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## **High Technology in New Hampshire: The Future is Now**

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## High Technology in New Hampshire: The Future is Now

### *I. The Early 2000s Technology Decline in New Hampshire and the Nation*

High technology employment started to decline in the nation and New Hampshire in December 2000. This was after a “technology boom” and an extended period of economic prosperity in New Hampshire and the nation. The decline in the State lasted almost three years, until October 2003. During that time period, New Hampshire lost more than one of every three high technology jobs, compared to the national average of one in five.

New Hampshire’s percentage decline was higher than any state with significant high technology employment concentration. In comparison, Massachusetts and Colorado -- the two highest ranking states in technology employment concentration -- both lost one of every four high technology jobs.

The decline of high technology in the early 2000s in New Hampshire represented a significant downturn. The State was among the leading high technology states in the 1990s and a leading state in overall economic growth, ranking among the top states in per capita income growth (2<sup>nd</sup> to another high technology leading state, Colorado) and rising from 25<sup>th</sup> to 6<sup>th</sup> in per capita income over the last 2 decades of the 20<sup>th</sup> century.

In the last published American Electronics Association (AEA) *Cyberstates Report* (2003), New Hampshire ranked 10<sup>th</sup> among the 50 states in the percentage of private sector employment in high technology industries, with 7.3 percent of employment in high technology (see Table 1 below). This ranking, while high, represented a significant drop from 1995, when the State was ranked first in the nation, and also a drop from 1998, when the State had the second highest high technology employment concentration in the nation -- trailing only Colorado. New Hampshire now has a lower concentration of high technology workers than Colorado, Massachusetts and seven other states.

Table 1

State	2002	Ranking 2002	Ranking 1998	Ranking 1995	Change in Ranking (95-98)	Change in Ranking (98-02)	Change in Ranking (95-02)
Colorado	97.9	1	1	2	1	0	1
Massachusetts	91.8	2	3	3	0	1	1
Virginia	90.0	3	5	8	3	2	5
New Mexico	81.6	4	22	25	3	18	21
Maryland	80.2	5	12	10	-2	7	5
<b>New Hampshire</b>	<b>72.5</b>	<b>10</b>	<b>2</b>	<b>1</b>	<b>-1</b>	<b>-8</b>	<b>-9</b>

*High-Tech Workers Per 1,000 Private Sector Workers (Source: AEA)*

The State’s experience contrasts sharply with three states that moved ahead of New Hampshire in the AEA high technology ranking in the early 2000s. New Mexico, benefiting from Federal research and development investment, improved 21 positions from 25<sup>th</sup> to 4<sup>th</sup> in rank from 1995 to 2002. Virginia, with growth in software and Internet-related industries, improved 5 positions from 8<sup>th</sup> to 3<sup>rd</sup>. And Maryland, also benefiting from Federal research and development, as well as National Institute of Health and Department of Defense funding, improved from 10<sup>th</sup> to 5<sup>th</sup>.

**II. What is high technology?**

There are many definitions of high technology. For reporting and comparative standards we use the AEA definition of high technology industries. Table 2 below lists the key AEA high technology industries in which New Hampshire has significant employment and provides the State’s high-tech location quotients for these industries, with manufacturing industries shown in blue. Location quotients (which are calculated as the percentage of total high technology employment in a specific detailed industry sub-sector in New Hampshire, divided by the percentage for the nation) are useful to depict industries of high and low concentration within high technology. A location quotient above 1 indicates industry concentration in the State above the U.S. average, while a location quotient less than 1 indicates industry concentration below the average.

Table 2

NAICS CODE	INDUSTRY	Location Quotient
3341	Computer and Peripheral Equipment Manufacturing	1.8
3342	Communications Equipment Manufacturing	2.0
3344	Semiconductor and Other Electronic Component	2.3
3345	Measuring, Electromedical, and Control Instruments	2.6
5112	Software Publishers	1.4
5171	Wired Telecommunications Carriers	0.3
5172	Wireless Telecommunications Carriers	0.3
5173	Telecommunications Resellers	0.4
5174	Satellite Telecommunications	0.3
5179	Other Telecommunications	0.0
5181	Internet Service Providers and Web Search Portals	0.4
5415	Computer Systems Design and Related Services	0.8
5417	Scientific Research and Development Services	0.4

*Location Quotients for key high technology industries (Source: AEA)*

Within the general category of high technology, New Hampshire has a much higher concentration than the U.S. average in manufacturing industries but a lower concentration in service industries. The measuring, electro-medical and control instrumentation industry in New Hampshire has the highest concentration relative to the U.S. average. This industry's New Hampshire location quotient of 2.6 documents that the industry has 2.6 times the employment concentration as the U.S. average. Outside of four manufacturing industries, software is the only high technology industry for which the State has a higher concentration than the U.S. average.

Within measuring, electro-medical and control instrumentation, New Hampshire has particular concentration in one industry -- search and detection instrumentation manufacturing. Nearly one of every five high technology jobs and (one of every three high technology manufacturing jobs) in the State is now in this defense-related industry. There are also other industries within high technology that are defense-related, but this is far and away the most significant. The industry includes establishments in manufacturing search, detection, navigation, guidance, aeronautical, and nautical systems and instrument manufacturing. Examples of products made by these establishments are aircraft instruments (except engines), flight recorders, navigational instruments and systems, radar systems and equipment, and sonar systems and equipment. The primary employer in this industry in New Hampshire, and one of the largest private employers overall in the State, with 4,600 employees, is BAE Systems.

New Hampshire's high technology concentration in search and detection instrumentation manufacturing is more than six times the industry's concentration in the nation and its concentration in the leading high technology states, Colorado and Massachusetts.

Despite the overall decline in technology employment in New Hampshire during the early 2000s, search and detection instrumentation manufacturing employment was stable. Without this industry, the decline of high technology employment in the State would have been even more pronounced - declining by closer to 40 percent rather than one-third. During the "tech bust", the search and detection instrumentation industry's concentration of technology jobs in New Hampshire increased from about one-eighth in 2000 to nearly one-fifth by 2003.

The search and detection instrumentation and other high technology industries provide not only significant employment, but also contribute substantively to the research and development (R&D) and innovation base in the State. The search and detection industry alone provides about one-third of the R&D investment in the State and the leading company in the industry, BAE Systems, on its own accounts for 1 of every 4 patents in the State, a percentage that has been increasing over time.

### ***III. Why we should care about high technology in New Hampshire?***

Why should we care about high technology industries when the overall New Hampshire economy experienced recovery (starting in 2002) even before the recovery of high technology industries in the State? New Hampshire has led the New England region in employment growth since 2002, with total employment growth of 2.5 percent compared to the U.S. average of 1.4 percent. This compares very favorably with the experience in Colorado (.4%) and Massachusetts (-1.7%), the leading high technology states.

We care about high technology in New Hampshire because over one-third of the State's gross product is directly or indirectly tied to high technology industries. The direct effects are through employment; the indirect effects are through supplier relationships and purchases by companies and employees. And we care because high technology contributes significantly to high income and income growth. States leading in high technology -- including Massachusetts, New Hampshire, Colorado and Maryland -- have the highest per capita income in the nation, and also

lead the nation in per capita income growth over the last quarter century (see Figures 1 and 2 below).

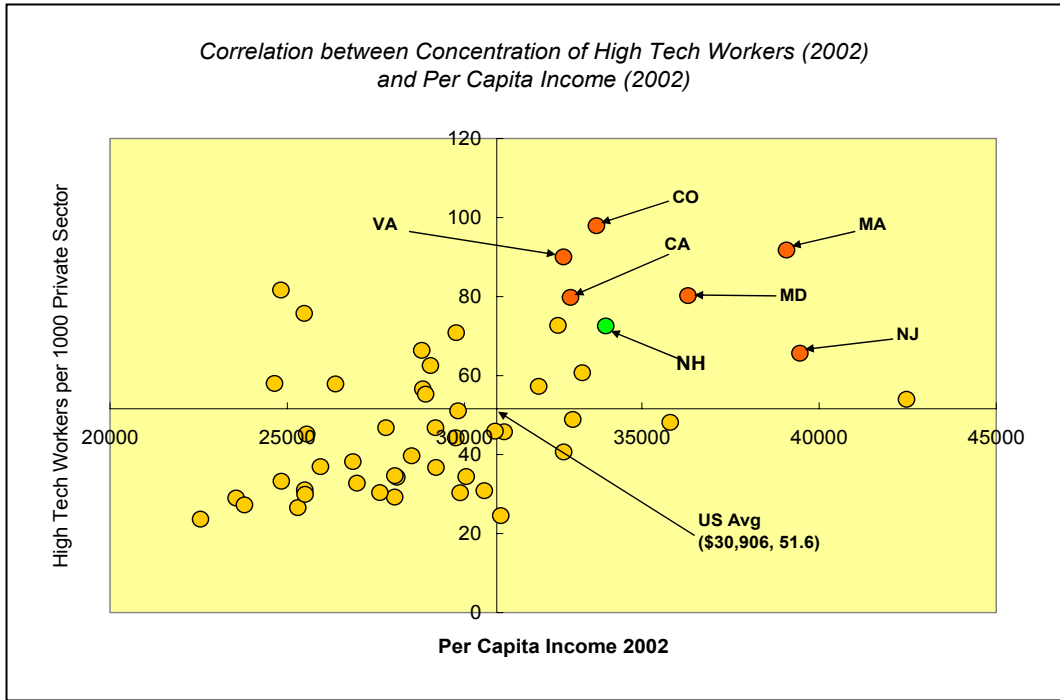


Figure 1

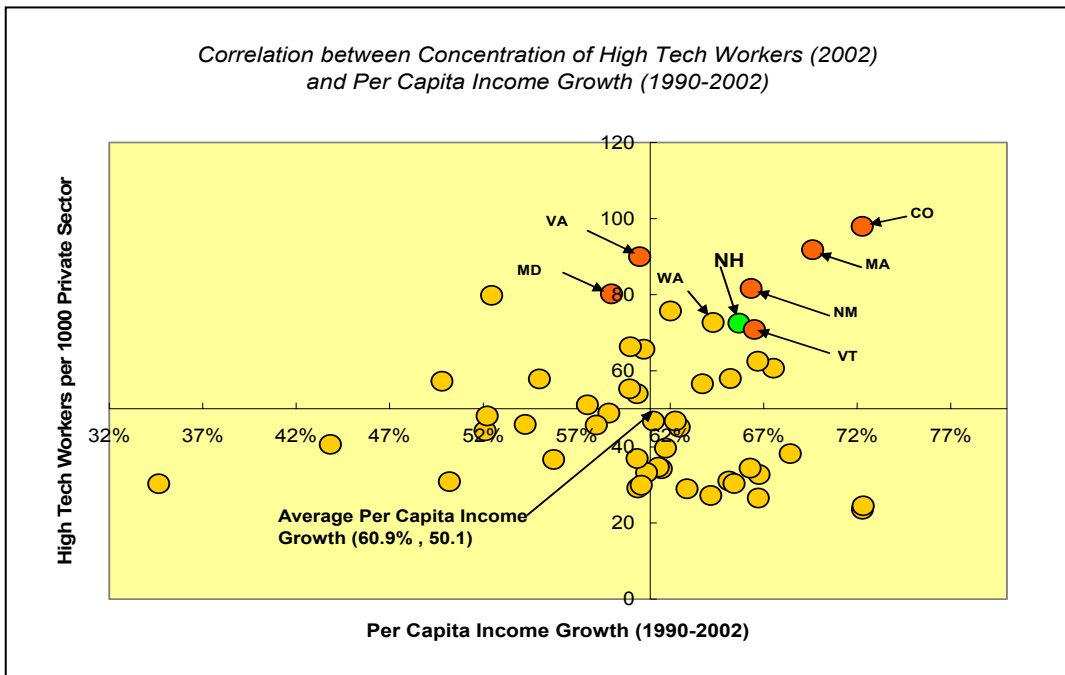


Figure 2

The relationship between high technology employment and high per capita income is also true within the Granite State. The two New Hampshire counties – Rockingham and Hillsborough – with the highest concentration of high technology employment also have the highest per capita income growth in the State. The two counties with the lowest employment concentration in high technology – Coos and Carroll – have the lowest per capita income growth.

We care about high technology in New Hampshire because high technology industries pay substantially higher wages compared to other private sector industries. In the State, wages in high technology are higher than the average private sector wage by 75 percent.

And we care because the contributions of high technology to the State’s economy cannot be fully represented by only documenting the employment of high technology industries as defined by the AEA and others. Many industries outside the formal definitions of high technology employ workers in technology occupations. For example, over 25 percent of Fidelity’s 5,000+ employees at its Merrimack facility are “technologists” who use computers and applied knowledge in their day-to-day work activities. According to the NH Department of Employment Security, three of the top four leading occupations in terms of expected job growth in the State – computer software application engineers, network systems and data communication analysts and medical records and health information technicians – are and will continue to be in technology fields over the next 10 years. Each of these occupations is expected to grow by more than 50 percent in the State over the 10-year period. Across New Hampshire in many industries not traditionally classified as high technology industries -- such as hospitals, insurance, and banking and financial services—much of the job growth will be among technologists.

#### ***IV. The “tech bust” in New Hampshire - what happened?***

The main reason for New Hampshire’s pronounced decline in high technology in the early 2000s was the State’s significant concentration in *commodity-like* technology product manufacturing relative to other states. In 2000, approximately two-thirds of the State’s technology employment was in manufacturing, compared to the U.S. average of one-third and the New England regional and Massachusetts averages of approximately 40 percent. About one-eighth of total technology employment in New Hampshire in 2000 was in two manufacturing sub-sectors, semiconductor manufacturing and non-defense related instrumentation. These are highly cyclical industries that

in the late 1990s and early 2000s were not only adversely affected by the cyclical and post-Y2K downturn in the demand for technology products, but also severely impacted by the increased outsourcing of high technology component parts to lower cost nations, including China.

As these industries declined, so did New Hampshire's high technology rank and status. And with the decline came heightened concern for high technology's future in the Granite State, especially with increased global outsourcing of commodity-like products and services.

It is unlikely that commodity-like semiconductor and non-defense related instrumentation manufacturing employment will grow significantly in the future, even with a cyclical upturn and post Y2K recovery. Evidence of this in New Hampshire in January 2005 -- as high-technology recovers in general across the nation and globally -- are the vacant parking lots at two semiconductor and related parts contract manufacturers, Celestica and Flextronics, at the Pease International Tradeport. Both companies are increasing production of semiconductors at their facilities in other nations, while continuing to pay rent on their dormant Pease facilities.

The decline in commodity-like technology product manufacturing is a national phenomenon, and not specific to New England or New Hampshire. Over the last two decades employment in instrumentation manufacturing in the U.S. has declined 23 percent. Since 2001 employment in semiconductor manufacturing in the U.S. has declined by 28 percent. The declines are a result of not only the late 1990s cyclical downturn in technology, but also the globalization of the technology production and services and the outsourcing of commodity-like technology product manufacturing to nations with the lowest labor costs and weakest environmental standards. Outsourcing is expected to continue and even increase.

What was specific to New Hampshire was the State's sizable concentration in high technology product manufacturing (more specifically, commodity-like semiconductors and non-defense instrumentation manufacturing) and, of course, the recent consequences noted above. The vulnerabilities in the manufacture of commodity-like technology products in the U.S. and New Hampshire have been "exposed" and have resulted in a pronounced decline in New Hampshire's high technology employment overall, and also relative to other leading high technology states in the late 1990s and early 2000s. The State cannot rely on a cyclical recovery in these industries for a revival of its high technology industry.

## V. Looking forward

The outlook for high technology in New Hampshire is uncertain. While the State is in the top quintile in current technology position, as measured by concentration of total employment in high technology industries by the AEA, the recent trends have included the sharp decline in high technology employment in the early 2000s and the bleak prospects for recovery in two important industry sectors. There is also concern with regards to the State's infrastructure being capable of supporting future technology growth and competitiveness.

In high technology infrastructure, New Hampshire fares less favorably than other states in the top quintile AEA ranking. This is as documented and assessed by two leading "think tanks" on high technology, the Milken Institute and the Committee for Economic Development (CfED), in their most recent reports and rankings. The Milken Institute produces a Science and Technology Index Ranking of the 50 states' capacity to compete effectively in an innovation-based global economy. The CfED assesses the U.S. states on overall economic development capabilities, including capacities closely related to technology industries.

In 2004, New Hampshire had an overall Milken Institute National State Technology & Science Ranking of 12<sup>th</sup> of the 50 states. Leading all states is NH's neighbor, Massachusetts. Two other New England states, Rhode Island and Connecticut, rank above NH, being 9<sup>th</sup> and 10<sup>th</sup> in the nation. Rhode Island most significantly improved in rank by 10 positions over the last 2 years.

Table 3

<b>State Technology &amp; Science Overall Index</b>						
<i>Source: Milken Institute</i>						
<b>State</b>	<b>Score (2004)</b>	<b>Rank (2004)</b>	<b>Score (2002)</b>	<b>Rank (2002)</b>	<b>% Change in Score (02-04)</b>	<b>Change in Ranking (02-04)</b>
Massachusetts	84.4	1	84.9	1	-0.6%	0
Colorado	78.8	3	80.6	2	-2.2%	-1
Maryland	78.2	4	77.9	4	0.4%	0
Virginia	72.3	5	73.3	5	-1.4%	0
Utah	66.5	9	68.3	9	-2.6%	0
Connecticut	66.3	10	68.6	8	-3.4%	-2
Rhode Island	64.0	11	57.3	21	11.7%	10
<b>New Hampshire</b>	<b>63.4</b>	<b>12</b>	<b>63.4</b>	<b>13</b>	<b>0.0%</b>	<b>1</b>

Looking more specifically into the most relevant composites that go into the overall Milken Index, New Hampshire was ranked in the top quintile in 2 of the 4 composite ranks in which it has also been improving -- Research and Development Inputs, and Risk Capital and Entrepreneurial Infrastructure. In another composite, the State is in the median quintile and improving -- Human Capital Investment. But in a very important factor -- Technology and Science Workforce -- New Hampshire ranked poorly and has declined in rank. On this critical measure the State ranks in the second-to-bottom quintile and declined six rank positions in the last two years.

The main reasons for the poor rank in Technology and Science Workforce are the low percentages of high skilled scientists and engineers in the workforce. The State's rank in Technology and Science Workforce is in sharp contrast to the positioning of other high technology leading states --Massachusetts, Maryland, Virginia and Colorado—which all rank in the top five in this category. The recent decline in New Hampshire's rank is also in sharp contrast to Rhode Island's improvement from 2002 to 2004, from 32<sup>nd</sup> rank to 21<sup>st</sup>. This suggests that decline in workforce capabilities in technology is not a regional, New England, phenomenon.

**Table 4**

<b>Technology &amp; Science Workforce Composite Index</b>				
<i>Source: Milken Institute</i>				
<b>State</b>	<b>Score (2004)</b>	<b>Rank (2004)</b>	<b>Rank (2002)</b>	<b>Change in Ranking (02-04)</b>
Massachusetts	89	1	3	2
Maryland	86.11	2	1	-1
Virginia	81.56	4	4	0
Colorado	78.78	5	5	0
Connecticut	71.22	9	9	0
New Mexico	62.89	15	19	4
Utah	62.11	17	20	3
Rhode Island	57	21	32	11
Oregon	53.89	24	24	0
<b>New Hampshire</b>	<b>47.67</b>	<b>32</b>	<b>26</b>	<b>-6</b>
Maine	44.56	37	35	-2

## ***VI. Yes, there is a future for high technology in NH***

### ***A. Resiliency***

Even with the deficiencies outlined above, the technology sector in New Hampshire has been resilient in the past and appears to be once again after the early 2000s technology downturn. In the late 1980s, the State's high technology industries recovered from the decline of the mini-computer and the exit of the State's largest private sector and technology employer at the time (Digital Equipment Corporation) to rank first in high technology employment concentration in the mid-1990s. Today's resiliency includes a relatively quick and robust recovery from sharp employment decline and a proclivity to shift within high technology from sub-sectors in decline, to growth sectors.

The good news currently is that, once again, the technology sector in New Hampshire is a national leader. After having the sharpest decline, New Hampshire has experienced the best "recovery" of any high technology state. While not recovering all the jobs lost yet, New Hampshire has had the highest percentage increase in total technology employment. This is as measured from October 2003 (the low point in the most recent tech downturn) to June 2004 (the latest month for which data is available for all the states). In that time period, technology employment has increased over nine percent in New Hampshire. This compares to a 1 percent increase (from troughs) in the nation, and in the two leading states in high technology employment concentration, Massachusetts and Colorado.

The most recent data indicates that New Hampshire does have a future in high technology and that the State's high tech recovery has already started.

### ***B. Strengths***

#### ***1. Core NH Strengths***

New Hampshire can continue to leverage its core economic strengths to shift employment to growth sectors and to sustain a high technology and high per capita income based economy. The State's strengths include: a favorable business and tax climate, a superior quality of life,

technology history and culture, proximity to the Boston/Route 128 high-tech centers and university and research and development resources, and access to financial capital.

## 2. *Specific High Tech Strengths*

Specific strengths in high technology in New Hampshire as identified in the most recent Milken Institute Science and Technology rankings include a technology and Internet savvy and wired population, research and development investments in the environmental sciences, venture capital investment in the State and the concentration of software industry professionals in the current workforce. These are the detailed components in the composite measures reviewed above for which New Hampshire ranks highest.

**Table 5**

TECH & SCI INDEX COMPONENT	Rank Among 50 States 2004
Households With Computers Percent, 2001	2
Households With Internet Access Percent, 2001	2
R&D Expenditures on Environ Sciences US\$ Per Capita, 2001	3
No. Companies Receiving VC Investment per 10,000 Business Establishments, 1993 - 2002	3
Venture Capital Investment As Percent of GSP, 2002	3
Intensity of Software Engineers, Systems Software Per 100,000 Workforce, 2001	8

Notably, there are leading sectors within high technology that have performed relatively well in New Hampshire and have good prospects for grow in the future. These include the defense-related industries, such as search and detection instrumentation manufacturing, and in the future Homeland Security related industries. Also included is the service sector within high technology in New Hampshire -- in particular such industries as computer system design, computer software development, research and development services and engineering and related services – which has grown significantly in employment over the last two decades.

In the high technology service industries there has been growth over the last decade similar to or greater than other high ranked technology states and better than the U.S. average. The relative strong performance endured even the early 2000s tech downturn. For example, computer system design employment in New Hampshire grew by 14 percent over the last decade compared to 13 percent nationally and 12 percent in Massachusetts, and employment in the industry declined less in New Hampshire during the recent recession than in Massachusetts and the U.S. average. Since the bottoming out of high technology in New Hampshire, high technology services in New

Hampshire have grown over seven percent, with growth concentrated in engineering services and custom computer programming employment.

The movement of high technology concentration to new growth sectors can be, once again, facilitated by the State's strong entrepreneurial culture. There is a high level of entrepreneurial activity in New Hampshire, with over 4,600 companies started in 2003, or about 3.6 per 1,000 population. This is a significantly higher rate than the national start-up average of just below 2, and the State has the highest start-up rate per capita in New England.

### ***C. Concerns***

#### ***1. Employment Growth***

While companies are started in New Hampshire, they do not seem to be making it to the phase with significant employment and this has adversely impacted the high technology sector in the State. According to the most recent (2004) report and ranking from the Committee for Economic Development (CfED), the State lags other high technology states (see Table 6 below) in the five-year percent change in new companies and employment growth at new companies. This is primarily a result of gaps/deficiencies in new venture financing, private investment in research and development and technology workforce development.

#### ***2. Capital Gap***

In 2003, the venture capital industry allocated only nine percent of investments in the State to companies in the seed and start-up stage, investing a total of only \$2 million in three seed/start-up investments in New Hampshire. This venture capital allocation represents a continued move away from seed and start-up companies to later stage investments and contributes to the lack of capital for New Hampshire's high growth, high technology entrepreneurial ventures. In contrast to the venture capital funds, in 2003 angel investors in New Hampshire and nationally invested the majority of their funds in seed and start-up stage companies.

Employing conservative estimates, the State's capital gap is close to \$75 million at the low end and \$165 million on the high end. This gap represents the seed and start-up equity investment capital needed for high growth entrepreneurial start-ups in New Hampshire.

### **3. *R&D Investment***

In research and development (R&D) investments, New Hampshire, relative to Massachusetts and other high technology states, ranks very low in investment per capita. In 2000, The State ranked only 21<sup>st</sup> of the 50 states in R&D investment per capita, with less than one-third the investment per capita of Massachusetts and less than one-half the levels of two other states in New England, Connecticut and Rhode Island (Milken Institute, Science and Technology Index, 2004).

Currently, U.S. Department of Defense (DoD) contractors and the search and detection instrumentation manufacturing industry are the most significant contributors to R&D in the State. We estimate that DoD contractors in the State, through government-funded and self-funded R&D investments in the State, account for greater than one-third of the total private R&D in the State. Without the defense industry, New Hampshire would drop to well below the median in R&D spending and the State's ability to compete and grow in high technology would suffer significantly.

Close to 50 percent of all Federal R&D funding and 90 percent of all Federal R&D funding of industry in New Hampshire is from the DoD. For example, BAE Systems (the largest DoD contractor in the State) accounts, on its own and through its subcontracts, for approximately \$100 million of R&D spending in the State annually. The company's Information & Electronic Warfare Systems (IEWs) unit, headquartered in Nashua, accounted for a significant portion of the \$5 billion in revenues generated by BAE Systems North America in 2004, with almost all (about 95%) of IEWS' revenues coming from Federal contracts. In addition to its DoD efforts, BAE Systems has increasing activity in Homeland Security, with revenues of over \$100 million last year. BAE Systems provides significant subcontracting opportunities to other companies in the State, with over \$80 million in contract work awarded to more than 300 companies in New Hampshire in 2004. Many of these companies are high technology companies.

### **4. *Workforce Skills***

New Hampshire is also increasingly lagging other high technology states in advanced technical skills of the workforce. Initiatives are required to help address the State's workforce capabilities shortcomings relative to other high-tech competitor states (see ranked order list of areas that NH

ranks below top high-tech ranked states' average below). This is particularly true with regards to graduate students and PhD holders in science and engineering. Contributing to this is the State's poor ranking on investment in education, Federal research and development investment, and university spin-offs of tech companies.

**Table 6**

Variable	Rank NH 2004	Difference between NH and Avg Rank of Other HT States (CO,MA,VA,NM,MD)
Graduate Students in Science & Engineering	39	-26.8
Five Year Change in New Companies	44	-25.7
Charitable Giving	48	-21.8
Job Growth Due to New Business	41	-17.8
Energy Costs	45	-13.7
PhD Scientists & Engineers	22	-13.3
Average Teacher Salary	42	-13.2
Initial Public Offerings	25	-12.2
Loans to Small Businesses	46	-8.3
Federal Research & Development	13	-6.8
University Spin-outs	26	-6.8
Private Research & Development	33	-5.3
High School Completion	36	-4.5
Technology Industry Employment	11	-4.3
Industrial Diversity	32	-1.0
Average Annual Pay	16	-0.5
New Companies	16	-0.2
Average Annual Pay Growth	36	-0.2

***VII. Policy Priorities***

Technology workforce development, investment in research and development and new venture financing are three key areas that need to be addressed to keep the New Hampshire high technology sector strong. These and some other critical areas (including leveraging and growing the State's DoD and Homeland Security related industries, and promoting/branding New Hampshire as a desired destination for high technology industries, skilled workers and entrepreneurs) must be addressed to keep New Hampshire among the leading high technology states.

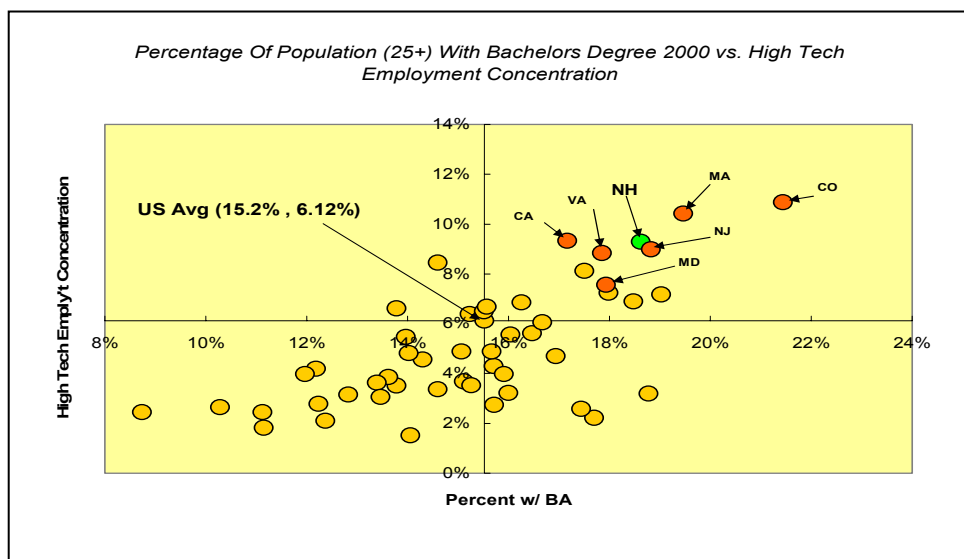
In particular, initiatives are required to help facilitate an effective transition in the technology sector from concentration in commodity-like product manufacturing to new innovative product manufacturing and higher concentration in technology services.

NetworkNH -- with participation by representatives from NH High Technology Council, Department of Resources and Economic Development, University of New Hampshire, NH Small Business Development Center, Manchester Chamber, Monadnock Region Business Incubator Network, Mt. Washington Valley Economic Council, Portsmouth Chamber and others -- has organized efforts to identify and address key challenges for New Hampshire's high tech sector. NetworkNH's objective is to help focus economic development efforts throughout the State on the high technology sector, build on technology strengths and address weaknesses. Our goal is to retain New Hampshire's position as a desired destination for investment and employment and to brand the State nationally and internationally as a desired location for high technology.

**A. Workforce Development Recommendations**

**1. NH's Education System**

A priority has to be high technology workforce development. The State and its educational institutions -- from kindergarten through graduate education -- need to focus more on engaging and educating New Hampshire students in key areas related to a high technology economy. These include science, engineering, mathematics, computer science and business fields. Also, the general educational attainment level has to be improved to ensure a strong high technology future, as there is a strong and clear link between high technology employment concentration and the percent of adults with a four-year college degree across the 50 states, as depicted below.



**Figure 3**

## **2. *Training Opportunities***

Specific recommendations in the workforce development area include strengthening the links between the high tech business community and post-secondary education resources in terms of both traditional education programs and on-going education and training for technology workers. The latter could include on-site education and training by industry sector and on-going worker/adult education and training at institutions of higher education.

## **3. *Internships***

Another recommendation is the development of an information sharing process for New Hampshire businesses to list internship opportunities at all of the post-secondary institutions in the State, both public and private. Internships strengthen the communications channels between businesses and higher education, resulting in improved curriculum development and student placement. And, students who have meaningful internship experiences are more likely to stay with the businesses offering the internships, and in the State, than students without New Hampshire internships to pursue their careers. We recommend expanding existing communications channels to exchange information about internship opportunities. For example, the State of New Hampshire could utilize the list of businesses registered through the Business Enterprise Tax record keeping system to offer those businesses the opportunity to list internship opportunities on-line, with the data being transmitted to career services offices at all of New Hampshire's higher education institutions. Internship opportunities would be posted for students to pursue. Internship opportunities would have an expiration date, and career services staff would be the link between companies and students.

## **4. *NITAS***

Also in the area of workforce development, we suggest that the State consider becoming part of the National Information Technology Apprenticeship System (NITAS) through the State's Workforce Opportunity Council. NITAS is a national information technology (IT) workforce development program for companies of any size. Its objectives are to help U.S. industries compete through rapid worker and company adaptation to technological innovation. The New

Hampshire Workforce Opportunity Council could coordinate the process of New Hampshire's involvement and implementation in this program.

## ***B. Research and Development Recommendations***

Another priority area should be to increase research and development investment in the State. This could be done with a combination of targeted tax incentives for private businesses and enhancement to Federal R&D pipeline, such as Department of Defense, National Institute of Health and Homeland Security Department funds.

### ***1. Tax Incentives***

The State of New Hampshire should consider ways to provide tax incentives to business to encourage research and development efforts in the State. One such effort was House Bill –466, which would have re-instituted an R&D tax credit in New Hampshire. While this Bill was defeated in the current legislative session, a study committee has been established to gather more information on the need for an R&D tax credit in New Hampshire. The Bill would have created a 15 percent tax credit against the State's business profits tax (BPT) and/or the business enterprise tax (BET) for R&D expenditures, which are described as wages of those involved in R&D. The total tax credit could not exceed 5 percent of a company's total obligation under the BPT or BET. A company could take the credit against either the BPT or the BET – but not both. The credit would only be for research done in New Hampshire.

House Bill 466 had the support of the NH High Technology Council, the NH Business and Industry Association, the Software Association of NH, and BAE Systems. Since the original R&D tax credit was repealed in July 1995, private sector investment in R&D has lagged behind other high technology states, as highlighted above. The estimated fiscal impact of the tax credit was \$650,000 in FY 2006 and FY 2007, and \$700,000 in FY 2008 and FY 2009. The supporters of HB 466 argued that these near-term tax costs would pale in comparison to the potential benefits to the State from positioning New Hampshire, both with companies in the State and those considering investments in the State, as actively promoting research and high technology.

In considering this particular Bill or any similar type of legislation, the goal should be to encourage R&D investment by New Hampshire businesses in order to help create new high technology jobs in the State. Those jobs offer the opportunity of substantial economic benefits to the State, including, on the tax side, the opportunity to grow the State's business tax base as the companies providing those jobs grow in New Hampshire.

## ***2. Defense Spending***

Related to R&D are defense-related industries. These industries are both a critical component and, in certain respects, a lost opportunity for high technology in New Hampshire. At present, it is a lost opportunity because the State ranks below the U.S. average and all the other New England states in DoD contracts per worker and has been experiencing a decline in ranking. Currently New Hampshire is below the median and significantly lower ranked in DoD contracting and grants than other high technology states.

Defense-related activity is an opportunity area for New Hampshire high technology. It is an area that New Hampshire's private sector, with the assistance of the State's congressional representatives and State government, can address with concerted efforts to increase Federal contracts. This is not only true with DoD contracts, but also with Homeland Security, a growing area of opportunity for New Hampshire high technology companies.

There are also significant opportunities to broaden the benefits from existing Federal contacts and the existing defense industry concentration in New Hampshire. BAE Systems as a hub firm has generated many commercial "spin-offs" from its defense contract work and innovations and also from ex-employees leaving the company to start their own firms in New Hampshire. This model and these types of spin-offs can be supported with collaborations between New Hampshire's DoD and Homeland Security contractors, the State's high technology leaders (including private angel and venture capital funders), UNH and Dartmouth researchers and educational programs, and state and local government.

### **3. EPSCoR**

NetworkNH also encourages support and private sector engagement on a new state initiative as a member in the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR). EPSCoR focuses on states, like New Hampshire, that have historically received below average amounts of Federal research and development funding, and are committed to developing their research bases and improving the quality of science and engineering research conducted at their universities and colleges. EPSCoR's goal is to maximize science and technology resources as a foundation for economic growth through partnerships among universities, industries, state government and the Federal research and development enterprise.

EPSCoR can aid researchers and institutions in securing Federal R&D funding. It is managed at the state level by a planning group drawn from business, government and academia. In addition to NSF funding, EPSCoR opens the door to research dollars from the DoD, DEA, and NASA, among others. EPSCoR provides funding in three areas: infrastructure improvement, research and educational grants and outreach initiatives. Potential resources for New Hampshire are up to \$9 million over 36 to 48 months. EPSCoR states have used their funding to advance or begin new initiatives that have benefited their economies. Louisiana, for example, expanded its research in micro- and nano-scale science and technology. Maine has used EPSCoR resources to support its Environmental Sensor Research Group -- which spun off two startup companies -- and Rhode Island is enhancing its training and education for students in science and engineering to better connect the workforce to new jobs being created. EPSCoR can infuse money into research areas that link to New Hampshire high technology companies. It can also foster change in educational programs and practice, and redefine research opportunities for graduate and undergraduate students.

#### **C. Collaboration**

Enhancing R&D investments and capacity with State efforts, such as House Bill 466 and EPSCoR, is crucial to being able to retain high technology manufacturing industry employment in New Hampshire. There is also a need to focus efforts on high technology services with favorable long-term growth prospects in the U.S. -- such as computer system design, software

development and Internet and related systems development and services. Efforts across the State need to link the development of high technology service industries to research and educational centers of excellence at Dartmouth, UNH and other colleges in the State.

#### ***D. Access to Capital***

To enhance the flow of early stage equity capital to New Hampshire entrepreneurial ventures, a pool of leveraged capital for angels should be created. Towards these ends, NetworkNH supports the start-up of the so-called Archimedes Fund, a proposed \$10 million fund with 3-to-1 leverage that would both increase available start-up capital for New Hampshire ventures to \$40 million and provide a form of downside risk protection for angel investors in the State. The Archimedes Fund is not a venture capital fund, but rather a matching fund for angel investments in New Hampshire, with corporate partners as the source of the capital in the fund.

To complement the Archimedes Fund and to enhance the quality of deal flow, a web-based system would be created for entrepreneurs to submit business plans for potential angel funding. Utilizing the resources of the business schools in New Hampshire, MBA students would provide screening and initial due diligence for the proposals. This assessment would be available to angels to help manage deal flow and also available to entrepreneurs as a timely feedback mechanism in their search for equity capital. The cost of this screening process would be covered as a management fee by the Archimedes Fund.

#### ***E. The NH Advantage***

Always at the foundation of high technology in New Hampshire, and needing continued support and attention, will be New Hampshire's quality of life and the State's relative cost advantage.

The unique quality of life in the State serves as a magnet for high skilled workers and technology entrepreneurs. New Hampshire consistently ranks in the top three in Morgan Quitno's and other national rankings of most livable states. There is a need to maintain the high quality and unique character of the New Hampshire environment and communities as an economic development asset in attracting and retaining high technology workers and investment.

The cost advantage is primarily a personal income tax and sales tax advantage of the State, as New Hampshire is the only state in the nation other than Alaska without either a personal income or sales tax. While New Hampshire continues to have the lowest state and local taxes as a percent of personal income in the nation, there has been a steady “creep up” of business taxes with the State now ranked fourth highest in per capita corporate income taxes. A cost advantage has to exist both for individuals and for businesses to attract high technology investment in New Hampshire. In addition to the impact that business taxes play in a company’s decision on where to locate or expand its business, tax predictability (including both the type of business taxes and the tax rates) is also very important to high tech and other companies who are doing their business planning several years out.

In addition to an overall tax advantage, New Hampshire has a relative cost advantage in housing, real estate and many living costs compared to other high technology and Northeast states, as New Hampshire’s housing costs are still below those found in Boston and Silicon Valley.

Finally, collective (public, private and University-based) efforts should be undertaken to promote the State as an attractive destination for high technology investment, skilled workers and entrepreneurship. The attributes to highlight include the strong economy – *resilient in recovery in 2000s and through previous economic and technology cycles*, the State’s superior quality of life – *you can have it all here*, and proximity to Boston and Route 128 – *be at the center of America’s high technology future*. Opportunities and strong prospects for New Hampshire’s high technology future should be a leading element of the State’s economic positioning. New Hampshire does have a high technology future and the future is now.

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