



Virginia Research & Technology Advisory Commission



Report of the VRTAC Sub-committee on:

The Creation of New High-technology  
Industries in Virginia

November 2003

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The Honorable Mark Warner  
Governor of Virginia  
State Capitol, 3<sup>rd</sup> Floor  
Richmond, VA 23219

Dear Governor Warner:

The final report of the Virginia Research and Technology Advisory Commission (VRTAC) Incubation of New High-tech Industries in Virginia Sub-committee is attached. In response to House Bill 2639, the report outlines specific recommendations to propel Virginia into a leadership position with regard to the incubation of new high-tech industry through innovative changes that create friendly working relationships with universities, government labs, industries, and other Virginia organizations; access to capitol and other infrastructure throughout the state.

The VRTAC Incubation of New High-tech Industry in Virginia Sub-committee is co-chaired by Dr. Ariel Gomez, Vice President for Research and Graduate Studies at the University of Virginia and Dr. Kent Murphy, President & CEO of Luna Innovations, providing leadership from both private sector technology-based organizations and research universities in the Commonwealth. The Sub-committee has diverse representation from the universities, federal laboratories, and private sector technology and research organizations; members are identified in the study preface. Their effort benefited greatly from the guidance and leadership of two Gubernatorial Secretariats, the Honorable Michael Schewell, Secretary of Commerce and Trade and the Honorable George Newstrom, Secretary of Technology.

Three critical issues were identified and addressed: recognizing and building the existing regions of technological leadership in the Commonwealth while recognizing an imperative need for Virginia to further spur the development of private equity capital targeted at early-stage technology companies in high growth technology regions; bridging the physical gap between research universities and technology businesses in Virginia; and recognizing the importance of the mission of CIT and funding that mission. From these core issues, seven key recommendations were developed to enhance the global competitive advantage of both research institutions and technology-based commercial endeavors within the Commonwealth.

Sincerely,

Executive Director  
Linda Hutson Green  
lgreen@cit.org

Mr. John Backus  
VRTAC Co-Chair  
Report Attached

Dr. John Noftsinger, Jr.  
VRTAC Co-Chair

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## Preface

The VRTAC sub-committee on the ‘Creation of New High-technology Industry in Virginia’ is comprised of twelve distinguished members representing the State General Assembly, academic institutions and private sector establishments in Virginia. This sub-committee has been privileged to have the Secretary of Technology, Honorable George Newstrom and Secretary of Commerce and Trade, Honorable Michael Schewel among its members and has tremendously benefited from their able and valuable guidance.

The sub-committee has held eight meetings over the past six months and its members have been actively involved from the inception to the compilation of this report. The stages in which the sub-committee progressed from defining its ‘Vision and Mission’ to framing specific recommendations are as follows:

1. Current analysis of the High-tech Industry in Virginia.
2. Competitive analysis of Virginia and the more highly ranked states like California and Massachusetts in terms of federal funding, university research and venture capital investments in these states.
3. Identification of issues to be solved, to achieve Virginia’s goal of becoming ‘**the leading High-tech State.**’
4. Policy recommendations with specific action items to create more high-technology industries in the Commonwealth.

The sub-committee would like to thank the Co-Chairs of the commission, Mr. John Backus and Dr. John Noftsinger, Jr. for their continued support and direction. We would also like to thank the staff of Virginia’s Center for Innovative Technology (CIT) especially Ms. Linda Hutson Green, Entrepreneurship Director, CIT for her valuable support.

Membership of the VRTAC Incubation of New High-tech Industries in Virginia Sub-committee includes:

- John Backus, Managing Director, Draper Atlantic Venture Fund
- The Honorable Jeannemarie Devolites, Member Virginia House of Delegates
- Catherine Giordano, President and CEO, Knowledge Information Solutions, Inc.
- Dr. Ariel Gomez, Co-chair, Vice President for Research & Graduate Studies, University of Virginia
- Stephen Halliday, Director of Corporate Acquisition & Strategy, Kaufman and Canoles Consulting LLC
- Rodney Hunt, President and CEO, RS Information Systems, Inc.
- Douglas Koelemay, Managing Director, Qorvis Communications, LLC
- Harris Miller, President, Information Technology Association of America
- Dr. Kent Murphy, Co-chair, President & CEO, Luna Innovations
- The Honorable George Newstrom, Secretary of Technology, Commonwealth of Virginia
- Linda Powers, Managing Director, Toucan Capital Corp.
- The Honorable Michael Schewell, Secretary of Commerce & Trade, Commonwealth of Virginia

## **Executive Summary:**

The main objective of the VRTAC Sub-committee on ‘The Creation of New High-technology Industries in Virginia’ is to make very specific policy recommendations that will enhance the Governor’s endeavors to position the Commonwealth as an emerging leader in technology-based research and commercial accomplishments both nationally and globally.

This sub-committee was consciously formed with a highly experienced team of members from the State General Assembly, the top research institutions and successful private sector establishments in Virginia. Hence, it has been a sincere and diligent effort of the sub-committee to utilize the diverse knowledge and expertise of its members in making recommendations. These recommendations are the end results of six months of extensive research, periodic meetings with not just the sub-committee members but also with other key officials, vice presidents of research and development, leaders of technology transfer, successful entrepreneurs and venture capitalists from both Virginia and other competing states. As a result of these extensive efforts, the sub-committee has identified three critical issues that Virginia must immediately address, in order to burgeon out from its current leadership in federal funding and high-technology employment to becoming a highly sought after state for investments in high-technology research, development and commercialization. The three critical issues are:

- 1. Recognizing and building the existing regions of technological leadership in the Commonwealth, while addressing the imperative need to further spur the development of private equity capital targeted at early-stage technology companies in Virginia.**
- 2. Bridging the physical gap between research universities and technology businesses in Virginia.**
- 3. Recognizing the importance of the mission of CIT and funding that mission.**

The sub-committee report further explains why these issues can act as impediments to Virginia’s economic growth and how they can be transformed to catalysts of success.

More than 90 % of the new technology start ups in Virginia are funded by private sources while fewer than 7% spin out from the SBIR programs and less than 1% from university labs. (‘Technology-Based Businesses’, December 2002 report of the joint force appointed by Secretary of Technology and Secretary of Commerce and Trade). To create new knowledge intensive industries that would spur technological and economic advancement in both the public and the private sectors in Virginia, it is vital that the policy makers (technology facilitators), the universities (technology developers) and the corporate sponsors (technology marketers) collaborate and discharge their roles in building a high-technology state. The recommendations of this sub-committee are focused around building those collaborations and are as follows:

- 1. Extend Virginia’s already “business-friendly” climate to address stage two**

- (growth oriented) venture-backed businesses to secure their establishment of headquarters and/or key operational units in Virginia.**
- 2. Create an “Invest Virginia” program to mobilize investments in Virginia-based venture capital funds from private sources through use of selective investment incentives.**
  - 3. Provide Virginia code changes and allocate baseline funding for the Center for Innovative Technology of at least \$7.65 million annually.**
  - 4. Develop Virginia’s nanotechnology sector, focusing on industry leadership in nanomanufacturing.**
  - 5. Recommend SCHEV conduct a study of alternative ways to create a world-class science and technology-focused research and post-graduate educational institution in Northern Virginia, which can leverage the expertise in Virginia’s leading science and engineering departments across all of the state universities.**
  - 6. Eliminate barriers between Virginia universities and industry.**
  - 7. Revise leave of absence policies and reward faculty with bonuses to increase quality of research and education in Virginia universities.**

The recommendations in this report are just the beginning of creating the necessary environment for growth and include establishing several key working groups that will continue to study and focus on making specific recommendations in the future.

## **Strategic Overview:**

The high-technology industry is one of the biggest sources of scientific innovation, making a huge impact on the state's gross domestic product and national income. The economic and social impacts of this industry have gone beyond mere job creation and asset mobilization. It is this industry that accelerated California to becoming the world's fifth largest economy. Many emerging nations, notably China and India, are diligently competing to catch up to and indeed to leapfrog the more advanced world economies in the high-technology arena.

France, Japan, China and Australia are investing billions of national and state dollars in emerging biotechnology, nanotechnology, tissue engineering and other high-technology industries. While Virginia cannot match these investments dollar for dollar, the state can significantly improve its ability to create businesses (which in turn create jobs and tax revenue) around these emerging technologies with a potential for high return on investments.

The Commonwealth of Virginia has made significant strides in its high-technology industry. The technology landscape of Virginia is testimony to the Commonwealth's realization that high technology's potential to enrich the state's economy is paramount. According to the June 2002, Warner Administration 'Technology Highlights', Virginia ranks among the top ten performing states in the New Economy. Also ranking fifth in the number of high-tech jobs (as a share of total employment), Virginia nearly doubled technology employment from around 123,000 in 1990 to over 236,000 by the end of 2000. Even more than employment, the number of firms in the high-tech industry has tripled from 2,300 in 1990 to over 8,400 in 2001.

While it is important to sustain and strengthen existing businesses and industries, it is imperative that the Commonwealth also undertakes bold initiatives to spawn new high-technology companies in the state. New industry translates into new jobs, new products, and new markets being created, thereby acting as an economic multiplier. Many of these new technology industries also provide enabling technologies that strengthen the existing industry base in the state. Virginia should consider a new key policy initiative to encourage the venture capital industry to invest more heavily in generating new industry in the state. According to the December 2002 report of the joint force appointed by the Secretary of Technology and the Secretary of Commerce and Trade titled "Technology-Based Businesses", fewer than 7% of Virginia's start-up companies receive funding from the SBIR program and less than 1% of Virginia's technology start-ups spin out from the technology developed at Virginia's state's universities.

In other words, most of the Commonwealth's new technology companies are born entirely from the private sector. Of course Virginia can and must do better attracting additional Federal funding for Virginia companies through SBIRs and other research grants, and the state must do a better job commercializing university and federal lab originated intellectual property. The most important thing the state can do is more of what is working today – encouraging the free market meeting of private risk capital and ambitious entrepreneurs with good ideas. The Commonwealth must convince them that



Virginia's climate is conducive to support technology companies from inception through maturity.

The Commonwealth must capitalize on this by embracing bold initiatives that facilitate venture-backed businesses relocating or setting up headquarters in Virginia. The Commonwealth should make significant commitments to promote 'knowledge intensive industry clusters' such as biotechnology, telecommunications, information technology and the more futuristic nanotechnology. These clusters around scientific innovations must form a key link between the private sector, university research and workforce development.

Virginia's capacity for innovation, together with its true will to innovate, must form the core of the Commonwealth's economic advantage as state leaders look toward the future. Virginia successfully and aggressively transitioned its economic engine over the past several decades into one fueled by advances in information technology services and products, and advanced manufacturing technology processes and goods. Virginia's continued competitiveness and viability in an increasingly global marketplace will depend on the ability to grow and diversify Virginia's economic base by helping businesses create entire new industries which will spawn an array of new products, new services, and new jobs. Properly positioned, Virginia has the opportunity to expand its dominance in the information technology sector, increasingly complemented by newly emerging and enabling technologies (including nanotechnology and biosciences) as the primary drivers of economic growth and job creation throughout the Commonwealth.

Virginia's policymakers must recognize that today's comparative advantage, established during the 1990's is quickly eroding. Other states, and increasingly other countries, are engaged in focused and relentless efforts to surpass their competition by channeling substantial resources into both subtle and overt recruitment efforts. Their efforts include attempts to entice Virginia businesses and top academic researchers to relocate, to invest or to expand elsewhere. These sponsored efforts include new public investments in state-of-the-art research facilities and equipment, a renewed focus on leveraging government resources to increase the availability of investment capital for new businesses and sophisticated, targeted educational funding to provide the highly-educated, well-trained workforce that will be needed to fuel tomorrow's high-tech industries.

One of Virginia's greatest advantages is its business-friendly tax, policy and regulatory climate. The Commonwealth must continue to leverage policies that are conducive to economic growth and entrepreneurship to encourage new business formation, particularly as other states with a high concentration of technology and knowledge jobs (California, New York, Massachusetts, and Illinois) are struggling through massive budget imbalances – and are looking towards their existing profitable technology companies as a means of bridging the revenue gap. Virginia cannot and must not mimic those efforts. Instead, the state should strive to highlight the contrast between Virginia and those aforementioned states and find and encourage those disenfranchised businesses to relocate their operations, staff and facilities to Virginia.

Virginia, for example, should signal its continued commitment to fostering a policy framework and regulatory environment conducive to technology based-economic

development by distinguishing itself from those states that would impose a tax collection burden and obligation on their Internet-based electronic commerce businesses in a short-term effort to fill holes in their budgets. Virginia should strive to create and sustain a burden-free zone for any business wishing to grow its market share and customer base through e-commerce. Moreover, Virginia should let every company in the nation know that in coming to Virginia, they will be afforded a regulatory environment free from the expense and burdens of collecting sales and use tax for outside states and localities in which they have no physical presence. Virginia should opt out of the SSTEP (Streamlined Sales Tax Project) agreement instead of seeing it as a band-aid for a small portion of the budget deficit. By taking such a bold move, Virginia can establish a leadership role and legacy for electronic commerce businesses much as the state of Delaware has done for corporate law and the state of South Dakota has done for Credit Card Issuers

As well, Virginia must not follow the “quick-fix” trendy and protectionist policies being espoused by many to solve short-term budget deficits. In today’s global economy, those countries which are able to provide a smart, educated labor force willing to work for minimal compensation (by USA standards) will necessarily see certain customer service, technical support and software development jobs flow into their borders. Many of those are the jobs of today. Virginia’s edge lies not with the Commonwealth’s ability to erect protectionist policies and restrictions to hold on to what the state has, but rather in the ability to attract, grow and build new industries fed by a homegrown workforce that will outperform any other in the world.

***But a business friendly climate is not enough.***

***The Commonwealth has three critical issues that must be addressed if Virginia is going to seriously compete against other states and countries for a leadership role in tomorrow’s economy.***

**1. Recognize and build the existing regions of technological leadership in the Commonwealth:**

Over the past many years, well-intentioned state policymakers have put great emphasis on placing high-technology jobs in depressed parts of Virginia. While this rationing of new high-tech jobs across the Commonwealth serves to benefit immediately people in those in regions, policymakers must be careful not to detract from efforts to reinforce those regions of the Commonwealth, which have already achieved a critical mass of technological competence. The new economic paradigm revolves around competition between regions – not States. And in that dynamic, Virginia must select a region to compete for the industries of the future against Boston’s Route 128 Corridor (not Massachusetts), Silicon Valley (not California), Austin (not Texas), Research Triangle Park (not North Carolina) and many other high profile regions (not States.) Virginia too must have a region or regions where the state can focus and concentrate its efforts. There is an imperative that Virginia further promotes investment in early-stage private equity capital to spur the success of these high growth technology regions.

Let's concentrate state efforts making the strongest technology hubs in the Commonwealth stronger – instead of trying to diffuse the efforts across the State. Northern Virginia, Hampton Roads and Richmond each have growing technology hubs with some scale in certain industries. However, there can be no denying the fact that the critical mass is in Northern Virginia – both on a stand-alone basis as well as part of the Greater Washington region. It is from here that the largest research dollars flow (from NIH, DARPA, NRL and many others), where 62% of Virginia's technology companies are located, and where the largest and most scientifically educated workforces reside. We must make a major bet on this region to carry the Commonwealth into the future.

This does not mean that the state ignore other parts of the Commonwealth when it comes to job creation – existing business attraction programs in Virginia are well suited at targeting these areas with immediate job opportunities. Rather, Virginia should recognize that it is both easier, and better for the State's overall economy when Virginia can establish a specific region in Virginia as a magnet for the top researchers, corporations, and private investors in an emerging technology sector such as nanotechnology or biotechnology.

This problem should be easy to solve with strong-willed policy leadership by a Governor and Legislature willing to look out for the good of Virginia, as opposed to the near-term needs of a particular zip code within the State.

2. **Bridge the physical gap between research universities and technology businesses in Virginia:**

The second issue is more difficult to resolve – as many are unwilling to discuss it in the first place. *Virginia's research universities are not located near Virginia's technology businesses* and this places both the universities and the technology businesses at a distinct and structural competitive disadvantage. This is a very real and serious imbalance that needs to be addressed if the state is going to be on the world stage with an intertwined and vibrant academic research environment and entrepreneurship culture.

According to SCHEV's May 22, 2002 "Condition of Research at Virginia Colleges and Universities", almost ninety percent of research and development expenditures in Virginia are attributable to private sector activities, federal agencies and federal labs. Over half of R&D expenditures in Virginia are attributable to the private sector, and a significant proportion of that activity is occurring in the high-tech center of Northern Virginia. Of the twelve federal labs, agencies and centers identified in the SCHEV report, six are located in Northern Virginia. Yet of the 7 public research universities identified in the SCHEV report, only one – George Mason University - is located in Northern Virginia.

While George Mason University is a rising star in Virginia's portfolio of universities, state policies, sustained funding shortfalls and other disparities have made it difficult for GMU to realize the full potential of its location as the only research university in the vibrant northern Virginia area. Without substantially more resources, it is unlikely that GMU will emerge as a top scientific research university for at least a generation.

Across the Commonwealth, several universities have gained eminence in critical fields of science and technology and attract top students from the Commonwealth, the nation, and internationally. Yet, most of the graduates of these leading edge programs are unable to find jobs in their fields near where they studied, and since they must relocate to find suitable employment opportunities, they are as likely to move out of Virginia, as they are to relocate within Virginia. This is not the case at MIT, Stanford, UT Austin, UC Berkeley and other top research universities, which are located where the jobs exist.

This structural geographic imbalance stymies collaboration between Virginia's research universities, the private sector and the federal customers that drive much of Virginia's technology-based business activity. The opportunity costs attributable to this imbalance are significant in scope and magnitude. Even with the new buildings to be built with funds made available through the passage of the higher education bond referendum of 2002, Virginia's research universities will continue to have insufficient space to house the R&D activities they are able to attract. Moreover, the Higher Education Equipment Trust Fund is not sufficiently funded to provide for the new, cutting-edge technologies and laboratory equipment that is essential to today's basic and applied research efforts. Clearly co-location of research space and equipment for shared use and partnership between universities, federal labs and the private sector can produce enhanced access to cutting-edge equipment, decreased expense associated with capital costs and equipment, and more professional collaboration and shared objectives between Virginia's various research actors.

Enhancing the capabilities of Virginia's universities to conduct sustained and significant research programs in close proximity to leading-edge companies and industries would contribute enormously to improving leverage of existing private sector assets and expenditures just as the private sector would gain better access to faculty and graduate student expertise. With closer ties to industry, the basic research activities of Virginia's universities would better correlate and cross-pollinate with the applied research activities of private industry in Virginia, and vice versa. Furthermore, in an environment where the private sector and universities are both seeking to improve alignment of their research interests, strategies and competencies with the areas of greatest interest to (and funding streams from) the federal government; close proximity and resulting stronger collaboration will allow the universities and private industry to better exploit their joint competencies, areas of expertise, and interests.

An honest recommendation for change here would be dramatic – and probably politically infeasible – which means that Virginia will likely remain at a structural disadvantage in competition for new industries.

Many members of VRTAC recommend that Virginia look seriously at establishing an integrated research and academic campus in Northern Virginia –one that would be accessible to technology businesses as well as DARPA, NRL and other leading customers– and have this campus attract, physically, the best and the brightest professors and students from the top science departments across the Commonwealth. They envision a “Research Triangle Institute” in Northern Virginia with a graduate school component that features participation from all Virginia universities. Ideally, for example, a student could earn a degree in nanotechnology from Virginia Tech at the Northern Virginia

Campus, while taking a UVA photonics course on the same campus, and all the while working part-time at Mitre Corporation on a cutting-edge research project for DARPA. Virginia should ask SCHEV to look seriously at this option, as well as other options, including a dramatic increase in funding to George Mason University for new Graduate-level science and technology initiatives.

3. **Recognize the importance of the mission of CIT and fund that mission:**

The current path to de-fund CIT by 2007 is Pollyannaish. Assuming for a moment that CIT is able to secure new revenue sources entirely outside of the State budget by 2007, does anyone really believe that it will continue to pursue a mission, which supports the State's technology industry? Of course not! It will pursue a mission that is set by the customers with which it works and who pay its bills. And if the State of Virginia does not provide funding, CIT will likely morph into either a for-profit technology center or company or a not-for-profit research institute.

Do we, as a State, want to eliminate CIT's successful early-stage new business grants and programs in entrepreneurship? Does the Commonwealth want to eliminate CIT's regional operations? Is the state looking to shut down the new Institute for Defense and Homeland Security (IDHS) before it even gets significant traction? And is Virginia prepared to walk away from CIT's emerging nano-manufacturing initiatives? The VRTAC Commission is united in recognizing that the path that CIT has been placed on is a path of self-destruction with respect to CIT's support for Virginia's technology initiatives. The Commonwealth must invest in CIT's technology mission and continue to provide baseline funding of at least \$7.65 million to support the development of the Commonwealth's entrepreneurial ecosystem.

**Strategic Approach:**

The following are the sub-committee recommendations that would facilitate the 'Creation of New High-technology Industries in Virginia'. Each recommendation is followed by a rationale and a set of specific follow up actions.

**RECOMMENDATION # 1: Extend Virginia's already "business-friendly" climate to address stage two (growth oriented) venture-backed businesses to secure their establishment of headquarters and/or key operational units in Virginia.**

**RATIONALE:** According to a study on the Economic Impact of Venture Capital, commissioned by the National Venture Capital Association (NVCA) in 2001, 4.3 million jobs and \$736 billion in annual revenues were created by venture-backed businesses in 2000. Venture capital backed small businesses enrich regions and provide jobs directly and indirectly. The Commonwealth must maximize the potential of venture-backed businesses in job creation and revenue generation by creating a business-friendly climate for these businesses to be headquartered in Virginia. Stage two venture backed companies provide the opportunity to achieve very rapid business expansion with corresponding employment and tax revenue gains.

The existing technology network provided by the regional technology councils and partnerships, the Center for Innovative Technology and the Department of Commerce and Trade provide significant value addition for high growth companies by delivering networking opportunities, support programs and research expertise. In order to obtain a significant advantage in luring the Venture backed businesses to Virginia, the VEDP should develop a specific recruitment campaign designed to identify industry segments for pursuit and potential incentives for relocation/location of these companies. Specific economic incentives, regional living condition profiles and asset profiles (universities, technology councils, venture firms, institutes like IDHS.) should be developed as incentives for attraction. A ‘welcome program’ must be developed to facilitate speedy completion of necessary business startup functions including licensing, facilities location, employee relocation guides and business support services.

**FOLLOW UP ACTION:**

1. Ensure that VEDP’s and DBA’s missions include the ‘venture capital backed’ and emerging business class of companies.
2. Direct CIT, VEDP and DBA to collaborate and develop a plan and budget to support the initiatives outlined above.
3. Provide guidance to the Warner administration and general assembly regarding the legislative and budget support required for VEDP to conduct the programs defined in the first action item.
4. Direct VEDP and DBA to implement a public awareness program designed to profile the Commonwealth’s focus on venture-backed companies.
5. Develop a collaborative marketing campaign of the “*Virginia is for Technology*” theme showing a united front of all technology, state economic development and academic entities of Virginia.

**RECOMMENDATION # 2: Create an “Invest Virginia” program to mobilize investments in Virginia-based venture capital funds from three major private sources through use of selective investment incentives, as follows:**

**(a) For Virginia institutions, such as the Virginia Retirement System (VRS), the Commonwealth should provide a guarantee of 8% percent positive net return on investments in Eligible VC Funds, which these institutions commit within the next five years. The guarantee would not be triggered until the VC funds completed their operations (typically after a ten-year period), and would apply on a net basis to the overall basket of VC investments maturing in a given year.**

**(b) For out of state pension funds and other institutions, the Commonwealth should provide a guarantee of principal protection (i.e., a guarantee against losses, but no guarantee of any overall positive return). The structure of the guarantee (applicable only to investments in Eligible VC Funds committed within the next five**

years, triggered only at the end of a VC fund's operations and determined on a net basis) would be the same as for Virginia institutions.

**(c) For angel investors, the Commonwealth should revamp and clarify the existing tax credit program, changing it to a tax deduction rather than a credit, and making it for a definite amount rather than an unpredictable amount based upon a statewide pool. The tax incentive should apply only to investments in Eligible VC Funds or a state-approved fund of funds, committed within the next five years.**

**Rationale:** A major constraint on the development of technology businesses in Virginia is the chronic shortage of seed stage capital. Although Virginia ranks number three in the country in federal research funding, Virginia ranks only eighth in the country in venture capital funding - and only a small fraction of this venture capital is seed stage funding. At present, the Commonwealth is unable to provide large amounts of state funds for seed stage capital. Private sources – both institutional and individual – are able to provide large amounts of funds, but are deterred by the high-risk nature of venture capital (especially seed stage venture capital). Impediments to private funding for venture capital can be overcome, with no current cash cost to the Commonwealth of Virginia, by providing limited state incentives in the form of future guarantees, or by targeting existing tax credits.

State guarantees can be a highly efficient mechanism for mobilizing the funds needed for venture capital, for several reasons. First, the state guarantees mobilize the needed cash from private sources with no front-end cash cost to the Commonwealth. Second, the point when state guarantees will be triggered – if at all – is far in the future: the guarantees would only pay off when the VC funds complete their operations and their overall performance (profit or loss) is known, which will typically be ten years in the future. Third, the state guarantees would only pay off on a net basis: if an institution spread its investment among several VC funds, as they typically do, the performance of all of the VC funds would be netted, and the state guarantee would only have to pay off if the net overall was a loss or was less than the guaranteed minimum return.

Limiting these guarantees and tax deductions only to investments committed within the next five years will also help make the program efficient. In essence, it provides an automatic sunset for the program. Under this structure, the incentives are only offered on a one-time basis, for a limited transition period to help establish a track record of institutional and angel investments in Eligible VC Funds. After that, such investments will have to stand or fall on their own, based on market factors, unless a sufficiently compelling case can be made at that time of the need to extend the program.

In each case, the Commonwealth's guarantees should only apply to investments in venture capital funds that meet the following eligibility criteria ("Eligible VC Funds"):

- The VC fund establishes or maintains an office in Virginia.
- The VC fund has an established track record of investing in seed and truly early stage companies.

- The VC fund contractually commits to use best efforts to invest in early stage Virginia businesses three times (3X) the amount of the funding received by the VC fund that is covered by the investment incentives.

(a) Investment Incentives for Virginia Institutions. The Commonwealth should provide the strongest investment incentives for Virginia institutions that invest in eligible VC funds (e.g., the Virginia Retirement System -- VRS). These institutions already have a certain amount of investment in venture capital firms, but most or all of those VC firms are outside of Virginia. The Virginia institutions, such as VRS, have important fiduciary duties to produce good investment returns for their beneficiaries, and have made clear that they are unwilling to make further investments in venture capital firms – or to invest in eligible Virginia venture capital funds in particular -- without state guarantees of at least a minimum level of positive returns to satisfy their fiduciary obligations.

The case for providing state guarantees is strongest in regard to Virginia institutions. Virginia institutions have large pools of money – more than enough to provide a huge boost to venture capital availability within Virginia. The beneficiaries of Virginia institutions will benefit from the job creation and economic growth provided by VC-backed technology businesses. And, in the event that any pay-off on state guarantees is required due to VC losses or returns below the guaranteed level, such pay-off will go entirely to beneficiaries within the state (teachers, police and fire personnel, etc.).

(b) Investment Incentives for Out of State Institutions. The Commonwealth should provide a secondary level of investment incentives to out of state institutions that invest in eligible VC funds in Virginia: not any guaranteed level of positive returns – only a guarantee against net losses of principal. Such institutions, collectively, have far more assets than Virginia institutions alone, and could greatly increase the amount of funds mobilized for venture capital in Virginia. Without some incentives, these institutions have shown that they are unwilling to make substantial VC investments in Virginia – rather; they put their VC investments into more established regions and marquee name VC funds. Limited incentives (guarantees) can overcome this unwillingness and enable Virginia to tap into these larger pools of funds.

On the other hand, if any pay-offs are required on the Commonwealth's guarantees when the VC funds complete their operations in the future, such pay-offs will go to out of state beneficiaries rather than Virginia beneficiaries. In light of such considerations, it is reasonable for the guarantees to out of state institutions to be more limited than to Virginia institutions, and to be limited to just covering net losses of principal, not insuring any net positive level of returns.

(c) Investment Incentives for Angel Investors. Although individual angel investors' investments tend to be small (in the tens or hundreds of thousands), collectively they are a large source of funds for seed and early stage ventures. Virginia's existing tax credit for such angel investments is well intentioned, but not an effective mechanism for mobilizing angel investments because it is too uncertain. The credit is currently an unpredictable amount, because it is allocated on the basis of a capped statewide pool. The amount of tax



credit an angel receives depends upon how many other angels file for the credit and how much they claim. An angel investor has no way of knowing this in advance, and so cannot use this as a factor in deciding whether and/or how much to invest. Although a tax deduction is a lesser incentive than a tax credit, a deduction of a definite, predictable amount would be a more effective incentive mechanism than the current tax credit program.

**Follow Up Action:**

- 1. For Virginia institutions, provide a guarantee of 8% percent positive net return on investments in Eligible VC Funds, which these institutions commit within the next five years, such guarantee to be triggered only upon completion of operations of each Eligible VC Fund, and such guarantee to apply on a net basis, after offsetting of gains and losses on all of an institution's investments in Eligible VC Funds maturing in a given year.**
- 2. For out of state pension funds and other institutions, provide a guarantee against losses (but no guarantee of any overall positive return), on investments in Eligible VC Funds which these institutions commit within the next five years, such guarantee to be triggered only upon completion of operations of each Eligible VC Fund, and such guarantee to apply on a net basis, after offsetting of gains and losses on all of an institution's investments in Eligible VC Funds maturing in a given year.**
- 3. For angel investors, replace the existing pooled tax credit with a tax deduction rather than a credit, for a definite amount rather than an unpredictable amount based upon a statewide pool, such tax deduction to apply, at the time of investment, only to investments in Eligible VC Funds or a state-approved fund of funds committed within the next five years.**

**RECOMMENDATION # 3: Provide Virginia code changes and allocate baseline funding of at least \$7.65 million annually for the Center of Innovative Technology to ensure a statewide focus for the development of an 'entrepreneurial ecosystem' including facilitation of collaborative university research; acceleration of federal lab and university IP commercialization; and support programs for very early stage entrepreneurial companies.**

**RATIONALE:** Attracting additional research to Virginia's universities and labs will provide a net increase in science and technology professionals to the Commonwealth. This community of highly educated professionals in conjunction with an entrepreneurial support environment delivered through a network of public and private organizations will yield the 'entrepreneurial ecosystem' that generates new companies and future economic growth.

Competition from states in leading edge technology fields like semiconductor and nanotechnology threaten Virginia's ability to secure a strong foundation in next

generation technology industries. The state of New York and SUNY in conjunction with the Semiconductor Industry Association has committed \$800M to establish a world-class research program in semiconductors. Virginia needs to be proactive in determining its future technology direction and accomplish this by continuously conducting a critical review of its university, federal laboratory and industry assets. The end product of this critical review process shall be a roadmap for Commonwealth and congressional delegation investment. Performance against this roadmap shall be monitored by VRTAC - yet the VRTAC volunteers cannot set this strategy. As a neutral third party with technology expertise, the Center for Innovative Technology must facilitate the review and roadmap development process and coordinate execution of the strategy.

On both a national as well as statewide basis, the rate of IP commercialization from university and federal labs is extremely low. The exact cause of low commercialization rates continues to be extensively studied without clear recommendations for resolution. To address this issue, Virginia must explore alternative commercialization approaches including pilot projects concentrating on specific research areas and/or researchers. The goal of these pilots shall be to examine the effectiveness of alternative approaches to commercialization and intellectual property access. The Center for Innovative Technology in conjunction with the offices of the Secretary of Commerce and Trade and the Secretary of Technology should facilitate and report on the progress of these pilots to the VRTAC.

Very early stage investment capital placed by angel investors in Commonwealth companies declined 70% from 2000 to 2002 in line with the declines in venture capital investment at later stages. Angel investment is a very critical component of early stage support. To accelerate the return of very early stage investment, Virginia must implement a very early stage investment program designed to bridge the gap between an entrepreneur's 'friends and family' investment and the first significant external investment from early stage venture capital investors. This investment program would provide investments in the \$100,000 range as well as serve to provide deal flow to outside investors. The program must be designed with the goals of attracting additional investors into the first financing round, securing additional follow-on investment for the startup, as well as providing a return on the funds invested by the Commonwealth. Outside investment experts shall determine which companies qualify for investment after due diligence is conducted by CIT. The Center for Innovative Technology under the supervision of outside investment professionals shall operate the program. The program should be funded as a separate companion program to the Commonwealth Technology Resource Fund. A similar program implemented by Maryland's TEDCO (Maryland's version of Virginia's CIT) threatens to lure North Virginia startup companies to locate across the Potomac in order to secure TEDCO funds.

**FOLLOW UP ACTION:**

1. Fund the CIT with an annual appropriation of at least \$7.65 million to support the initiative outlined above.
2. Provide guidance to the Warner administration and general assembly

regarding the legislative and budget support required for CIT to conduct the programs defined in the first action item.

3. Direct CIT and the Virginia Department of Business Assistance (DBA) to implement a public awareness program designed to profile the Commonwealth's focus on entrepreneurial support.
4. Task CIT to examine opportunities to leverage state funds with private angel funds to yield a five to one leveraged investment fund. Provide a separate seed stage program to be used to leverage angel investment participation, fund the program initially at \$1 million.
5. Develop an annual program review to determine the effectiveness of the initiatives described above including a benchmark for continuance and/or transition to private sector management.

**RECOMMENDATION # 4: Develop Virginia's nanotechnology sector, focusing on industry leadership in nanomanufacturing.**

**RATIONALE:** Virginia has a tradition of industrial excellence, from large businesses to entrepreneurs. This leadership has existed in traditional industries, such as furniture and textile manufacturing, as well as in emerging technologies, including information technology, communications, and biotechnology. Virginia now has the opportunity to build on its existing expertise and become a national and international leader in nanomanufacturing.

Nanotechnology promises to transform most industries and will have a particularly profound impact on health care, homeland security, national defense and the national infrastructure. Nanotechnology is poised to become the largest government science initiative since the space race.<sup>1</sup> The President's FY04 budget request of \$849 million for nanotechnology research and development<sup>2</sup> reflects the administration's priority, having grown from a request of \$422 million in FY01.<sup>3</sup> Both global and state competition is heating up. According to The Nanotech Report (2003), more than \$3 billion will be invested worldwide in nanotechnology research and development in 2003, leading to a predicted \$1 trillion nanotech industry by 2015.<sup>4</sup> California, Colorado, Georgia, Illinois, New York, and Texas are among states that have announced a commitment to nanotechnology.

Manufacturing remains central to America's economic growth and improving standard of living, as well as the nation's national defense and homeland security. For instance, manufacturers' account for two-thirds of the country's research and development; manufacturing jobs pay 18 percent more than the national average.<sup>5</sup> Nanomanufacturing will require new skills among its workforce, new equipment to produce goods, and manufacturing firms will choose proximity to the research community for this quickly advancing sector.

Virginia has an existing national recognition in nanotechnology, as the Commonwealth's leading research universities and national laboratories continue to produce groundbreaking work in biomedicine, electronically functional nanomaterials, alternative

energy sources, and nanostructured coatings. Additionally, Virginia has existing industrial strengths where nanotechnology will play a critical role, including health care, aerospace, semiconductors, communications, information technology, chemicals, and power generation.

**FOLLOW UP ACTION:**

1. Establish a gubernatorial board to develop recommendations for a statewide comprehensive and coordinated strategy for nanotechnology research and economic development. Task the CIT and the VEDP as the administrative support of the board.
2. Task the Center for Innovative Technology with assessing the commercial potential of nanotechnology research underway at Virginia's universities and federal laboratories. Highlight commercialization opportunities to the regional investment and technology communities.
3. Task CIT, VEDP and DBA with providing business development and mentoring resources to nanotechnology researchers and emerging companies.
4. Fund the Commonwealth Technology Research Fund (CTRF) with \$5 million annually to be used to support leverage of federal research investments in nanotechnology.

**RECOMMENDATION # 5: Recommend the State Council for Higher Education in Virginia (SCHEV) conduct a feasibility study to build a research campus in Northern Virginia that provides a world-class academic research environment, focused on emerging technologies, in which existing State Universities can bring their areas of expertise to the region to educate a new generation of science and engineering graduate students.**

**RATIONALE:** Most successful research universities have developed a reputation for close partnerships with industry and have been the intellectual resources for innovative start-up companies and ultimately huge economic drivers in their nearby localities (e.g. MIT in Boston, Stanford University in California, the University of Texas in Austin, Georgia Tech in Atlanta and Duke University and UNC at Research Triangle Park in North Carolina). Virginia's universities could provide substantially greater impetus to economic development and growth in the Commonwealth by co-locating their research in fields with commercial applications next to those potential commercial customers. Research Centers that provide a platform for universities and industry to effectively collaborate have proven to be extremely successful in helping universities realize their full research potential.

The Stanford Industrial Park in California, Lincoln Labs in Massachusetts and the

Research Triangle Institute (RTI) in North Carolina have become the cornerstones of research and development for their respective states. They provide the physical and intellectual resources to attract the private sector industry. Research Centers are also emerging as significant economic multipliers.

- a. The RTI in North Carolina has grown from a handful of scientists in 1959 to over 2,100 today, adding \$ 286 million in revenue to North Carolina's economy in 2002. (RTI International Annual Report 2002).
- b. The Microelectronics Center of North Carolina (MCNC), a non-profit research center founded by the General Assembly in 1980 is a joint activity of the three Triangle Universities (North Carolina State University, Duke University and UNC-Chapel Hill) and the Research Triangle Institute. MCNC provides research resources for the rapidly growing semiconductor microelectronics industry in North Carolina and has spun off four companies in the last four years creating over 300 jobs in the region.

The two research centers, RTI and MCNC, put together generate about half a billion dollars in revenue for North Carolina besides putting the state on the global map in technology circles. These successful institutions have been the engine for growth in their respective geographic areas. Northern Virginia must have a top ranked institution and the state must invest in making it happen.

**FOLLOW UP ACTION:**

Task SCHEV to conduct a feasibility study that would explore alternative ways of ensuring that Northern Virginia is served by a world-class academic research and advanced education enterprise, including building a multidisciplinary academic research center in Northern Virginia to provide a vehicle for multi-university collaborations and closer industry ties.

**RECOMMENDATION # 6: Eliminate barriers between Virginia's universities and industry.**

**RATIONALE:** Bringing new technologies from the research lab to the marketplace require that both academia and industry work together in new and innovative ways. Investment in strategic areas will allow the Commonwealth to more fully benefit from its investments in higher education and economic development.

**FOLLOW UP ACTION:**

**1. Offer internship incentives.**

Offer incentives for industry to partner with universities in the practical training of undergraduate and graduate students. This might take the form of research collaborations involving academic and corporate labs, or could be a summer internship in an industrial setting. This program, which could also be a part of an SBIR or STTR award, could be fostered and directed by CIT in concert with representatives

from universities. It would allow real-world experiences for students, and institutions would get feedback from industry on the relative quality and desirability of its graduates.

As an instructional complement to this internship, departments will prepare brief presentations for students on the translational aspects of scientific research, such as patents, ethics, commercialization, industrial applications, and business plans.

**2. Facilitate adjunct faculty appointments.**

Provide opportunities and incentives for corporate scientists and engineers to have adjunct appointments at universities to train and collaborate with both faculty and students. This would strengthen already existing collaborations, foster new ones, and facilitate the SBIR and STTR application process.

**3. Provide funding for translational research facilities.**

Assist universities in acquiring funding to build or buy facilities where academic labs and corporate entities, both large and incubator spin-offs, can work together. There is an inherent value associated with proximity to faculty and students for the companies. It would also greatly facilitate the SBIR and STTR process that involves partnering of research activities for academic and corporate researchers.

**4. Facilitate faculty to take 1-2 year sabbaticals in a corporate setting or at a National Lab.**

Provide opportunities and assistance for academic researchers to spend time with Industry or National Labs and to develop a clear research plan that demonstrates the value of the corporate experience and the value that is brought back to the department, school, and students from that experience.

**RECOMMENDATION # 7: Revise leave of absence policies and reward faculty with bonuses to increase quality of research and education in Virginia universities.**

**RATIONALE:** This recommendation is geared towards new ways of promoting higher qualities of teaching and research in Virginia-based universities. According to the U.S. News Report on ‘America’s Best Colleges’, excellence in teaching at the undergraduate level and high quality research are two main factors that contribute to a university’s success to a large extent. A focus on quality research and teaching will bring about growth in revenues; attract higher quality students and faculty, and higher rankings in

Virginia based universities.

For the Commonwealth's universities to maintain and enhance their positions at the forefront of research on a national and international basis and hence draw industries to locate, incubate and grow to maturity in Virginia, it is critical to recruit and retain top faculty. Bonuses can be used as an effective recruiting tool as well as a retention incentive for faculty to continue and optimize their efforts in high quality research and development. Bonuses rather than large raises may also prevent faculty members with very high salaries from slowing down after a few years of outstanding performance. Faculty bonuses must be introduced to not only attract high quality researchers to Virginia institutes but also act as a constant motivation to bring in more industrial dollars into university research. True success of Virginia based universities lies in the hands of high quality faculty and researchers with the drive to provide excellent education and build positive relationships with the industry.

In addition, it is recommended that the leave of absence policies be changed to allow faculty the time to fully develop or transfer technology from university labs to industry.

**FOLLOW UP ACTION:**

1. Increase the 2-year leave of absence to 4 or less years for the science and engineering faculty depending on their proposals to effectively utilize the time-off from teaching to generate more industrial sponsored research.
2. Allow industry to fully fund faculty salary and allow the faculty to work in industry with proper IP regulations that provide the security required by industry. The faculty would remain a university employee.
3. Allow faculty to be a part-time university employee and a part-time industry employee.

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<sup>1</sup> James Pethokoukis, "Science of the Small is Getting Big," *USNews.com*, June 25, 2003

<sup>2</sup> National Nanotechnology Initiative, Supplement to the President's FY 2004 Budget

<sup>3</sup> National Nanotechnology Initiative, Research and Development FY 2003

<sup>4</sup> The Nanotech Report 2003, Lux Capital

<sup>5</sup> National Association of Manufacturers, The Facts About Modern Manufacturing (2003)

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**CHAPTER 365**

*An Act to direct the Virginia Research and Technology Advisory Commission (VRTAC) to develop strategies for the incubation of new science and technology industries in the Commonwealth.*

[H 2639]

Approved March 16, 2003

Whereas, VRTAC was established to advise the Governor on appropriate research and technology strategies for the Commonwealth with emphasis on policy recommendations that will enhance the global competitive advantage of both research institutions and technology-based commercial endeavors within the Commonwealth; and

Whereas, the development of new science and technology industries will enhance the global competitive advantage of the Commonwealth; now, therefore,

Be it enacted by the General Assembly of Virginia:

**1.** *§ 1. The Virginia Research and Technology Advisory Commission (VRTAC) shall develop strategies for the incubation of new science and technology industries in the Commonwealth. The Commission shall provide a report of such strategies to the Governor and the General Assembly by November 30, 2003*