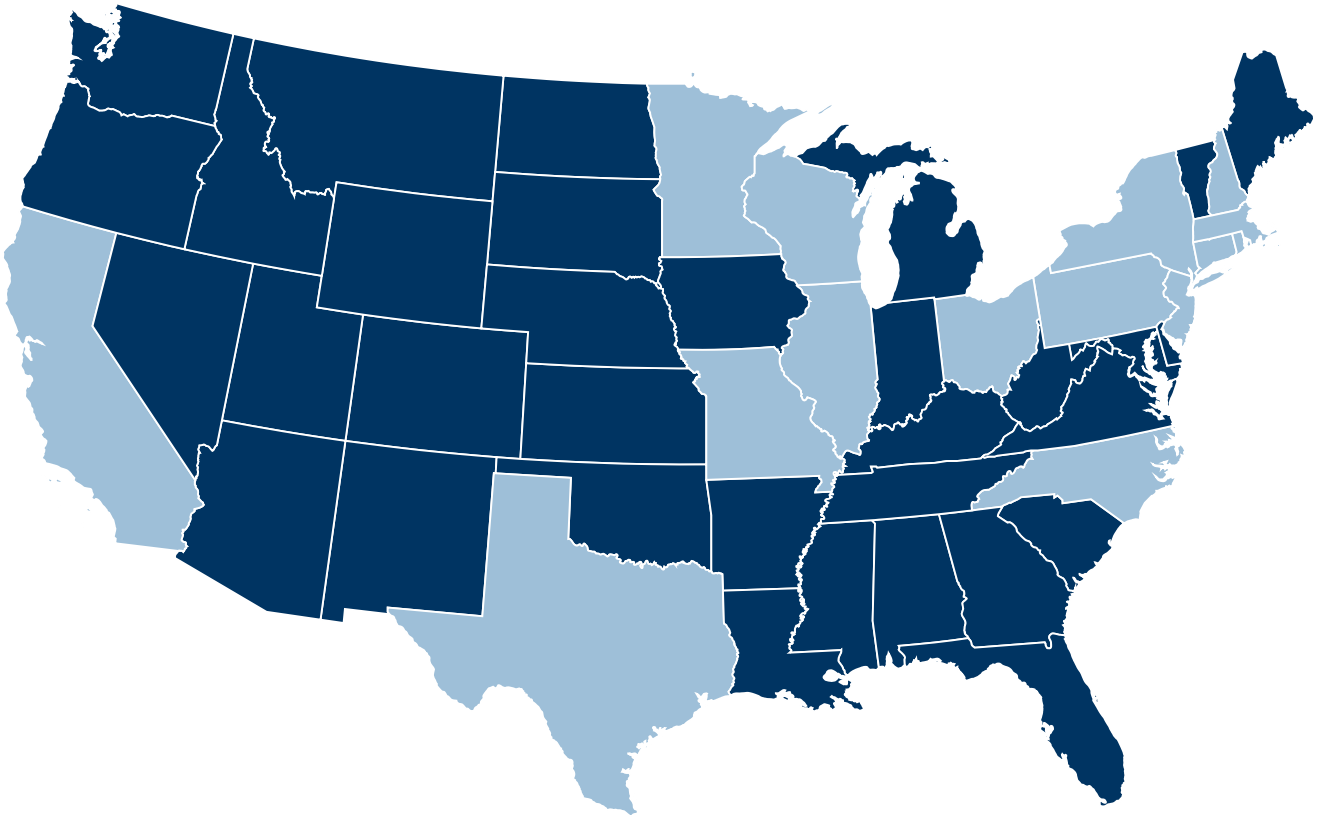
SELECTION OF THE LEADING TECHNOLOGY STATES (LTS)

Every year, the *Index* compares Massachusetts' performance on a number of metrics to a group of **"Leading Technology States" (LTS)**. The LTS have economies with a significant level of economic concentration and size in the 11 key sectors that compose the **Innovation Economy (IE)** in Massachusetts. The *Index* accounts for three metrics deemed representative of not only the intensity of the innovation economy but also the size and breadth of a state's innovation economy and evaluates them simultaneously.



THE METRICS USED TO SELECT THE 2016 LTS:

Number of key sectors with significantly above average employment concentration

This is defined as the number of innovation economy sectors in each state where employment concentration is more than 10% above the national average and is a measure of the breadth of a state's innovation economy.

Overall innovation economy employment concentration relative to the nation

This is defined as the percent of a state's workers who are employed in the innovation economy relative to the national percentage and is a measure of the overall intensity of a state's innovation economy.

Total innovation economy employment

This measures the number of employees who work within one of the innovation economy sectors in each state and is a measure of the absolute size of a state's innovation economy. A score is then applied to all of the states in order to determine the top 15.

To learn more about the selection methodology for the LTS, see page 63.

2016 Leading Technology States	
State	**Innovation Economy Score**
Massachusetts	2.27
California	2.18
Pennsylvania	2.00
New York	1.71
Connecticut	1.69
Illinois	1.68
Ohio	1.63
Minnesota	1.52
New Hampshire	1.51
Rhode Island	1.49
New Jersey	1.43
North Carolina	1.43
Texas	1.39
Wisconsin	1.33
Missouri	1.32

PROFILES OF LEADING TECHNOLOGY STATES

MASSACHUSETTS

2015 POP: 6,794,422
2015 GDP: $427.5 billion
# of IE Jobs: 1,286,578
% of IE Jobs: 37.60%

KEY SECTORS

- Biopharma & Medical Devices
- Computer & Communications Hardware
- Defense Manufacturing & Instrumentation
- Financial Services
- Healthcare Delivery
- Postsecondary Education
- Scientific, Technical, & Management Services
- Software & Communications Services

UNIVERSITIES & RESEARCH INSTITUTIONS

- MIT
- Harvard University
- UMass-Amherst
- Boston University
- Northeastern University
- Tufts University
- Worcester Polytechnic Institute

COMPANIES

- Raytheon
- Dell-EMC
- Athenahealth
- Fidelity Investments
- State Street Bank
- Biogen
- Genzyme
- GE

INITIATIVES

Collaborative R&D Matching Grant Program: A program to make seed investments in non-profit research centers matched by funds from non-state sources with the end goal of strengthening existing clusters and increasing research activity in Massachusetts, leading to more economic growth in the future. Investments have been made so far in cloud computing, printed electronics, marine robotics, data science & cybersecurity, and health technologies.[1]

Life Sciences Initiative: A $1-billion, state-funded investment initiative being implemented by the Massachusetts Life Sciences Center which states "These investments create jobs and support advances that improve health and well-being. The MLSC offers the nation's most comprehensive set of incentives and collaborative programs targeted to the life sciences ecosystem. These programs propel the growth that has made Massachusetts the global leader in life sciences."[2]

MassChallenge: Non-profit business accelerator that runs a highly competitive program that attracts applicants from all over the world. MassChallenge participants do not give up equity in their companies as winners receive a grant at the end of the program, made possible by public and private sector donors. Since founding in 2010, MassChallenge has grown to become the world's largest accelerator program and has expanded to Israel and the UK. In 2016, PULSE@MassChallenge, a digital health focused program, was set up in Boston's Longwood Medical Area, with state and private sector support.[3]

CALIFORNIA

2015 POP: 39,144,818
2015 GDP: $2,206.8 billion
# of IE Jobs: 4,618,040
% of IE Jobs: 28.30%

KEY SECTORS

- Biopharma & Medical Devices
- Computer & Communications Hardware
- Defense Manufacturing & Instrumentation
- Scientific, Technical, & Management Services
- Software & Communications Services

UNIVERSITIES & RESEARCH INSTITUTIONS

- Stanford
- UC Berkeley
- UCLA
- Cal Tech
- Scripps Oceanographic Institute
- Lawrence Livermore National Lab

COMPANIES

- Amgen
- Intel
- Lockheed Martin
- Google
- Facebook
- Apple
- Cisco
- Oracle
- Wells Fargo
- Qualcomm

INITIATIVES

Biotech Connection Los Angeles: Biotech Connection Los Angeles (BCLA) describes themselves as "an organization run by students, postdocs and young professionals from all over Los Angeles. Our mission is to facilitate the connection between academics across disciplines with each other and the biotech industry to move innovation forward. We engage our community through educational events such as seminars, workshops, panel discussions, and networking opportunities that provide unique industry perspective. We help fostering on-campus conversations between biotech professionals and young academics that strive to be future industry leaders."[4]

SFMade: SFMade describes themselves as a Non-profit organization whose "mission is to build and support a vibrant manufacturing sector in San Francisco, that sustains companies producing locally-made products, encourages entrepreneurship and innovation, and creates employment opportunities for a diverse local workforce."[5]

CONNECT: Non-profit organization spun out of UC San Diego tasked with fostering the growth of San Diego's innovation ecosystem by acting as an incubator of sorts for cluster organizations, eventually spinning them off when they are able to stand on their own.[6]

PROFILES OF LEADING TECHNOLOGY STATES

PENNSYLVANIA

2015 POP: 12,802,503
2015 GDP: $626.7 billion
# of IE Jobs: 1,828,142
% of IE Jobs: 32.10%

KEY SECTORS
- Advanced Materials
- Biopharma & Medical Devices
- Business Services
- Diversified Industrial Manufacturing
- Financial Services
- Healthcare Delivery
- Postsecondary Education

UNIVERSITIES & RESEARCH INSTITUTIONS
- Penn State
- University of Pennsylvania
- University of Pittsburgh
- Carnegie Mellon
- Temple University

COMPANIES
- PNC Financial
- GE Transportation
- Comcast
- Wyeth Pharmaceuticals
- Allegheny Technology
- Uber

INITIATIVES

Catalyst Connection: Non-profit organization headquartered in Pittsburgh that provides consulting and training services to small manufacturers in southwestern Pennsylvania, with the goal of accelerating revenue growth and improving productivity. In 2015, 178 recent Catalyst Connection partners had reported $131M in increased revenue and 982 jobs created or retained.[7]

Ben Franklin Technology Partners(BFTP): BFTP has been an important seed stage capital provider for the Southeastern PA's technology sectors, investing over $175 million in more than 1,750 regional technology companies over the last 30 years, many of which have gone on to become industry leaders. BFTP has also launched university/industry partnerships that accelerate scientific discoveries to commercialization, and has seeded regional initiatives that strengthen the entrepreneurial community in Southeastern PA.[8]

The Science Center: Five educational and medical institutions in Philadelphia joined together in 1963 to create the Science Center, an organization that promotes place and innovation-based economic development in the Philadelphia region by convening entrepreneurs, investors, and academia as well as through the creation of a large, urban science park.[9]

NEW YORK

2015 POP: 19,795,791
2015 GDP: $1,265.7 billion
# of IE Jobs: 2,863,084
% of IE Jobs: 31.80%

KEY SECTORS
- Business Services
- Financial Services
- Postsecondary Education

UNIVERSITIES & RESEARCH INSTITUTIONS
- Cornell University
- Columbia University
- State University of New York System
- New York University
- University of Rochester

COMPANIES
- IBM
- Global Foundries
- Most major banks
- Google
- Bristol Myers Squibb
- Xerox

INITIATIVES

Buffalo Billion: Wide-ranging $1B initiative to regenerate Buffalo through investments and tax credits supporting clean energy, life sciences, and advanced manufacturing. Also incorporates efforts to train the workforce for in-demand high skill positions.[10]

Albany Nanotech: SUNY Poly describes the College of Nanoscale Science and Engineering (CNSE) as "a fully-integrated research, development, prototyping, and educational facility that provides strategic support through outreach, technology acceleration, business incubation, pilot prototyping, and test-based integration support for on-site corporate partners including IBM, TEL, Applied Materials, ASML and International SEMATECH, as well as other "next generation" nanotechnology research activities. CNSE has over 300 global corporate partners to date, and more than 2,600 R&D jobs on site."[11]

NYSTAR Centers for Advanced Technology: NYSTAR funds fifteen Centers for Advanced Technology (CATs) with the intention to "encourage greater collaboration between private industry and the universities of the state in the development and application of new technologies. The CAT program facilitates a continuing program of basic and applied research, development, and technology transfer in multiple technological areas, in collaboration with and through the support of private industry. It plays a critical role in spurring technology-based applied research and economic development in the state; promoting national and international research collaboration and innovation; and leveraging New York's research expertise and funding with investments from the federal government, foundations, businesses, venture capital firms, and other entities."[12]

PROFILES OF LEADING TECHNOLOGY STATES

CONNECTICUT

2015 POP: 3,590,886
2015 GDP: $230.3 billion
# of IE Jobs: 565,793
% of IE Jobs: 34.00%

KEY SECTORS
- Biopharma & Medical Devices
- Computer & Communications Hardware
- Defense Manufacturing & Instrumentation
- Diversified Industrial Manufacturing
- Financial Services
- Postsecondary Education

UNIVERSITIES & RESEARCH INSTITUTIONS
- Yale
- UConn
- Hartford Hospital

COMPANIES
- United Technologies
- GE
- Sikorsky
- General Dynamics
- The Hartford
- Travelers
- Cigna
- Aetna
- Kayak
- Priceline
- Accenture
- Apex

INITIATIVES

UConn Tech Park: Phase one of a new university technology park is due for completion in early 2017. The goal is to facilitate partnerships between industry and the university by providing flexible lab space and access to UConn's research resources and "Industry Centers."[13]

CT Next: Statewide network that connects start-ups to mentors, collaborative workspaces, universities, suppliers, and other entrepreneurs.[14]

Connecticut Skills Challenge: Coding and engineering contests for college students to test their skills and get noticed by employers. Challenge participants are entered into an online directory where employers can search for talent and are invited to participate in Connecticut Technology Council job fairs.[15]

ILLINOIS

2015 POP: 12,859,995
2015 GDP: $689.9 billion
# of IE Jobs: 1,797,220
% of IE Jobs: 30.70%

KEY SECTORS
- Advanced Materials
- Diversified Industrial Manufacturing
- Financial Services
- Postsecondary Education
- Scientific, Technical, & Management Services

UNIVERSITIES & RESEARCH INSTITUTIONS
- Northwestern University
- University of Chicago
- University of Illinois
- University of Illinois-Chicago

COMPANIES
- John Deere
- Caterpillar
- Chicago Mercantile Exchange
- Motorola
- Boeing
- Chase Bank
- AbbVie

INITIATIVES

University of Illinois Research Park: On-campus research park home to more than 100 companies, 1,700 employees, and 600 interns that also includes a 43,000 sq ft incubator for early stage tech companies.[16]

Illinois Innovation Network: Common platform through which startups, innovation-driven enterprises, service providers, research and academic institutions, and community leaders connect, share ideas, and offer tools and resources to accelerate the growth of businesses and industries in the state and beyond.[17]

Illinois Technology Development Account: In 2003, the State Treasurer was authorized to invest up to 1% of the state's investment portfolio into venture capital and private equity in Illinois. Illinois has invested nearly $45 million since 2003, which was matched by $742 million in private investment, creating 3,500 jobs in 60 local companies.[18]

OHIO

2015 POP: 11,613,423
2015 GDP: $533.3 billion
# of IE Jobs: 1,610,890
% of IE Jobs: 30.60%

KEY SECTORS
- Advanced Materials
- Business Services
- Defense Manufacturing & Instrumentation
- Diversified Industrial Manufacturing
- Healthcare Delivery

UNIVERSITIES & RESEARCH INSTITUTIONS
- Ohio State
- Case Western Reserve
- Kent State University
- Cleveland Clinic
- University of Cincinnati
- Wright-Patterson Air Force Base

COMPANIES
- GE Aviation
- General Dynamics
- Timken Steel
- Nationwide Insurance
- Jones Day

INITIATIVES

Bioenterprise: A public private partnership started by the state government, several foundations, research universities, and hospitals to grow the biotech industry in the Cleveland Metropolitan Area.[19]

Edison Welding Institute: Non-profit organization that links manufacturers to cutting edge research in advanced materials joining and manufacturing technology.[20]

Partners for a Competitive Workforce: A public private partnership in the Greater Cincinnati Area that seeks to meet current and future demands for skilled workers through job matching programs, designing new training programs, and working with educational institutions to develop career pathways.[21]

PROFILES OF LEADING TECHNOLOGY STATES

MINNESOTA

2015 POP: 5,489,594
2015 GDP: $298.8 billion
# of IE Jobs: 876,583
% of IE Jobs: 31.60%

KEY SECTORS
- Biopharma & Medical Devices
- Business Services
- Computer & Communications Hardware
- Diversified Industrial Manufacturing
- Financial Services

UNIVERSITIES & RESEARCH INSTITUTIONS
- University of Minnesota
- Mayo Clinic

COMPANIES
- Medtronic
- 3M
- U.S. Bancorp
- United Health
- St. Jude Medical
- IBM

INITIATIVES

MnDRIVE: Minnesota's Discovery, Research, and Innovation Economy (MnDRIVE) is an $18 million annually recurring investment in four research areas at the University of Minnesota (Robotics, Global Food, Environment, Brain Conditions). To date this has leveraged $167 million in external funding and launched 13 start-up companies.[22]

Enterprise Minnesota: Non-profit manufacturing consulting organization that works with small and medium sized companies to increase efficiency and profitability. Also administers the Growth Acceleration Program through which the Minnesota state government provides matching funds to small business looking to invest in improving their operations.[23]

University Ave Innovation District: Effort led by the University of Minnesota to develop an Innovation district between their campus and downtown St. Paul, made possible by large infrastructure investments by the state and local governments including bringing light rail to the area.[24]

NEW HAMPSHIRE

2015 POP: 1,330,608
2015 GDP: $65.5 billion
# of IE Jobs: 203,438
% of IE Jobs: 32.00%

KEY SECTORS
- Computer & Communications Hardware
- Defense Manufacturing & Instrumentation
- Diversified Industrial Manufacturing
- Financial Services
- Postsecondary Education

KEY SECTORS (cont)
- Software & Communications Services

UNIVERSITIES & RESEARCH INSTITUTIONS
- University of New Hampshire
- Dartmouth College
- Dartmouth Hitchcock Medical Center

COMPANIES
- BAE Systems
- Dyn
- Fidelity Investments
- Hypertherm
- Lonza Biologics
- Portsmouth Naval Shipyard

INITIATIVES

New Hampshire Innovation Research Center: Established by the NH legislature to "support innovations through industry and university collaborations, thereby increasing the number of quality jobs in the state. Since its inception, the NHIRC has awarded more than 6 million in state funds to support research projects and has been responsible for the creation or retention of 650 jobs. Awardees have received more than $32 million in federal SBIR grants and over $900 million in investment/acquisition capital."[25]

Live Free and Start: LFS "provides startups with the resources and connections they need to build their businesses in the Granite State. It is focused on expanding access to capital, modernizing business regulation, and sharing stories about how NH's inspiring innovators are building a vibrant tech ecosystem."[26]

Tech Women|Tech Girls: This initiative from the NH High Tech Council is described as "a forum focused on building a strong community of women enthusiastic about technology and supporting efforts where girls are exploring STEM as a career or area of study. TechWomen|TechGirls holds programs for professional women to connect, educate, and explore ideas around career development, technology initiatives, and innovation. The community will also deploy volunteers and mentors to support academic STEM initiatives and events for girls happening all over New Hampshire."[27]

RHODE ISLAND

2015 POP: 1,056,298
2015 GDP: $51.1 billion
#of IE Jobs: 149,104
% of IE Jobs: 31.70%

KEY SECTORS
- Biopharma & Medical Devices
- Business Services
- Diversified Industrial Manufacturing
- Financial Services
- Healthcare Delivery
- Postsecondary Education

UNIVERSITIES & RESEARCH INSTITUTIONS
- University of Rhode Island
- Brown University
- U.S. Naval War College
- Rhode Island School of Design

COMPANIES
- Citizens Financial
- Amica Insurance
- Fidelity Investments
- Metlife
- General Dynamics
- Textron
- CVS Caremark

INITIATIVES

Undersea Technology Innovation Center: According to UTIC, the organization "promotes advanced learning in the undersea sector and the rapid development, testing and commercialization of innovative undersea technology for commercial, academic, and defense organizations."[28]

Innovation Vouchers: This RI Commerce Corporation program lets businesses utilize R&D capacity in Rhode Island. Rhode Island businesses with fewer than 500 employees can receive grants of up to $50,000 to fund R&D assistance from a Rhode Island university, research center or medical center.[29]

Innovate RI Fund: The Fund supports a variety of programs through which eligible Rhode Island small businesses may apply for grants to reduce the cost of applying for SBIR/STTR awards, match SBIR/STTR Phase I and Phase II awards and hire interns.[30]

PROFILES OF LEADING TECHNOLOGY STATES

NEW JERSEY

2015 POP: 8,958,013
2015 GDP: $508.2 billion
# of IE Jobs: 1,200,368
% of IE Jobs: 30.80%

KEY SECTORS
- Biopharma & Medical Devices
- Financial Services
- Scientific, Technical, & Management Services
- Software & Communications Services

UNIVERSITIES & RESEARCH INSTITUTIONS
- Princeton University
- Rutgers University
- New Jersey Institute of Technology
- Stevens Institute of Technology

COMPANIES
- Prudential
- Brystol Myers Squibb
- Pfizer
- Merck
- Johnson & Johnson

INITIATIVES

New Jersey Innovation Institute: New Jersey Innovation Institute is a non-profit intended to match local firms with university researchers in order to accelerate research and development in health care, bio-pharmaceutical production, civil infrastructure, defense and homeland security and financial services. This program proved successful for New Jersey in 2014, with 20 start-ups initiated from universities, hospitals, research institutions, and technology investment firms, more than doubling the total amount from 2013.[31]

Technology Center of New Jersey: Technology park developed by the New Jersey Economic Development Authority to leverage its prime location between Princeton and Rutgers University. The park has 325,000 square ft of lab space and ready-to-build sites for over 500,000 sq ft more.[32]

Newark Innovation Acceleration Challenge: Entrepreneurs submit ideas to be evaluated by a panel of judges for the opportunity to win $3,000 to fund a summer fellowship to work on their idea. Open to Newark college students and residents.[33]

NORTH CAROLINA

2015 POP: 10,042,802
2015 GDP: $442.5 billion
# of IE Jobs: 1,267,765
% of IE Jobs: 29.00%

KEY SECTORS
- Advanced Materials
- Biopharma & Medical Devices
- Computer & Communications Hardware
- Postsecondary Education

UNIVERSITIES & RESEARCH INSTITUTIONS
- UNC Chapel Hill
- Duke University
- North Carolina State

COMPANIES
- Bank of America
- SAS Institute
- Cisco Systems
- GlaxoSmithKline
- IBM
- Red Hat

INITIATIVES

Research Triangle Park: Industry, University, and Government partnership leveraging proximity to Duke, UNC Chapel Hill, and NC State to create the world's largest research park run by a non-profit that re-invests profits in improving the community. RTP is home to 200 companies, 50,000 skilled workers, and invests $296M annually in R&D at local universities.[34]

NCBioImpact: NCBioImpact describes itself as an industry-driven program which "combines the resources of North Carolina's university and community college systems to meet the growing demands of the biotechnology and pharmaceutical industries. The training programs partner closely with the North Carolina Biotechnology Center, NCBIO, the NC Department of Commerce and industry to form a unique academic, industry and government collaborative."[35]

NC IDEA: NC IDEA serves as a "catalyst for young, high-growth, technology companies in North Carolina". Its main focus is providing grant financing for companies in IT, Medical Diagnostics and Devices, Material Sciences, and Green Technology. Grantees may also utilize the extensive expertise of NC IDEA management in growing early stage companies.[36]

TEXAS

2015 POP: 27,469,114
2015 GDP: $1,475.5 billion
# of IE Jobs: 3,303,956
% of IE Jobs: 28.30%

KEY SECTORS
- Computer & Communications Hardware

UNIVERSITIES & RESEARCH INSTITUTIONS
- University of Texas
- University of Houston
- Rice
- Texas Medical Center
- NASA Johnson Space Center

COMPANIES
- Dell
- Texas Instruments
- Apple
- Freescale Semiconductor
- Rackspace
- Celanese

INITIATIVES

Governor's University Research Initiative: GURI is a matching grant program to assist eligible institutions of higher education in recruiting distinguished researchers, with the goal of bringing Nobel Laureates, winners of other prestigious awards, and members of national honorific societies to Texas universities.[37]

Texas Enterprise Fund: The Texas Economic Development Corporation describes the fund as "a cash grant used as a financial incentive tool for projects that offer significant projected job creation and capital investment and where a single Texas site is competing with another viable out-of-state option. Since its inception in 2004, the TEF has awarded over 100 grants totaling more than $500 million across a wide variety of industries and projects. Variations in award amounts are influenced by the number of jobs to be created, the expected time frame for hiring, and the average wages to be paid. In the past, awards have ranged from $194,000 to $50 million."[38]

BioHouston: Non-profit organization leading a broad-based effort to establish the Houston region as a top-tier global competitor in life science and biotechnology commercialization. Its mission is to create an environment that will stimulate technology transfer and research commercialization, thereby generating economic growth for the Houston region and making it a global competitor in the life sciences industry.[39]

PROFILES OF LEADING TECHNOLOGY STATES

WISCONSIN

2015 POP: 5,771,337
2015 GDP: $273.7 billion
# of IE Jobs: 849,930
% of IE Jobs: 30.40%

KEY SECTORS
- Advanced Materials
- Business Services
- Defense Manufacturing & Instrumentation
- Diversified Industrial Manufacturing
- Financial Services

UNIVERSITIES & RESEARCH INSTITUTIONS
- Marquette
- University of Wisconsin System
- Milwaukee School of Engineering

COMPANIES
- Kohler
- Rockwell Automation
- Johnson Controls
- John Deere
- Caterpillar
- Oshkosh
- Harley Davidson
- Epic Systems
- Fiserv

INITIATIVES

Qualified New Business Venture Program: QNBV is a program intended to incentivize investment in early stage businesses developing innovative products, processes or services by angel investors, angel investment networks and qualified venture capital funds through providing a tax credit equal to 25 percent of the amount of the equity investment.[40]

The Water Council: The Water Council describes themselves as a "non-profit organization established by Milwaukee-area businesses, education and government leaders with a mission of aligning the regional freshwater research community with water-related industries. The Water Council links together global water technology companies, innovative water entrepreneurs, government agencies, non-governmental organizations, acclaimed academic research programs and some of the nation's brightest and most energetic water professionals."[41]

UW Milwaukee Innovation Campus: A "third generation" research park that offers technology transfer and business incubation services, as well as incorporates the academic and research enterprise of the university directly into the development of a private sector park that will leverage the research and intellectual property generated by the university.[42]

MISSOURI

2015 POP: 6,083,672
2015 GDP: $261.5 billion
# of IE Jobs: 822,197
% of IE Jobs: 30.30%

KEY SECTORS
- Business Services
- Defense Manufacturing & Instrumentation
- Financial Services
- Healthcare Delivery

UNIVERSITIES & RESEARCH INSTITUTIONS
- University of Missouri
- Washington University
- St. Louis University
- University of Missouri-Kansas City

COMPANIES
- General Motors
- Ford
- Emerson Electric
- Monsanto
- Cerner
- Express Scripts

INITIATIVES

Cortex: Public-private partnership to create a biotech-focused innovation district in St. Louis anchored by Washington University and two major hospitals.[43]

Missouri Innovation Center: Non-profit operator of incubator and accelerator programs for the University of Missouri. Current initiatives include a 33,000 sq ft life sciences incubator and the Mid-MO Tech Accelerator. Also provides assistance obtaining financing.[44]

Missouri Innovation Corporation: According to the MIC, their mission is "to foster business and community development and facilitate the process of innovation to enhance the regional economy of Southeast Missouri and support the technology transfer and commercialization of innovations derived from research within Southeast Missouri State University, to create new, high-value jobs and positive economic or social benefits for the University and regional economy."[45]