent. Because recruitments for several top faculty will begin in advance of the opening of the new building, initial investments to install the core laboratory technology must be in place soon after the building opens. This timing is necessary to place orders and coordinate the installation of the core technology in close association to opening of the building. The \$30 million of the scientist-specific equipment will be requested as operating budget resources and spread over multiple fiscal years to match the phased hiring plan for the 25 research scientist team leaders and their teams.

This request is for an \$18 million General Fund capital appropriation in fiscal year 2020 to purchase and install the technology for the five core laboratory facilities. The timing of actual expenditures is expected upon delivery and installation of the technology, which is expected in fiscal year 2021 and fiscal year 2022. This equipment funding package is for specialized biomedical research equipment that is above and beyond the normal furnishings, fixtures, and equipment budget of a capital project.

The pace of growth for research and economic impact of the second facility depends on the number of research scientist working in the building. Without state government support for a one-time appropriation to install the core biomedical research laboratory technology, the hiring plan will stretch out several years beyond the desired seven year startup period, and the associated benefits would be phased further accordingly.

The list of core laboratory technology items is shown in the attached table below.

ITEM Est. Price

1 - Siemens mMR PET CT with Future Technology Upgrades \$4,600,000
1 - Bruker small bore - high field animal MRI \$3,000,000
1 - Animal facility racks, cages, surgical facilities \$1,800,000
1 - Good manufacturing practices lab instrumentation \$1,500,000
1 - Computer clusters for data center \$1,500,000
2 - Fluorescence activated cell sorting systems \$1,200,000
1 - Scanning Serial Block Face electron microscope \$800,000
1 - Technai transmission electron microscope \$800,000
1 - Micro-PET/CT \$800,000
2 - Laser scanning confocal microscopes \$800,000
1 - Siemens Somatom Confidence CT \$700,000
1 - Mass Spectrometer \$500,000
TOTAL \$18,000,000

Justification

BACKGROUND:

Program and Impact of the First Building – Phase One (2010-2018):

The Commonwealth, Virginia Tech, and Carilion Clinic developed a highly successful public-private partnership in 2008 which resulted in a 150,000 gross square foot research institute and medical school opening in 2010.

During its first decade, the Virginia Tech Carilion Clinic (VTC) partnership has catalyzed the new Roanoke based AHC into a nationally recognized innovation leader in biomedical and health science research, education, and training with an increasing emphasis on industry partnerships and commercialization.

By focusing on a small, well-defined set of opportunistic areas, the AHC has been able to successfully compete and in many cases surpass other more established academic medicine programs. An essential feature of the program's success is the integration of traditional medical science with veterinary medicine and the physical, life, engineering, computational, and social sciences. Combining this integrated approach with trans-disciplinary team science embedded in an institute setting for research, education and training has facilitated the successful recruitment of leading global talent and an increasingly diverse workforce that is committed to fundamental discovery, translation, and commercialization of discoveries within the Commonwealth.

In addition to the involvement of VT graduate and undergraduate students from the sciences and engineering in experiential learning at the institute, medical students from the VTC-School of Medicine and clinicians from CC also play an important role in the research enterprise. In one of the institute's signature educational programs, teams of graduate and undergraduate students from VT's Translational Biology, Medicine and Health program and from the colleges of business and engineering work together in teams to identify biomedical Intellectual Property around which they form companies and present commercialization plans to potential investors.

Partnership Funding for Phase One:

The cumulative investment in the VTC partnership to date for Phase One is approximately \$394 million, which includes funding from the state in 2008 for building the initial 150,000 gross square feet building; from the city of Roanoke for the site; from Virginia Tech for VTCRI startup costs, facility up-fits, and operations; from grant expenditures by VTCRI (of which almost 90 percent is from federal sources); and from Carilion Clinic for VTC-School of Medicine start-up and operations and towards the new biomedical research building.

Impact of Phase One:

These activities have contributed considerably to the intellectual, cultural, and economic vibrancy of Roanoke, southwest Virginia, and the Commonwealth of Virginia. VTCRI has been central to this impact based on its ability to attract national and global faculty leaders and student talent to the region, winning multiple major extramural funding awards, generating spinoff companies and industry partnerships, and establishing deep connections with the community through innovative outreach programs.

VTCRI faculty have successfully competed for new research funding that supports high paying jobs, bringing significant new dollars to southwest Virginia including over \$150 million in total grant funds have been awarded to the institute of which over 90 percent are from extramural sources outside the Commonwealth. A recent formal economic analysis completed by the Weldon Cooper Center for Public Service projects over \$450 million in annual economic impact after the newest research facility in Roanoke is completed in winter 2021 and operations are fully staffed by fiscal year 2027.

During the previous fiscal year (FY18), 498 faculty, staff and students worked at VTCRI with an annual payroll of \$17.8 million. VTCRI initially selected four key strategic biomedical-health science research areas to differentiate the Commonwealth as a national and global biomedical-health science research innovation hub: cardiovascular science, cancer, immunology, and neuroscience. VTCRI has made transformative discoveries and become a recognized leader in several areas in a short period of time. Of particular note are major advances made by institute faculty, staff and students in:

- 1) The diagnosis and treatment of addiction and substance abuse in adolescents and adults including for opioids, tobacco and alcohol;
- 2) A new form of intensive child neurorehabilitation to treat the devastating (and otherwise lifelong) consequences of neonatal stroke resulting in cerebral palsy;
- 3) major new technological innovations in interactive multi-subject and real time human functional brain imaging with the parallel development of the new field of computational psychiatry;
- 4) A revolutionary paradigm for understanding how electrical signaling occurs in the human heart with concomitant identification of new targets for treating disturbances of heart rhythm to reduce sudden cardiac death;
- 5) Several new strategies compounds developed for treating the deadliest form of brain cancer including in companion animals as well as humans; and,
- 6) The first elucidation of the structural deformity (with a process to repair it) in the molecule that causes a pernicious form of breast cancer, the BRCA1 protein as part of the entirely new field of medicine and science known as structural oncology.

In addition to scholarship, discoveries, grant awards and economic impact of the research enterprise, VTCRI has contributed to the reputation and brand of Virginia Tech, its partner Carilion Clinic, and SW Virginia through high visibility favorable national and global press coverage in addition to translational activities that bridge academia and private industry. Examples include the spinout of several companies by VTCRI faculty that have received national awards, multiple competitive funding awards from the federal small business and technology transfer programs, private equity investment as well as the establishment of collaborative partnerships with state, regional and global private companies.

Program and Impact of the Second Building – Phase Two (2020 and beyond):

The first eight years' success has provided the foundation for launching an exciting new phase – a health sciences and technology (HS&T) campus in Roanoke that includes VTCRI, the VTC –School of Medicine, and Carilion's clinical operations. VT and CC are also working closely with Roanoke city government and economic development leadership to integrate the growing campus with the development of an innovation corridor that connects the HS&T campus to the nearby city center in a partnership that will make major contributions to the economic and cultural development of the entire region, including Roanoke county and Montgomery County.

As part of this growth of the Roanoke campus, VT and CC have formed multiple new partnerships across the Commonwealth that are bringing a new level of cooperation and synergy across state institutions. Examples include the soon to be awarded NIH Clinical and Translational Science Award to the University of Virginia in partnership with VT, CC, and Inova, the soon to be awarded nationwide first NIH Pediatric Stroke Net clinical trials program that will be led by VTCRI faculty, the establishment of the statewide opioid research, education and treatment initiative by the state's Virginia Biosciences Health Research Corporation in which VTC plays a major role, and multiple collaborative research partnerships between VTCRI, VCU, and UVA with private industry partners and matching state support from the Virginia Biosciences Health Research Corporation and private companies in the Commonwealth such as Indivior and BRAINBox Solutions.

The Phase Two of development of the Roanoke campus is spearheaded by the new \$91.7 million biomedical research building addition, which has already attracted the attention of many collaborators. The initiative provides an exciting opportunity to build on the recent success, including contributing to making a transformative economic impact on the region and state while also improving health throughout the Commonwealth and the world. The paradigm also provides an educational model that is highly valued by employers by preparing students for real world contributions working in team based discovery groups in areas key to local and national health, security and economic well-being.

Through a two year intensive due diligence process, VT and CC assembled faculty, administrative and staff leaders from multiple colleges and discipline from Blacksburg and Roanoke to plan the future phases of growth of the AHC, based on the successful model of VTCRI. The

resultant plan calls for a continued focus and growth of several key areas of accomplishment including neuroscience, cardiovascular science, cancer and immunology/infection.

These areas also represent growing strengths and rich connectivity between VTCRI, faculty and students from multiple colleges at VT in Blacksburg as well as in the NCR and among physicians at our clinical partner CC, who are now faculty at VT in our ninth college, the VTC-School of Medicine.

In addition to these areas, several exciting new opportunities were identified for strategic growth and investment. In each of those cases, VT is already strongly positioned to have major national presence through strategic investments in personnel, programs and infrastructure to take advantage of major new federal and private funding initiatives. These areas involve technological innovations and growth opportunity spaces as well as target important clinical areas of need in SW Virginia and throughout the Commonwealth. Two areas of note are:

1) Biomaterials and body-device interfaces which builds on VT's College of Engineering's prominence in biomedical, electrical, computer and mechanical engineering and materials science, and

2) Obesity and metabolism builds on VT's strong programs in Human Nutrition, Foods and Exercise in the College of Agriculture and Life Sciences, its strength in the department of Psychology within the College of Science and its new Roanoke-Blacksburg partnership in the science of behavioral medicine through the Center for Transformative Research on Health Behaviors.

Both of these new focuses address areas of compelling health needs - tissue repair/replacement, apps for home health monitoring with point of care service delivery, and the growing epidemic of childhood and adult obesity and diabetes. These are areas in need of innovation that also represent opportunities for scientific innovation, development of intellectual property, translation, and commercialization.

Each of the focus areas provides an opportunity for collaborative research and for a robust student educational experience through experiential learning linking the AHC campus in Roanoke with VT programs based in Blacksburg including those in the College of Science, the College of Veterinary Medicine, the College of Liberal Arts and Human Sciences, and with faculty and students at several of VT's other institutes.

The College of Veterinary Medicine (CVM) based primarily in Blacksburg has established an exciting new program in Roanoke. The CVM will locate its Comparative Oncology Research Center (CORC) in the new biomedical research building that will house a state of the art linear accelerator for treating companion animals (dogs and cats primarily) who have cancer in clinical trials. The CVM veterinarians, scientists, and students will collaborate with researchers from VTCRI, CC, and other VT college faculty and students based in the new building. The contiguity of infrastructure and intellectual resources creates a powerful nexus to inform and implement the latest advances in science and medicine across traditional boundaries. This program also provides a platform for a novel type of education/training destination area for graduate students and undergraduates, working in interdisciplinary teams with residents, fellows, scientists, physicians and veterinarians.

The CORC will be connected to another key feature located in the new biomedical research building addition - a suite of next generation multi-scale imaging modalities including for human imaging - computerized tomography, magnetic resonance imaging guided positron emission tomography, MRI guided focused ultrasound and the first optically pumped magnetometry platform in the U.S. for imaging dynamic brain activity at very high resolution in mobile patients.

In addition to these state of the art facilities for humans, the site will be equipped with a range of multi-scale instruments for application to small lab animals including a high field whole body imaging facility, molecular imaging with cryo-electron microscopy, super resolution microscopy, and scanning block face electron microscopy. These facilities will be available to faculty and students from each of VT's campuses including all of the colleges in Blacksburg, the NCR as well as colleagues at other universities and health systems throughout the state such as in the Hampton Roads area. This facility will make SW Virginia one of the world's premiere biomedical research imaging centers, attracting collaborators from other Virginia universities, health systems, and private industry collaborators.

Partnership Funding for Phase Two of the Program:

Going forward, a similar investment partnership approach is planned, that should result in substantial Return on Investment (ROI) for the. As with the operating startup costs for the first building, the resource plan to support the seven-year, \$205 million of costs calls for a strong partnership and a combination of resources. The partnership includes Virginia Tech, Carilion Clinic, research grants, private philanthropy, local government, and state government.

Under this plan, state government is asked to provide approximately one quarter of the funding, particularly \$48 million of the biomedical laboratory technology. The \$48 million would be spread over seven fiscal years, decreasing from a maximum of \$18 million in FY2021 to \$400,000 in FY2027. Virginia Tech, Carilion Clinic, research grant support, private philanthropy, and local government would provide the remaining \$157 million of operating funding over the seven year period.

Projected Impact of Phase Two of the Program:

As in the earlier iteration of the VTC partnership, the expected ROI will be substantial contributions to the local, regional and state economies. Total annual expenditures of the expanded research enterprise are projected to grow from \$54 million to \$190 million by fiscal year 2026 with

employment increasing from 1,700 to 3,100 (currently the average job at VTCRI pays an annual salary of \$88,000), and an overall economic impact growing from its current \$214 million to \$465 million in fiscal year 2026. This will be in addition to grant expenditures. The annual extramural research grant award values are expected to increase from \$20 million to \$50 million while the total extramural research grant portfolio value should increase from \$110 million to over \$400 million. Generally, research grant expenditures run at approximately 75 percent of available annual award amount adding an additional \$37.5 million. Additional expenditures will accrue from private industry partnerships and spinoff companies that locate on the HS&T campus. To date, five startup companies have spun out from VTCRI faculty research and partnerships have been established with four drug and medical device companies with discussions underway with four others. The CC enterprise will also add substantial impact to the enterprise based on increasing case load and planned major facility and personnel expansion.

Accelerating the Impact of the Second Phase of the Program:

The new biomedical research building is well under way and is projected to be on budget on time to open in spring of 2020. It is planned to grow to capacity over a seven year period after opening. This pace will require several faculty recruitments in advance of the opening of the new building.

The core laboratory technology is required to attract leading talent. Because recruitments for several top faculty will begin in advance of the opening of the new building, initial investments to install the core laboratory technology must be in place soon after the building opens. This timing is necessary to place orders and coordinate the installation of the core technology in close association to opening of the building.

The pace of growth for research and economic impact of the second facility depends on the number of research scientist working in the building. Without state government support for a one-time appropriation to install the core biomedical research laboratory technology, the hiring plan will stretch out several years beyond the desired seven year startup period, and the associated benefits would be phased further accordingly.

Alternatives Considered

Costing Methodology

See attached list of scientific research and technology equipment items.

Agency Funding Request

Phase	Year	Fund	Subobject	Requested Amount
Full Funding	2020	01000 - General Fund	2241 - Laboratory Equipment	\$18,000,000
Total				\$18,000,000

Project Costs

Cost Type	Requested Funding	DGS Rec
Acquisition Cost		
Building & Built-in Equipment	\$18,000,000	
Sitework & Utility Construction		
Construction Cost Total	\$18,000,000	
DESIGN & RELATED SERVICE ITEMS		
Design & Related Services Total		
INSPECTION & TESTING SERVICE ITEMS		
Inspection & Testing Services Total		
PROJECT MANAGEMENT & OTHER COST ITEMS		
Project Management & Other Costs Total		
Furnishings & Movable Equipment		
Construction Contingency		
TOTAL PROJECT COST	\$18,000,000	

Capacity

Cost Type	Unit of Measure	Units	Cost Per Unit
Acquisition Cost		0	\$0

Construction Cost			0	\$0
Total Project Cost			0	\$0

Operating and Maintenance Costs (Agency)

Cost Type	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GF Dollars	\$0	\$0	\$0	\$0	\$0	\$0
NGF Dollars	\$0	\$0	\$0	\$0	\$0	\$0
GF Positions	0.00	0.00	0.00	0.00	0.00	0.00
NGF Positions	0.00	0.00	0.00	0.00	0.00	0.00
GF Transfer	\$0	\$0	\$0	\$0	\$0	\$0
GF Revenue	\$0	\$0	\$0	\$0	\$0	\$0
Layoffs	0	0	0	0	0	0

Planned start date of new O&M costs (if different than the beginning of the fiscal year):---

Supporting Documents

File Name	File Size	Uploaded By	Upload Date	Comment
VTCRI Technology Package.xlsx	11,214	Rob Mann	10/9/2018	VTCRI: Technology Package Equipment List

Workflow History

User Name	Claimed	Submitted	Step Name	Submit Action
Rob Mann	10/05/2018 10:11 AM	10/05/2018 10:11 AM	Enter Capital Budget Request	Continue Working
Rob Mann	10/05/2018 10:11 AM	10/05/2018 10:14 AM	Continue Drafting	Continue Working
Rob Mann	10/05/2018 10:15 AM	10/05/2018 10:16 AM	Continue Drafting	Continue Working
Rob Mann	10/08/2018 04:36 PM	10/08/2018 04:38 PM	Continue Drafting	Continue Working
Rob Mann	10/09/2018 12:29 PM	10/09/2018 01:01 PM	Continue Drafting	Submit for Agency Review
Rob Mann	10/09/2018 04:35 PM	10/09/2018 04:36 PM	Agency Review Step 1	Ready for DPB Bulk Submit
Rob Mann	10/09/2018 04:46 PM	10/09/2018 04:46 PM	Ready for DPB Submission	Submit to DPB
Anne Smith	10/18/2018 12:08 PM	10/18/2018 12:12 PM	DPB Review	Continue Review
Anne Smith	10/23/2018 02:56 PM	10/23/2018 03:03 PM	DPB Review	Continue Review
Anne Smith	10/23/2018 03:03 PM	10/23/2018 03:04 PM	DPB Review	Continue Review
Anne Smith	10/23/2018 03:53 PM	10/23/2018 03:55 PM	DPB Review	Continue Review
Anne Smith	10/24/2018 11:40 AM	10/24/2018 11:40 AM	DPB Review	Continue Review
			DPB Review	