THE COMMONWEALTH RESEARCH COMMERCIALIZATION FUND:

ADVANCING TECHNOLOGY AND ECONOMIC DEVELOPMENT IN VIRGINIA BY INVESTING IN HIGHER EDUCATION RESEARCH

ANNUAL REPORT
JULY 1, 2010 – JUNE 30, 2011

Submitted by the Fund Administrator:
Center for Innovative Technology
The Commonwealth of Virginia
Innovation and Entrepreneurship Investment Authority
October 1, 2011

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In accordance with Code of Virginia Sections 2.2-2233.1 G and 2.2-2221 (18), and on behalf of the Innovation and Entrepreneurship Investment Authority, the Center for Innovative Technology (CIT) respectfully submits this report regarding the performance of the Commonwealth Research Commercialization Fund (CRCF) in FY2011. Separately, and in accordance with Code Section 2.2-2221.2 D, CIT will submit the Commonwealth Research and Technology Strategic Roadmap, which discusses research, development and commercialization initiatives and opportunities in the Commonwealth.

The predecessor of CRCF, the Commonwealth Technology Research Fund (CTRF), was created in the 2000 Session of the General Assembly. Its purpose was to attract public and private research funding for institutions of higher education in order to increase technological and economic development in Virginia. Awards from the Fund could be made to Virginia public institutions of higher education or their associated intellectual property foundations. The projects discussed below aligned with programs established in legislation at that time. The CTRF was renamed in the 2009 Session of the General Assembly to the Commonwealth Research Commercialization Fund. At that time its goals were oriented more strongly towards commercialization.

This report addresses the two CTRF FY2008 awards that remained active in FY2011: 1) The Development of BioEclipse, the First Biologically Optimized Treatment Planning System for Proton Radiotherapy, Eastern Virginia Medical School (EVMS), and 2) A Center for Community Security and Resilience, Virginia Tech.

Both projects were completed in FY2011. The annual and final reports for each project are on file with the Fund Administrator, and the Table of Grants provided in Appendix A identifies both awards discussed in this report. Completion of these projects closes out CTRF expenses; $1,277.17 remained unspent and available to the Fund.

This report also discusses planning that took place in FY2011 in order to issue FY2012 solicitations. Although the original FY2011 and FY2012 budgets did not include CRCF appropriations, $6 million was appropriated for CRCF during the 2011 Session of the General Assembly.

BACKGROUND

The CRCF is tied to the Commonwealth Research and Technology Strategic Roadmap; awards from the Fund may only be made to applications that further the goals set forth in the Roadmap.

Programs that are eligible for funding appropriated by the General Assembly in FY2011 and may be included in the FY2012 Request(s) for Proposals are identified below.

- **SBIR Matching Fund Program**: For fiscal years beginning with a Fund balance of less than $7 million, an SBIR matching funds program was designed for Virginia-based technology businesses. Businesses are eligible to apply for an award if they have received a Phase I

Small Business Innovative Research (SBIR) award from the National Institutes of Health (NIH) targeted at the development of qualified research or technologies and meet other specified criteria. $2 million was appropriated for this program in FY2012.

- **Matching Funds Program:** This component was designed to help public and private colleges and universities in Virginia, and other research institutions, leverage federal and private funds designated for the commercialization of qualified research or technologies. These matching funds not only help to qualify institutions for grant competitions, they also reflect the state's and institution's commitment to the project and influence decision-makers regarding the feasibility and value of the proposed research.

- **Facilities Enhancement Program**: This component was designed to help qualifying universities and political subdivision establish and/or upgrade facilities used to commercialize qualified research or technologies, particularly those developed that the institutions. Award uses from this program include lease or credit guarantees.

- **Commercialization Program:** This component incentivizes the commercialization of a product or service related to a qualifying technology. The program was particularly designed for collaborative projects that will have a demonstrable economic benefit to the Commonwealth and have a reasonable probability of enhancing the Commonwealth's national and global competiveness.

- **Eminent Research Recruitment Program**: This component helps state institutions of higher education acquire and enhance research superiority through the hiring of eminent researchers; research must be conducted in a qualifying technology. Collaboration and commercialization are important elements of this program.

2011 legislation set forth additional criteria, including that applications must include a strategic plan identifying, at a minimum, (i) how the proposed project fits into the Commonwealth Research and Technology Strategic Roadmap, (ii) other funds that may be reasonably expected from other sources as a result of an award from the Fund, (iii) the potential for commercialization of the research or technology underlying the application, and (iv) opportunities for public and private collaboration.

2011 HIGHLIGHTS

AWARD PROGRESS

Job Creation and Retention

- Eastern Virginia Medical School's BioEclipse project with Hampton University is closely tied to the recently opened Hampton University Proton Therapy Institute (HUPTI). HUPTI has a staff of 37, along with 18 personnel under subcontract. In their proposal, EVMS estimated that HUPTI would create 125 jobs. HUPTI is ramping up employment and expects in FY2012 to exceed this estimate with direct employees and subcontractors.

- Eastern Virginia Medical School's proposal estimate for its BioEclipse project with Hampton University is on track: annual payroll of approximately $1.3 million upon opening in fall 2010, with an increase to approximately $2 million in a year. Jobs include those of radiation oncologists, radiotherapy technologies, and medical physicists, as well as a facility manager and scientific director.

Economic Development

- HUPTI will be at full capacity late in FY2012. The proposal estimate of more than 2,000 patients a year seeking treatment at the new facility associated with the CTRF/CRCF project remains on track. Visiting patients and family members contribute to the local economy through hotel room reservations, meals, and entertainment.

A summary of each award follows.

The Development of BioEclipse, the First Biologically Optimized Treatment Planning System for Proton Radiotherapy, Eastern Virginia Medical School

Partners: Hampton University and Varian Medical Systems
Fund Component: Strategic Enhancement

Dr. Richard Britten, Principal Investigator, Eastern Virginia Medical School, was awarded $487,910 from the Fund for this three-year project. The goal of the project was to develop a biological based treatment planning strategy to maximize the therapeutic effectiveness of conformal proton treatment. Proton treatment represents the most advanced form of radiation treatment for cancer patients in the United States and is a rapidly expanding treatment modality worldwide; it is anticipated that every major U.S. city will, within 20 years, have a Proton Treatment Facility. The Proton Therapy Institute at Hampton University (HUPTI), which opened in October 2010, brought this treatment option to Hampton Roads.

The study was designed to obtain the relevant data on the biological response of tumor and blood vessel cells at various positions along the proton beam, and to use that data to develop a modified version of Varian Medical Systems' Eclipse treatment planning system, BioEclipse. As a result of the research, Varian's BioEclipse will configure proton treatment plans that take into account the variable biological properties of protons at different depth doses. This is believed to be the first biological based treatment planning system that takes into account both cell killing and radiation-induced ischemia. The Eclipse program developed by Varian is the preferred system by HUPTI and many other centers. The development of BioEclipse would be a joint venture, although plans for commercialization of the sub-routine that will be incorporated into the Eclipse program – and were developed in part through CTRF/CRCF support – are yet to be determined.

The project consisted of two key components: 1) obtaining data on the biological depth-dose profile of specific proton beams in order to obtain reliable biological weighting factors for tumor tissues at various depths along the proton tracks, and 2) applying these weighting factors to the physical doses at various depths along the proton tracks in order to develop a treatment planning algorithm based upon biological rather than physical depth dose profiles.

The project deliverables were completed on time and on budget, and the team took large steps towards developing BioEclipse. In FY2011, key activities focused on modeling and

implementation. Overall, the team's work included model development, equipment design and purchase, measurements calibrating the requisite equipment and establishing beam parameters, and biological depth-dose profile determination for Hep2cell line with significant initial findings. The research team identified a unique model (equation) that accurately predicts the biological effect of a proton at a given depth dose, which could easily be implemented in the Eclipse Treatment Planning System to create BioEclipse.

Hampton University, the Principle Investigator, and co-investigators hold intellectual property rights associated with U.S. Patent 7,550,752. The patent application was submitted in March 2007 for the concept of biological based proton treatment planning.

As of June 30, 2011, $486,632.83 had been spent, and $1,277.17 remained unspent and available to the Fund. CTRF/CRCF expenditures in FY2011 totaled $171,702.62.

A Center for Community Security and Resilience, Virginia Tech

Partners: IBM Research and Arlington County
Fund Component: Strategic Enhancement

Dr. James Bohland, Principal Investigator, Virginia Tech (VT), was awarded $271,965 from the Fund in January 2010 to catalyze the Center for Community Security and Resilience (CCSR). The Center was established in 2009 by VT, IBM Research, and Arlington County; its mission was and remains to conduct research and create solutions to help secure communities, ensuring they have the capacity to recover and adjust to changes brought about by catastrophic events. As a result of CTRF/CRCF funding, this program established a successful test bed in Arlington County to successfully plan for and respond to catastrophic disruptions within a community.

The team's tenet to identify and focus on specific research topics addressed both the technological and societal dimensions of the Center's overall challenge, enhancing community resilience through robust environmental services, critical infrastructure, and health-related services, while safeguarding the individual freedoms embedded in America's democracy.

The public safety leadership in Northern Virginia was and remains primarily concerned with two overriding problems addressed by the VT-IBM partnership with Arlington County. First is the challenge of developing and maintaining appropriate situational awareness before, during, and after critical events, including coordination of public and private actions. Second is the overriding influence of key critical infrastructure, such as traffic and electrical systems, in the efficient functioning of communities before, during, and after events. The CCSR recognized that solutions must be supported by the involvement of the public, and the Center must incorporate a process for continued investment.

CCSR met its goals for the project and through its strong partnership with Arlington County and created a living laboratory research environment. Through CTRF/CRCF funding, CCSR established a digital presence (*ccsr.ncr.vt.edu*) and convened two workshops with researchers and public safety officials. Based on the findings from the first workshop, CCSR solicited and funded a set of five proposals addressing critical needs in community resilience, each of which established a team of Virginia Tech and IBM researchers that engaged the emergency response

and public safety community in Arlington Country and the National Capital Region and developed proposals for ongoing work. The second workshop provided an opportunity for researchers and stakeholders to discuss the project results. The effort actively engaged the public sector, private industry, academia, and the general public in helping to design, use and evaluate technology that can and will aid communities as they plan for, respond to, and recover from significantly disruptive events. The Center continues to seek funding to support research proposals developed by the five project teams.

Through this effort, Virginia Tech and IBM agreed to policies governing the ownership and sharing of intellectual property related to the joint research supported by this project. In essence, jointly developed IP is to be owned jointly, and pre-existing IP is protected when shared among the parties.

Of the five research projects, one team developed intellectual property with licensing potential in the form of an application for Android mobile devices. However, the goal of the project was to make the application widely available to the public, so no limited licensing options were pursued. Nevertheless, the process for Virginia Tech and IBM jointly developing IP related to community resiliency was tested and worked well.

Three papers developed from Virginia Tech presentations made at the First International Conference on Community Resiliency in October 2010 in Zurich, Switzerland received special recognition via their inclusion in a special issue of the *International Journal of Critical Infrastructures.* The Second International Conference will be held at the Virginia Tech Ballston Research Center in September 2011.

As of June 30, 2011, the award was fully expended. CTRF/CRCF expenditures in FY2011 totaled $241,289.

PREPARATIONS FOR FY2012

The 2011 General Assembly appropriated $6 million for CRCF, of which $2 million was designated for the SBIR Matching Program for NIH Phase I award recipients. The 2011 legislation related to CRCF included an emergency clause, so beginning immediately after the Reconvened Session in April 2011 CIT began preparing for the FY2012 solicitation and award process. The process involved multiple steps and activities, with some of the work commencing in Q4 FY2011 and continuing into FY2012. Key activities, discussed below, were performed in a collaborative manner with the Secretariats of Commerce and Trade, Education, and Technology.

- Generating awareness within the technology community through such mechanisms as a press release, program overview, and Frequently Asked Questions, all of which were posted online.

- Establishing the Research and Technology Investment Advisory Committee (RTIAC); the RTIAC was created in the 2011 General Assembly session and is responsible for recommending awards to the Innovation and Entrepreneurship Investment Authority (IEIA). (The RTIAC was appointed in early FY2012, and members are identified in Appendix B.)

- Discussing guidelines criteria with the technology community, in advanced of guidelines development slated for early FY2012.

ADMINISTRATION

Administrative activities in FY2011 were two-fold: support to FY2008 award recipients regarding administrative and financial matters, and planning and preparations for FY2012 CRCF solicitations. Additionally, CIT maintained information about the Fund on its website and provided support to external organizations, state agencies, and researchers from academia and industry that requested information about the Fund and future solicitations. CIT also collected, reviewed, and assessed annual reports from award recipients in order to develop the Fund Administrator's Annual Report. Throughout the year, CIT provided oversight to ensure compliance with Fund's guidelines and other requirements.

APPENDIX A

Title	Period of Performance	Lead Institution	Principal Investigator	Total CTRF Award	Academic Match	Private / Other Match	Total Match*
The Development of BioEclipse, the First Biologically Optimized Treatment Planning System for Proton Radiotherapy	4/1/2008 – 3/31/2011	Eastern Virginia Medical School	Richard Britten	$487,910	$150,000	$338,000	$488,000
A Center for Community Security Resilience	1/1/2010 – 6/30/2011	Virginia Tech	James Bohland	$271,965	$203,395	$135,000	$338,395
Totals				$759,875	$353,395	$473,000	$826,395

APPENDIX B

Members of the Research and Technology Investment Advisory Committee

- Jeffrey Anderson, President and CEO, Virginia Economic Development Partnership (VEDP)
- Daniel Gonzalez, Principal, Avison Young
- Robert Kahn, Chairman, CEO & President, Corporation for National Research Initiatives (CNRI)
- Mohammad A. Karim, Vice President for Research, Old Dominion University (ODU)
- Thomas Kirchmaier, Division Senior Vice President and General Manager, Intelligence
- Solutions, General Dynamics Information Technology (GDIT)
- Dennis Manos, Vice Provost for Research and Graduate Professional Studies, College of
- William and Mary (W&M)
- John Noftsinger, Jr., Vice Provost for Research and Public Service, James Madison
- University (JMU)
- Robert Ocampo, Associate, Grotech Ventures
- Robert Patzig, Senior Managing Director and CIO, Third Security
- Thomas Skalak, Vice President for Research, University of Virginia (U.Va.)