LIFE SCIENCE AND GLOBAL HEALTH DEVELOPMENT IN WASHINGTON STATE: FUTURE AT RISK

APPENDIX B: Strategic Priorities for Turning the Growth Curve Around to Advance Washington’s Life Science Industry and Global Health Sector

Prepared for the Washington Life Science & Global Health Advisory Council by TEConomy Partners, LLC
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Innovating Tomorrow's Economic Landscape

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This Appendix provides the details on the strategic priorities presented in the February 2017 report, *Life Science and Global Health Development in Washington State: Future at Risk*. This report was prepared for the Washington Life Science & Global Health Advisory Council by TEConomy Partners, LLC. The Council was convened by Governor Inslee in October 2015 to take stock of Washington’s position in these highly competitive industries and highlighting opportunities for future growth.

Washington faces a stark choice in the development of its life science industry and global health sector. After a decade of strong growth from 2001 through 2011 demonstrated the potential of the life sciences and global health to become a major new economic driver for Washington, new challenges have arisen that are leading to stagnating industry growth and innovation.

This falloff in industry growth and innovation is taking place at a time when Washington is withdrawing many of its industry development programs for the life sciences and global health, such as the R&D tax credit and deferral, the Washington Global Health Fund, and the Life Sciences Discovery Fund (LSDF). At the same time, leading state competitors are sustaining or, in many cases, enhancing their efforts to develop their own life sciences and global health industry clusters (see text box below).

Four broad strategic priorities have been identified that need to be addressed:

1. **Reinstate the R&D tax incentives**
2. **Support entrepreneurship and company creation statewide**
3. **Retain high growth potential mid-sized companies**
4. **Attract major corporate innovation centers**

In addition to state initiatives detailed in the text box, while this study was ongoing, the State of New York announced a major new $650 million initiative to support the development of biotechnology across the state, with the plan’s major components spanning $250 million in tax incentives for both new and existing industry firms, $200 million in state grants for lab space, and $100 million to invest in new early-stage life sciences companies to be matched by $100 million in support from private-sector partnerships.

Based on the analysis, stakeholder interviews, and consultation with the Advisory Council, Washington needs a new playbook for public-private partnership initiatives to address specific challenges facing industry innovation, retention, and attraction across its life sciences and global health industry clusters.

Examples of States Sustaining and Enhancing Life Sciences Development Efforts

- **Massachusetts**: In 2008, a $1 billion, 10-year investment in the Massachusetts Life Sciences Initiative was made to advance a comprehensive effort overseen by a new state-sponsored nonprofit known as the Massachusetts Life Sciences Center. Its results are outstanding: 1.4 million square feet of new life sciences facilities, including incubators and accelerators as well as shared-use biomanufacturing facilities; $115 million in tax credits to over 75 companies that have committed to create more than 3,750 jobs; and 1,900 postsecondary interns placed since 2009 at more than 450 life sciences companies from across more than 160 colleges and universities. Across all of the Massachusetts Life Sciences Initiative efforts, it has been reported that $3.4 in additional non-state funding has been leveraged for every $1 invested.

- **North Carolina**: In 1984, North Carolina developed a unique model for life science-related development, centered on the formation of the North Carolina Biotechnology Center (NCBiotech)—a state-chartered, nonprofit development organization. Just from its long-term commitment to biosciences business development targeting emerging new ventures with a range of financing, NCBiotech-funded companies in 2014 employed 2,188 workers, with the total economic impact supporting 8,945 jobs in North Carolina. Annual revenues resulting from the total economic activity of these companies generate more than three times the tax revenue, an estimated $44.9 million in state revenues in 2014, than the state’s appropriation for NCBiotech of $13.6 million in 2014.

- **Texas**: Beginning with its Industry Cluster Initiative in 2005, a long-term economic development strategy focused on advancing targeted sectors, including biotechnology and life sciences, Texas has been “all in” on biopharmaceutical-related development through the Texas Emerging Technology Fund and one of the largest single-state-sponsored biopharmaceutical-related research initiatives, the $3 billion Cancer Prevention and Research Institute of Texas. Texas employment in the biopharmaceutical sector has been soaring as a result of this concerted effort, rising more than 8 percentage points higher than the nation from 2007 to 2014.

APPENDIX B

REINSTATE THE R&D TAX INCENTIVES

Rationale:

Washington is out of step with nearly all states with which it is competing for life sciences and global health development by allowing its tax incentives for R&D to expire. The Washington Department of Commerce in its internal assessment of the competitive landscape for the life science industry and global health sector makes the case of how out of line Washington is in clear terms, with its overview table of state incentives (Figure B-1).

Life sciences and global health innovation depends heavily upon industry investment in R&D. Research!America reports that industry R&D investment is nearly three times larger than the federal government and represents two-thirds of total medical and health R&D in the United States.²

Economic incentives for innovation-led activities by the life science industry and global health sector are of great significance given the lengthy, rigorous, and costly process for medical innovations to be developed and approved for human use, which includes going through clinical trials and other regulatory approval processes set out by the FDA. There is also significant uncertainty surrounding life sciences and global health-related R&D activities—with only 12 percent of investigative medicines entering clinical trials being ultimately approved by the FDA—making it particularly important to encourage R&D activities.³

So, the availability of tax incentives for R&D can ease the cash-flow demands that life sciences and global health companies face as they seek to navigate...

FIGURE B-1: Competitive Landscape—Life Science Industry and Global Health Sector

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<thead>
<tr>
<th></th>
<th>Washington</th>
<th>California</th>
<th>Florida</th>
<th>Massachusetts</th>
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<td>6</td>
<td>7</td>
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<td>% Growth '03-'13</td>
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<td>18.25%</td>
<td>8.42%</td>
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**BASELINE**

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**ECOSYSTEM**

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<td>✔</td>
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<tr>
<td>Business Climate Incentive</td>
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² Research!America, U.S. Investments in Medical and Health Research and Development: 2013-2015, Fall 2016, pages 3-4

*As of October 2015
**Washington’s biotechnology & medical device manufacturing sales & use tax deferral/waiver set to expire January 1, 2017
APPENDIX B

the long process of bringing a new technology or product to market. The Milken Institute explains their significance:

"Many states have implemented their own version of research and development tax credits in an effort to boost and attract more research activities and enhance their position in the innovation race. The structures of state tax credits vary, but they aim to stimulate the creation of high-value jobs and associated capital investment. Several studies have been performed demonstrating that these state R&D tax credits increase R&D spending at the margin by lowering the cost of capital relative to other nations and by attracting investments that might have been made in other U.S. states."

**Suggested Approaches:**

While nearly all competitor states provide for tax incentives for R&D, there are important features to consider going forward. One feature is the level of tax incentive, which varies widely across states. Some states offer incentives as high as 20 percent or more on at least a portion of the R&D base, including Arizona, Connecticut, Delaware, and Rhode Island; the more typical rates are 10 percent to 15 percent. Also, an important factor shaping the value of the tax incentive for R&D activities is whether to provide the incentives for R&D on incremental increases in R&D or on the base amount of R&D. Most states provide a tax benefit only on the incremental increase of R&D above a base level, which is similar to the federal government’s approach. Still, states such as Connecticut, Maryland, and Utah offer a tax incentive on the base amount and then a higher tax incentive on the incremental increase in R&D investments.

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4 Milken Institute, California’s Innovation Economy: Policies to Maintain and Enhance It, December 2015, pages 45–46.
SUPPORT ENTREPRENEURSHIP AND COMPANY CREATION STATEWIDE

**Rationale:**
Washington is progressing well in commercializing technology and generating new start-ups that leverage the breadth and depth of its world-class research base, but is not doing as well in creating the high-value business environment to bolster the success of these start-up companies and retain them in the state. Washington needs to pay more attention to nurturing its high-potential life sciences and global health companies to become mid-sized and larger companies firmly rooted in the state.

Washington does have some innovative approaches in place for entrepreneurial support. One is the privately financed Accelerator Corporation, which is one of a handful of organizations dedicated to life sciences and global health venture development in the nation. Its sole purpose is to serve as the initial management teams for identifying and launching new companies and then recruiting permanent management teams as the early-stage venture takes hold. Founded in 2003, the Accelerator Corporation is operated entirely in the private sector, though it has established partnerships with the University of Washington and Washington State University, and involves a broad array of partners among key life sciences contributors, including research institutes, biotech real-estate corporations, venture capitalists, and major biopharmaceutical companies. In the past 13 years, nearly 20 companies have been launched by the Accelerator Corporation, and more than $260 million in follow-on venture capital support has been raised for these new biotech firms formed. And, while the organization has recently expanded its operations into New York City, the one limitation of the Accelerator Corporation’s approach is its ability to scale up to engage more than a handful of new ventures at any one time.

A more far-reaching approach is the Washington Innovation Network (WIN) Entrepreneurial Mentoring Program operated by Life Sciences Washington and supported by one of the last LSDF grants. It is designed to provide ongoing support for life sciences business development by matching selected entrepreneurs with a team of established and seasoned volunteer mentors. The program has, in part, been based on other successful benchmarks, including the MIT Venture Mentoring Service and Chicago Innovation Mentors. Through early 2016, 28 new ventures are receiving support from 45 mentors and 6 new start-ups have graduated from the program.

**Suggested Approaches:**
Washington has opportunities to build a more high-value business environment that addresses specific identified gaps that are holding back many start-up companies from realizing their full potential. And, while certain specific approaches utilized in other states may not be feasible in Washington given the state’s constitutional prohibition on the lending of state credit and lack of state income tax, the following paragraphs summarize a range of best practice examples to consider for enabling Washington to create this growth-oriented business environment for life sciences and global health companies.

**Providing Targeted Support across the Stages from Commercialization through Business Growth**—Various state approaches on growth supports are well suited to helping new life sciences and global health companies get on a strong growth trajectory. One growing tool being used across states is to provide “pre-seed” commercialization funding to validate the commercial potential and move toward prototyping of products. A best practice example is the Colorado Bioscience Discovery Evaluation Grant Program (now known as the Advanced Industry Accelerator Fund), which made 163 proof-of-concept grants from 2007 to 2013 involving funding of just under $10 million, which led to 38 new companies.
formed, over $290 million of follow-on capital funding, and 34 licenses issued.

After the validation of the commercialization potential, states are increasingly turning to providing angel investment tax credits to support the advancement of early-stage companies. Angels are high-net-worth individual investors who make high-risk seed and early-stage investments in technology ventures. Often angel investors are serial entrepreneurs, who combine mentoring and business advice with their investments. For early-stage life sciences and global health companies, the risk and uncertainty are substantial; and attracting funding, particularly at the critical seed and early stages often involved in preclinical studies, is a major challenge for commercial development.

Over 20 states are currently providing angel investment tax credits. While most are available to a range of technology-based companies, Maryland offers the longest-standing investment incentive specifically targeted to life sciences companies. Established in 2006, Maryland Biotechnology Investment Incentive Tax Credit provides a refundable income-tax credit equal to 50 percent of an eligible investment to investors in qualified Maryland biotechnology companies. During the first eight years of the program, it has stimulated investment of more than $120 million in qualified Maryland biotech companies, with almost 70 companies taking advantage of the credits.

As life sciences and global health companies expand their activities, many are qualifying for high-quality job-creation tax credits being established in states across the nation. Massachusetts has focused specifically on life sciences companies for its Life Sciences Job Creation Tax Incentive Program, operated by the Massachusetts Life Sciences Center, which was established by the state in 2008 to spearhead the implementation of the state's $1 billion, 10-year investment in the Massachusetts Life Sciences Initiative. As of December 1, 2015, 90 companies had active or completed tax incentive awards from prior years, totaling more than $100 million. Those prior awardees have created nearly 4,000 new jobs after receiving their tax incentives. To receive an award, companies must receive certification from the MLSC and must demonstrate both the scientific and academic merit of their expansion plans. The Job Creation Tax Incentive Program is jointly administered by the MLSC and the Massachusetts Department of Revenue (DOR), which oversees the technical administration of the incentives. Jobs that are created must be maintained for at least five years. The Job Creation Tax Incentive Program mandates that awarded companies submit reports and respond to inquiries by the MLSC and DOR regarding employment figures. If a company receiving a tax incentive under the program does not meet and maintain its minimum threshold for job creation, the credit can be recovered by DOR, requiring that the company pay back all or a portion of the tax incentives it received.

Ensuring the Availability of Affordable Wet-Lab Space—Start-up and emerging life sciences and global health companies in Washington are facing difficulties in accessing the specialized wet-lab facilities and advanced equipment to commercialize and scale up production of new products. There is a need for large-scale incubation facilities that can provide wet-lab space close to anchor institutions. The costs of tenant improvements to create these labs and scale-up facilities can run into the hundreds of dollars per square foot given the needs for meeting clean room requirements for sterility and other specialized infrastructure requirements. This can place a significant financial burden on start-up and emerging life sciences and global health companies, often diverting scarce venture funding for building out space needs. In fact, some new life sciences companies in Washington, particularly in Seattle, are leaving due to a lack of lab space and are being recruited to states that provide it. States have needed to respond by creating incubators, accelerators, research parks, and specialized shared-use, scale-up manufacturing facilities to address these needs.

The efforts in Maryland and Massachusetts are excellent examples of how active use of a state's capital budget can establish an extensive network of technology incubators and research parks focused
on serving life science companies with wet-lab space and broader technology development and commercialization services across their states. Maryland has seven incubators across the state offering wet-lab space, including in the communities of Baltimore City, Baltimore County, Frederick County, Montgomery County, and Prince Georges County. Plus, it has provided capital support for research parks in Baltimore. These wet-lab incubators are typically located near academic or other anchor life sciences institutions. A quasi-state technology economic development corporation, TEDCO has in place an Incubator Business Assistance Fund used to assist incubators and their tenants in obtaining consulting and/or training resources to foster the development of tenant companies. TEDCO provides funding that can be used when business services are needed that cannot be provided by the incubator staff. For example, incubators may use these funds to help a company develop a business model or marketing strategy, retain legal services, create marketing collateral, update a business plan, engage a temporary chief financial officer, or attend business training seminars. In Massachusetts, a portion of the roughly $500 million capital program of the Massachusetts Life Sciences Center has been used to support incubator and accelerator facilities as well as shared-use manufacturing facilities across the state, including the following:

- LabCentral in Cambridge
- North Shore InnoVentures Center
- UMass Boston Venture Development Center
- UMass Lowell Biomanufacturing Center
- Berkshire Innovation Center in the City of Pittsfield
- UMass Medical School’s MassBiologics
- Massachusetts Accelerator for Biomanufacturing in Fall River
- Worcester Polytechnic Institute’s Biomanufacturing and Education Training Center.

Over the years, states have used traditional state financing mechanisms, such as loan guarantees, direct loans, or tax increment financing, to support the development of biosciences wet-lab tenant improvements. The most comprehensive effort has been by Connecticut through Connecticut Innovations’ Biotechnology Facilities Fund, which offers a targeted resource for financing specialized biosciences tenant improvements. Since the Fund’s inception in 1998, Connecticut has committed more than $40 million to facilitate the creation of more than 330,000 square feet of new laboratory and related space in the state. What stands out about Connecticut’s effort is its focus on a deal-by-deal funding approach that offers flexibility to fit specific situations. Projects range in size from 7,500 square feet for a start-up disease detection company to 41,000 square feet of space for a new corporate headquarters to 10,600 square feet of transitional space located in New Haven at Science Park at Yale, that University’s research park. Depending upon the situation, the Connecticut Biotechnology Facilities Fund has worked with developers and building owners or with the biosciences company itself to structure financing so that the focus is on developing space to a specific company’s needs. There are also no specific underwriting requirements beyond the potential growth of the life sciences company. The overall objective is to maintain principal, not make a return.

Deepening the Pool of Venture Financing Support—Washington has seen above-average levels and growth of venture investments in its life science industry in recent years, but feedback from industry stakeholders paints a more mixed picture on availability of venture capital, particularly with respect to a lack of locally based lead venture-capital investors and for larger tranches of funding to support expansion and growth of venture-backed life sciences companies.

The State of Washington and a consortium of partners has established the W Fund, an early-stage seed and venture fund that is targeting the investment of $20 million (inclusive of state funds) over the next four years in start-ups spinning out of public universities in Washington and other specialized research institutions.
Life Science and Global Health Development in Washington State: Future at Risk

APPENDIX B

(such as Pacific Northwest National Laboratory and the Benaroya Research Institute). The W Fund invests in life sciences together with several other core technology sectors (software, IT, engineering, and clean tech). The W Fund’s initial investments are up to $500,000 when participating in a round of $1 million or more. The Fund may occasionally invest alone, and expects to make follow-on investments in its portfolio companies. The W Fund has been financially supported by a consortium of Washington stakeholders, including venture capitalists, law firms, and entrepreneurs, along with the Washington Research Foundation. The State of Washington supports the W Fund with $5 million provided from federal stimulus dollars. This is a valuable effort, but a small one relative to the needs for life sciences venture investment and the need for follow-on local funding to ensure venture-backed companies reach their full potential.

And, while Washington has been active via the W Fund, it is helpful to examine the approaches of other states. States have used a range of programs to ensure that their emerging life sciences and global health companies can obtain venture financing:

• A direct financing approach is found in North Carolina through the longest-standing efforts by the North Carolina Biotechnology Center (NCBiotech), a state-chartered, nonprofit development organization founded in 1985 that receives annual funding by the state. NCBiotech has two nontraditional direct business financing programs, which, unlike traditional bank financing, are made at earlier stages of a company’s development when few others will invest in these companies and reflect the expertise of NCBiotech in assessing specialized life sciences company development.

  • NCBiotech’s Small Business Research Loan program provides loan financing of up to $250,000 to advance the development of commercially viable technologies/products. This program supports companies in reaching specific and meaningful research milestones that could position them to obtain additional funding from private and public sources.

  • NCBiotech’s Strategic Growth Loan (SGL) program is designed to help North Carolina life sciences product companies reach specific and meaningful milestones that will enable them to obtain further funding from investors and/or to commercialize their products. For most applicants, SGL awards of up to $250,000 will be matched by an equal or greater investment from one or more organized angel groups or venture capital firms. For certain exceptionally well-qualified applicants that have a larger matching investment from a top-tier life sciences investment group, an SGL award of up to $500,000 will be possible.

Since 1989, 239 business loans have been made to 168 companies; of these, 95 companies are currently active. These 95 companies directly employed 2,188 workers in 2014, with estimated revenues of $1.9 billion. The full multiplier impacts on the North Carolina economy generate almost $2.9 billion in economic activity in the state and create or support 8,945 jobs earning $633 million in labor income. Annual revenues resulting from the total economic activity of these companies generate more than three times the tax revenue, an estimated $44.9 million in state revenues in 2014, than the state’s appropriation for NCBiotech of $13.6 million in 2014.

• Other states are leveraging the use of tax credits to help provide a pool of funding for state-specific venture funds. A long-standing example is the Colorado Venture Capital Authority (VCA) established in 2004 to make seed- and early-stage capital investments in businesses. The VCA was allocated $50 million in premium tax credits, which it subsequently sold to insurance companies. The VCA selected fund manager High Country Venture, LLC, and established Colorado Fund I and Colorado Fund II, each with approximately $25 million. The minimum and maximum investment sizes generally range from $250,000 to $3.375 million. As of February 2015, 31 emerging companies received investments across the two funds of nearly $46 million,
leading to the creation of over 1,200 jobs. A sizable share of the investments made have been to biosciences companies, from its initial company investment in Taligen Therapeutics in August 2005 to its most recent investment in VetDC, providing anticancer agents for pets.

- Another mechanism used by states is a fund-of-funds approach in which a pool of investment funds, typically from institutional investors such as public pension funds and university foundations, is created to invest in several venture capital firms that agree to leverage the investments provided and make a good faith effort to invest within the state. Best results have occurred with a fund-of-funds approach when there are more specific requirements for venture capital firms to locate offices and/or having an active fund manager identifying investment-grade emerging companies and facilitating introductions to the venture capital firms receiving funding.

A good example is the experience of Indiana, which created its Fund of Funds as a follow-on financing to its own locally based seed investment funds. In 2003, the Indiana Future Fund (IFF) was established to invest in venture capital funds that in turn would consider investments in life sciences companies in Indiana, investing $73 million across six venture capital firms. In December 2009, a $58 million INext Fund was established as a successor fund to the Indiana Future Fund, with four venture capital firms receiving investments. Investors in the IFF include Eli Lilly and Company, the Indiana Public Retirement System, the Indiana University Foundation, Indiana University, Purdue University, Indiana State University, Ball State University Foundation, American United Life Insurance, and WellPoint Inc. INext’s investors include Eli Lilly and Company, the Indiana Public Retirement System, the Indiana State University Foundation, University of Notre Dame, Purdue Research Foundation, Purdue University, and the Richard M. Fairbanks Foundation. A 2014 study of the impact of public and private efforts to advance innovation capital in Indiana found that Indiana made substantial gains in life sciences venture capital investment due to the presence of the IFF, with total venture capital investment in the life sciences in Indiana over the period 2003 to 2013 rising to $349 million across 100 deals and 39 companies, well exceeding the $80 million invested in the prior decade.5 But, this success was largely due to the IFF, whose fund manager had an active presence in Indiana. The INext Fund did not do as well initially until a new fund manager was put in place with a strong presence in Indiana.

The message is clear that a high-value business environment for growing life sciences and global health companies can be advanced that complements the current entrepreneurial development efforts found in Washington.

5 Re-Examining the Need for Innovation Capital to Advance Life Science Development in Indiana, prepared by Battelle Technology Partnership Practice, October 2014.
APPENDIX B

RETAIN HIGH GROWTH POTENTIAL MID-SIZED COMPANIES

Rationale:
Washington currently lacks a “critical mass” of larger, more mature life sciences companies that help attract seasoned employees and provide stability. Washington needs to do more to retain its home-grown companies that are having success and reaching critical expansion stages of development, though still not profitable. Reinstating the R&D tax credit is an important step for Washington to remain a competitive location. In addition, addressing the retention and attraction of top talent to help lead the growth of its expanding, home-grown life science and global health ventures is another key challenge for Washington. A consistent and urgent message driven home by conversations with industry stakeholders across the state and spanning industry subsectors is that expanding, home-grown life sciences and global health companies are handicapped by the lack of expertise to lead life sciences and global health ventures. Without this talent base, Washington is limited in its ability not only in growing companies, but in positioning its technology commercialization in ways that address market needs.

Suggested Approaches:
The types of public-private initiatives that should be considered beyond the reinstatement of the R&D tax credit to retain expanding, home-growth life sciences companies is addressing the ability to attract and grow high-skilled life sciences talent. This includes establishing incentives for high-skilled life sciences and global health executive-level talent to come to Washington; building the next generation of entrepreneurial scientists through design projects, professional masters, entrepreneurial training for grad/postdocs, and internships; and further advancing Entrepreneurs in Residence efforts to help attract and retain serial entrepreneurs.

Establishing incentives for attracting high-skilled life sciences innovation talent to Washington.
There are relatively few examples of industry- and skill-specific incentive initiatives to attract talent. One can, however, look for examples outside of life sciences and global health to where this has been undertaken with some success.

- Oklahoma, in an effort to bolster innovation and remain competitive in its aerospace industry, established the Aerospace Engineer Workforce Tax Credit program, providing tax credits to aerospace engineers and contractors as well as the hiring aerospace company. Eligible employees can have a degree in a number of engineering fields—aerospace, mechanical, electrical, industrial—as long as they are a new hire to the state’s aerospace sector. Tax credits are greater for those firms hiring engineers with degrees from Oklahoma colleges or universities. In addition, employers can receive tax credits for tuition reimbursement for new graduates. The program provides an annual tax credit for companies of up to $12,500 for each engineer hired and employed for up to five years. Engineers are eligible to receive up to $5,000 tax credit for five years on their state income taxes. The incentives began in 2009 and were extended in April 2014 through 2017. The Oklahoma Tax Commission reports that 549 engineers filed for the credit in 2011. The credits help reduce the costs to companies of hiring engineers, who earn among the highest average wages in advanced manufacturing operations. Aerospace companies in Oklahoma cite the credits as part of their cost and recruitment considerations in selecting an Oklahoma location.

Top talent in the life sciences and global health sectors will typically consider their longer-term career prospects and look beyond a current employment opportunity in a new city or state to what their next opportunity or career options within that industry
cluster might be. This creates a role for industry organizations to play in educating and making top talent aware of the vibrancy of a local cluster to help candidates see the broader opportunities available to them upon moving. Both Life Science Washington and the Washington Global Health Alliance publish local job postings via their websites, but should consider further career-specific or other branding or awareness efforts to boost the visibility and viability of Washington as a major life sciences and global health hub.

- The organizations could consider a joint “Life Sciences and Global Health High-Skills Career Service” to facilitate match-making for both existing state employees as well as those considering a move to Washington. The service could maintain alumni connections for graduates of Washington institutions working in the sectors or those considering moving back to the state from elsewhere and enable them to learn about the range of job opportunities. At the same time, it would seek to raise the profile of companies, organizations, and their career opportunities in Washington.

- The value of a High-Skills Career Service would be to make it easier for local experienced, senior scientific, technical, and management workers to stay in the state, and for those considering relocating for positions elsewhere to resolve issues that would otherwise become impediments to staying. This could include arranging meetings with industry peers to understand the breadth of the established workforce or assisting “trailing spouses” who also need to find suitable quality positions in the state.

This effort can be informed by successful efforts in other states to recruit and retain high-skilled workers and top talent. This includes Project Boomerang in Oklahoma and the Iowa Careers Consortium, a public-private partnership created to meet Iowa’s need for highly skilled workers. In addition, it builds on the past experiences of organizations such as the Pittsburgh Digital Greenhouse, which, in its early years, focused on helping recruit talent for firms coming to Pittsburgh to pursue system-on-a-chip technology development and later focused more broadly on electronics and robotics. Currently, the Pittsburgh Technology Council operates an extensive service, PGH Career Connector, to connect individuals with career opportunities in southwestern Pennsylvania, that goes beyond just a job posting service to include out-of-town recruiting events, job fairs, and custom recruiting services.

**Building the next generation of entrepreneurial, industry-connected scientists and engineers.** Connecting top students and recent graduates of life sciences, engineering, and global health-related programs with local industry opportunities should be a priority in an innovation-driven talent strategy. With concerns about the current and next generation of managerial or executive-level talent, the industry should consider proven ways in which to connect with students that can include all or some mix of the following approaches: senior design projects and capstone courses, professional master’s programs, entrepreneurial training for graduate students and/or postdocs, internships, and co-ops.

- Relevant to medical devices and other life sciences manufacturing, there are opportunities to improve the alignment of engineering-student design projects, cooperatives, internships, and other experiential learning and professional opportunities with the life sciences. It is critical to connect engineering students who may be outside of biomedical engineering programs—including those in key mechanical or industrial engineering programs—to these opportunities in the life sciences. A unique characteristic of engineering programs is the senior design project undertaken as a capstone, often team-driven project with an applied industry focus (including real deadlines and budgets and often direct interaction with a company) to design and prototype a product, electronic device, or software system. Life sciences and global health organizations in Washington should consider sponsoring or participating in these design projects to expose engineering and other science students to opportunities within the industry.
Top biomedical engineering programs, such as those at the University of Pennsylvania and Stanford University, are connecting graduate students with clinicians to see first-hand how to translate research and ideas from the bench to the bedside, and their professors are often active partners with the life sciences industry. Such opportunities must also be afforded to students in mechanical and other engineering fields to see viable career paths in the life sciences.

Likewise, internships and co-ops offer meaningful experiential learning opportunities and exposure to real-world technologies in a corporate environment. Each of these represent opportunities for science and engineering students to engage with, and learn more about, careers in the industrial life sciences and healthcare delivery sectors.

The benefits of student-employer interactions and experiences are becoming clearer as several states have put into place formal internship programs and initiatives, particularly in high-demand STEM-related fields or in those industries, like the life sciences, identified as key state industry clusters.

The Ohio Third Frontier Program developed an extensive internship program that was recently discontinued but is being relaunched. The program reimbursed up to 50 percent of the intern’s wages, or no more than $3,000 for a 12-month period. Ohio has targeted its internships to a set of high-growth technology industries including the biosciences, IT, instruments and controls, advanced materials, advanced energy, and power and propulsion. Eligible students are at least college sophomores or graduate students at any level and are in good standing academically in a STEM-related degree program. Since 2002, more than 4,000 students and over 800 businesses have participated in the program.

Washington does have a broad-based work-study program that offsets the costs for employers to hire low- and middle-income students needing financial assistance. In the most recent year, 4,500 students across all fields of study used this program. This effort may offer a platform to establish a more targeted STEM-based internship program in Washington.

Creating a “bench” of Serial Entrepreneurs to help lead expanding, home-grown companies.
Washington needs to have serial entrepreneurs with executive level experience in product development, regulatory affairs, finance and marketing readily available. A proven approach to sourcing managerial talent for new ventures is to form a structure where successful serial entrepreneurs can be utilized to not only review and identify new business opportunities, but also to step in to manage newly formed, early-stage companies. One example, of modest proportions, is the Pittsburgh Life Science Greenhouse (PLSG). Since its founding back in 2001, PLSG has emphasized an Executive-in-Residence (EiR) program with domain-specific, C-level leadership, providing executive talent to help form and grow companies. Since inception, 50 executives have participated in the PLSG EiR program, 5 are currently active in the PLSG Executive Program, 35 former EiRs remain in the region (18 as CEOs and 17 as C-Suite and Executive Team members), and 15 of those 35 represented life sciences executives who relocated to the Pittsburgh region.

In Seattle, this EiR-type model is embraced and implemented by the Accelerator Corporation where experienced entrepreneurs and managers serve as the initial management teams of new life sciences ventures. The University of Washington’s CoMotion innovation initiative utilizes veterans of industry as EiRs for six- to nine-month stints to help identify technologies with commercial potential. In addition, the Washington Innovation Network (WIN) Entrepreneurial Mentoring Program, highlighted earlier in this section, is matching entrepreneurs with seasoned mentors.

But, Washington should consider leveraging EiRs at scale. One way is to create a national network of entrepreneurs to engage with local opportunities in Washington, and then to apply the incentives to grow local companies to attract these national entrepreneurs to help lead new start-ups and emerging companies in Seattle. By creating these
APPENDIX B

relationships, Washington can get beyond its locational issues. While there is no best practice location that has fully tackled raising scaled-up bench of entrepreneurial talent, the Innovation Center for the Rockies has an interesting approach through its database of more than 1,800 screened and qualified advisors with specific technology-domain expertise to support local early-stage companies and to inform the commercial assessment of university technology and guide its commercialization approach, including connecting it with investors and management teams. The Innovation Center for the Rockies has used this resource to become a premier entrepreneurial support organization that works closely with the university technology transfer offices across the Front Range region from Boulder to Denver to Colorado Springs, as well as to directly help launch new ventures.
ATTRACT MAJOR CORPORATE INNOVATION CENTERS

Rationale:

Other states are having notable success in attracting research centers of major biopharmaceutical and medical devices companies to collaborate with their universities and nonprofit research centers. Perhaps the best-known example is the “life sciences stampede” taking place in Cambridge, Massachusetts, and the Greater Boston area. Recent years have seen many of the largest life sciences companies in the world announce intentions to launch or expand their presence in Massachusetts, with 15 of the top 20 global leaders in biopharma now having a presence in Massachusetts, and many, like Pfizer, Biogen, Novartis, Shire, and Sanofi-Genzyme, each having over 1,000 employees in the state. Many of these companies had little to no presence in Massachusetts seven years ago. Site Selection magazine, in reporting on the relocation of Pfizer’s R&D operations to Cambridge in 2011, highlighted the importance of leading research institutions and the talent they house, as emphasized by Pfizer’s Worldwide R&D President: “We deliberately chose to move to Cambridge as part of our research and development strategy, in order to foster productive collaborations between our drug discovery experts and the outstanding scientists of Cambridge’s world-class institutions.”

This rise of corporations relocating major research facilities to be near universities reflects a larger shift in how innovation is advanced. Bruce Katz and Scott Andes from the Brookings Institution explain in a recent Harvard Business Review article: “What’s driving companies to relocate near urban universities is the changing role of innovation within the private sector as firms are increasingly relying on external sources to support technology development. In the past, many large companies tended to innovate in isolation… Today, few firms monopolize the technologies on which they rely, and they can no longer absorb the total costs of radical innovation alone… Technology “platforms” undergird new products more than in the past. Basic science in

Emerging Areas of Opportunity for Washington’s Life Sciences and Global Health Sectors

Discussions with university and industry leadership in the life sciences and global health sectors suggested that, beyond current and historical strengths, opportunities are emerging for the state to accelerate growth and capitalize on areas where complementary strengths in Washington align with emerging market needs. These discussions point to future areas where the state can make its mark, including the following:

- **Advancing a “One Health” approach** that leverages and connects Washington’s global health community with broader life sciences and technology strengths to pursue reach into global markets for Washington’s biopharmaceutical, medical device, animal health, and agricultural sectors… while addressing environmental and sustainability issues.

- **Pursuing “Technology Convergence”** with life sciences and global health, including Big Data, Personalized Medicine, and Digital Health.

- **Building off “Strengths in Immunotherapies”** to extend beyond cancer into medical innovation for autoimmune and neurodegenerative diseases.

6 “Potent Formula: Lured by proximity to Greater Boston’s key institutions and the talent they harbor, Pfizer expands in Cambridge,” Site Selection; November 2011.
genomic is the platform on which new biological drugs rely.... No corporate research center ‘owns’ any of these platforms, but they all must understand and apply advances within them to new products and services.7

While Washington has seen interest by companies establishing a research presence—such as GlaxoSmithKline launching its nonprofit research Altius Institute for Biomedical Sciences in Seattle, Celgene establishing a presence close to Seattle-based research partners, and Eli Lilly and Company continuing to partner with the Infectious Disease Research Institute as part of the Lilly Global Health Partnership—the state is not experiencing this growing national trend in the location of corporate innovation in the life sciences despite having leading positions in several growth opportunities of note. If anything, the recent loss of Amgen and Merck, after making acquisitions of local Seattle-based firms, suggests that a more intentional, public-private partnership focus on capturing corporate innovation centers is needed.

Suggested Approaches:

There are a growing range of examples of public-private partnership efforts to advance the presence of corporate innovation centers in targeted areas of life sciences and global health. Key to the success of these efforts is having state matching-fund support upfront to catalyze the effort and a broad approach to commercialization and entrepreneurial support.

- One such example is the Indiana Biosciences Research Institute (IBRI), launched in 2013 as a statewide public-private partnership with an initial $25 million state commitment that has now been matched by more than $200 million in corporate and philanthropic funders. The Institute is developing a novel operating model, with industry providing a major source of funding and defining the Institute's research focus to optimize commercialization opportunities. Industry executives from Eli Lilly and Company, Roche Diagnostics, Dow AgroSciences, Indiana University Health, Cook Medical, and Zimmer Biomet have been critical in advancing the Institute in partnership with BioCrossroads (a nonprofit life sciences development organization), state government, and Indiana's research institutions. The Institute will initially focus on conducting precompetitive research on the most pressing global and local interrelated human health issues: cardiovascular disease, diabetes, obesity, and nutrition. These interrelated metabolic disorders are a major economic burden and a leading cause of death in the United States.

- Another example is Cleveland's Global Cardiovascular Innovation Center (GCIC), a $250 million product-commercialization consortium led by the Cleveland Clinic. Partners include Case Western Reserve University, The Ohio State University, the University of Cincinnati, the University of Toledo, University Hospitals, industry leaders, and economic development organizations. The State of Ohio contributed $60 million to the Center. GCIC provides commercialization assistance to its member companies, including creation of spin-off companies and equity partnerships, assistance with licensing and intellectual property (IP) issues, technology validation, links to venture capital funding networks, and access to prototyping and preclinical facilities. It also actively recruits out-of-state cardiovascular companies to locate at its facilities. To date, GCIC has helped attract 22 businesses to Ohio that were not there before and has added over 1,000 jobs to the Ohio economy, plus its incubator facility is supporting 44 companies with 63 commercialization funding awards granted. Overall, nearly $1 billion in follow-on funding, mergers and acquisitions returns, or public offerings have been secured by GCIC portfolio companies.

- A third example is the California Institute for Quantitative Biosciences (QB3), established in 2000 as a partnership between the University of California system, state government, and industry with strategic collaborations across each entity. The Institute serves as a network to an array of basic research centers at the cutting edge of

quantitative biosciences, involving cell imaging, biocomputing and visualization, small molecule discovery, synthetic biology, and cell engineering, among others. It has developed a range of support for entrepreneurs including a network of incubators, a venture capital fund, a “startup in a box” program, Small Business Innovation Research/Small Business Technology Transfer workshops, and Bridging-the-Gap Awards. The QB3 Incubator Network spans 40,000+ square feet of space, and more than 80 resident companies and an additional 400 non-resident early-stage companies from 2005 to 2014 have created over 1,700 jobs and raised $600 million in investments from public and private sources. A 2015 survey found that in 2014, QB3 early-stage companies formed 77 new partnerships, plus QB3 also has a strong track record in advancing strategic research alliances, including with Pfizer, Johnson & Johnson and GE Healthcare.

Beyond state matching funds for new collaboration centers focused on growth opportunities, it is also important to extend job creation incentives to major life sciences and global health corporations. Massachusetts has had great success in using its Life Sciences Job Creation Tax Incentive Program to not only support emerging companies, but to “seal the deal” with larger corporation innovation relocations. As Travis McCready, President of the Massachusetts Life Sciences Center, explains: “The Massachusetts Life Sciences Center’s Job Creation Tax Incentive Program has encouraged life sciences companies of all sizes to create jobs and grow their businesses in Massachusetts, and it has also played a significant role in encouraging some of the global leaders in life sciences, such as Amgen, Shire and Baxalta, to make significant investments in new or expanded facilities here.”

Another state that has been successful in attracting life sciences corporate innovation investment through increased incentives is Iowa. As part of its High-Quality Jobs program, Iowa offers Supplemental Research Activities Credits of 3 percent if gross revenues are above $20 million and 10 percent if gross revenues are below $20 million. These supplemental R&D tax incentives have helped attract several agbiosciences research centers, including Monsanto, Cargill, and DuPont Pioneer.

While matching funds for targeted collaboration centers and enhanced tax incentives are important ingredients for attracting major corporate innovation centers, the experience of Georgia Tech, which has attracted more than a dozen such corporate innovation centers, highlights the importance of streamlining contracting and technology transfer agreements and creating the internal management systems to put these corporations first. Interviews with Georgia Tech leaders for advancing these corporate innovation partnerships emphasized the importance of “Georgia Tech having to establish new contracting approaches that are more business-like … for range of possibilities including traditional licensing, licensing with joint IP. Plus, key to success is having a dedicated “account management team” … takes a lot of energy and time to create value proposition for each company.”

10 TEConomy Interview with Georgia Tech leadership, June 2016.