2009 Progress Report
on the
Science and Technology Action Plan for Maine, 2005

Prepared for:
The Joint Standing Committee on Business, Research and Economic Development
124rd Legislature
Cross Office Building, Room 208
Augusta, ME

Prepared by:
Maine Innovation Economy Advisory Board (MIEAB)
c/o Office of Innovation
Department of Economic and Community Development
59 State House Station
Augusta, ME 04333-0059

March 2, 2009

Maine Innovation Economy Advisory Board

During the 123rd Legislature's first session in 2007, Maine established the Maine Innovation Economy Advisory Board (MIEAB) to coordinate the State's research and development activities and to foster collaboration among its higher education and nonprofit research institutions and members of the business community. The Board consists of thirty-two members including the Director of the Office of Innovation, the President of the Maine Technology Institute and representatives from the industry and research communities in the seven targeted technology sectors. The MIEAB replaces the Maine Science and Technology Advisory Committee (MSTAC) which had been established by Executive Order in 2003.

The MIEAB is required to produce an action plan for science and technology every five years, and an annual progress report on the plan that was approved in 2005. The Board is also expected to provide state and federal policy makers assistance in advancing research and development capacity initiatives in the State and to develop corresponding funding strategies; provide input on economic planning and the commercial application of the State's research and development efforts; facilitate research opportunities that create sustained, inter-institutional, collaborative, multidisciplinary, centers-based research projects; advocate for the State's research and development sector and interests; disseminate information about its work throughout the State; and serve as the EPSCoR steering committee for the State and evaluate proposals made to the Maine EPSCoR Program and related programs.

The members of the MIEAB are:

Miles Theeman (Affiliated Healthcare Systems), Chair; Patricia Hand (Mount Desert Island Biological Laboratory), Vice-Chair; James Atwell (Sevee & Maher Engineers, Inc.); Ken Ault (Maine Medical Center Research Institute); Pamela Baker (Bates College); Betsy Biemann (MTI); John Burns (Small Enterprise Growth Fund); Jacque Carter (University of New England); Habib Dagher (Advanced Engineered Wood Composites Center, U Maine); Chris Davis (Maine Aquaculture Innovation Center); Michael Eckardt (U Maine); Karin Gregory (Furman, Gregory, Hahn); William Harris (Marical); Rita Heimes (Center for Law and Innovation); Jack Kartez (University of Southern Maine); Whitney King (Colby College); Robert Lad (Laboratory for Surface Science and Technology, U Maine); Peter Merrill (Wahlco-Metroflex); Peter Murray (Quantrix); Robert Peacock (R. J. Peacock Canning Company); Hemant Pendse (Dept of Chemical and Biological Engineering, U Maine); Don Perkins (Gulf of Maine Research Institute); Catherine Renault (Office of Innovation); Jane Sheehan (Foundation for Blood Research); Graham Shimmield (Bigelow Laboratory for Marine Science); Dale Syphers (Bowdoin College); Barbara Tennent (Jackson Laboratory); Stephen Von Vogt (Maine Marine Composites); John Pierce Wise (University of Southern Maine); John Wright (School of Applied Science, Engineering and Technology, University of Southern Maine).

For more information, contact the Office of Innovation at (207) 624-9801 or Catherine.s.renault@maine.gov

Maine Innovation Economy Advisory Board
59 State House Station
Augusta, ME 04333-0059

February 13, 2009

Senator Elizabeth Schneider
Representative Nancy Smith
Members of the Joint Committee on Business, Research and
Economic Development

Dear BRED Members:

Pursuant to 10 MRSA c.107-D, §949, part 12, enclosed please find the annual progress report for the Science and Technology Action Plan -2005. As noted in the report, while the State of Maine continues to make progress on the objectives outlined in this plan four years ago, infrastructure and funding limitations have created significant challenges to meeting and exceeding plan goals.

Some highlights of 2008 were:

- Total R&D spending in the state is up dramatically and we have improved our position relative to other states.
- The $50 million R&D bond was implemented as the Maine Technology Asset Fund by the Maine Technology Institute (MTI) and the research institutions in the state responded by greatly increasing their collaborative activities among themselves and with state businesses.
- Following the publication of *Maine's Technology Sectors and Clusters: Status and Strategy*, several key investments in cluster development have been initiated including the BRAC-IT project with information technology, a food alliance cluster and an ocean energy cluster. The existence of new cluster funds at MTI has prompted several of these groups to get organized.

In 2009, the MIEAB will be developing a new Action Plan for Science and Technology that will better address the challenges that Maine faces at this time. We look forward to working with you to develop this plan and to implement its recommendations.

Please do not hesitate to contact me or Cathy Renault as you have questions or wish additional information.

Sincerely,

Miles Unobsky Theeman
Chair

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List of Abbreviations

AEWC	Advanced Engineered Wood Composites Center
AFUM	Associated Faculties of the University of Maine System
BETR	Business Equipment Tax Reimbursement
CEI	Coastal Enterprises Inc.
CFED	Council for Entrepreneurial Development
DECD	Department of Economic and Community Development
EPSCoR	Experimental Program to Stimulate Competitive Research
FAME	Finance Authority of Maine
GSBS	Graduate Science of Biomedical Sciences
GSP	Gross State Product
MBRF	Maine Biomedical Research Fund
MCED	Maine Center for Entrepreneurial Development
MDF	Maine Development Foundation
MEIF	Maine Economic Improvement Fund
MIEAB	Maine Innovation Economy Advisory Board
MIEX	Maine Investment Exchange
MIF	Municipal Increment Financing
MIHGH	Maine Institute for Human Genetics and Health
MOU	Memorandum of Understanding
MSTAC	Maine Science and Technology Advisory Committee
MTI	Maine Technology Institute
NASA	National Aeronautics and Space Administration
NSF RII	National Science Foundation Research Infrastructure Improvement Grant Program
OOI	Office of Innovation, Department of Economic and Community Development
P-K-20	Preschool-Kindergarten-Grade 20
R&D	Research and development
REDI	Joint Select Committee on Research, Economic Development and Innovation
SB(T)DC	Small Business (Technology) Development Center
SBIC	Small Business Investment Capital
SBIR	Small Business Innovation Research Program
SEGF	Small Enterprise Growth Fund
SENCER	Science Education for New Civic Engagements and Responsibilities
STEM	Science, Technology, Engineering and Mathematics
STTR	Small Business Technology Transfer Program
USDA	United States Department of Agriculture
USM	University of Southern Maine
WIRED	Workforce, Innovation and Regional Economic Development

Executive Summary

The Maine Innovation Economy Advisory Board (MIEAB) is required by statute to submit an annual progress report on the 2005 Science and Technology Action Plan to the Governor and the Joint Standing Committee on Business, Research and Economic Development every March. This document is the second report since the establishment of the MIEAB.

This progress report documents the status of the overall plan goal, its five key objectives, and the 2008 benchmarks and actions outlined in the document. Each objective, benchmark or action is described and then progress reported below.

Progress to Date

The progress to date can be summarized simply. We have made progress on many of the objectives that were set two years ago, but not as much as envisioned by the authors of the plan. Some highlights of the past year include:

- Total R&D spending in the state is up dramatically and we have improved our position relative to other states.
- The $50 million R&D bond was implemented as the Maine Technology Asset Fund by the Maine Technology Institute (MTI) and the research institutions in the state responded by greatly increasing their collaborative activities among themselves and with state businesses.
- Following the publication of *Maine's Technology Sectors and Clusters: Status and Strategy*, several key investments in cluster development have been initiated including the BRAC-IT project with information technology, a food alliance cluster and an ocean energy cluster. The existence of new cluster funds at MTI has prompted several of these groups to get organized.
- The State of Maine received new funds from EPSCoR totaling over $3.7 million including $633,000 from the Department of Energy, two Department of Defense awards, and a NASA EPSCoR award.
- A severe budget situation has forced the Governor to propose cutting back on some R&D expenditures, notably to the Maine Technology Institute, but the Maine Economic Improvement Fund remained substantially untouched.

Specific progress on the objectives is listed below:

Overall goal: *Maine will achieve $1 billion in R&D Activity by 2010*

Total R&D spending in the state was $524 million through the most recent reporting period (2005) for which comparable data is available. This is up 36% from 2004 and state rankings have improved from 49th in 1997 to 35th in 2005, indicating progress against our peers.

A $50 million R&D bond was passed by the legislature and approved by the voters in 2007. The first round of the MTAF was completed in 2008, with almost $30 million awarded to date. The funds are matched one-to-one and as expended in the years ahead should contribute to additional R&D in the state.

Key Objective One: *Maine's investments in R&D will stimulate and sustain consistent, competitive growth for Maine's economy.*

According to the 2008 Comprehensive Research and Development Evaluation, "Maine's overall R&D capacity has increased steadily and the direct investment in private sector companies indicates a solid return on public investment, yet the impact of investment has not yet transferred to the broader technology economy."

State investment has not reached the $120 million benchmark set in this plan. It has increased from around $20 million annually to $23 million for FY2008 and $26 million in FY2009 (before any cuts allocated in the Supplemental Budget). The Maine Technology Institute (MTI) received $4.5 million of new funding for a Cluster Enhancement Fund for the biennium FY2008-09. MEIF received an additional $3.0 million for the biennium; the Technology Centers were cut 25% to $187,250. In addition, the legislature passed and the voters approved a $50 million R&D bond that will be expended over the two years 2008-9.

The Maine Technology Institute's funding was cut in the FY09 curtailment by approximately $450,000 and there is a proposed cut for the FY10-11 biennium of $1.5 million. The MTI Board expects to fund the proposed biennium reduction with operational savings and the available portion of it unrestricted net assets, projected to be $1 million at the end of FY09, prior to cutting any future awards.

Key Objective Two: *Stimulate a robust R&D enterprise by boosting academic R&D capacity, developing an educated, technically skilled workforce, broadening the impact from the nonprofit research institutions and increasing private sector R&D activity in key strategic areas important to Maine.*

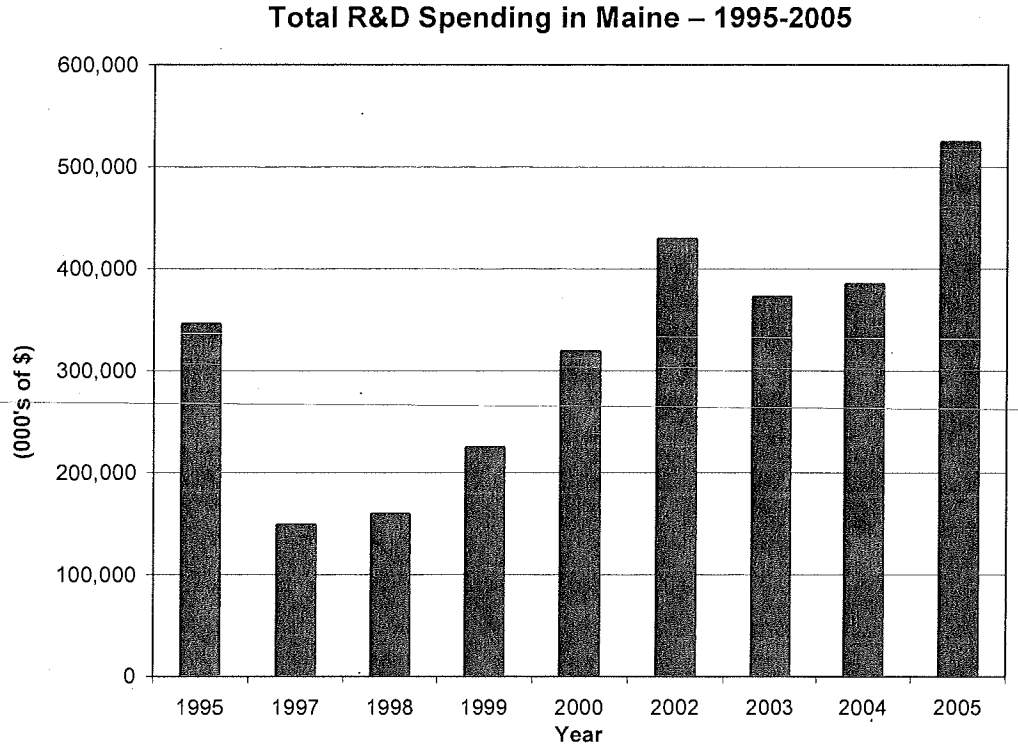
The most recent Maine Innovation Index using 2005 National Science Foundation data shows that our research and development expenditures are split--70.2 percent industry and 29.8 percent university and non-profit, which is quite close to the benchmark that was set. The industry R&D share is increasing but we dropped from 32nd in the nation in 2005 back down to 38th in 2006.

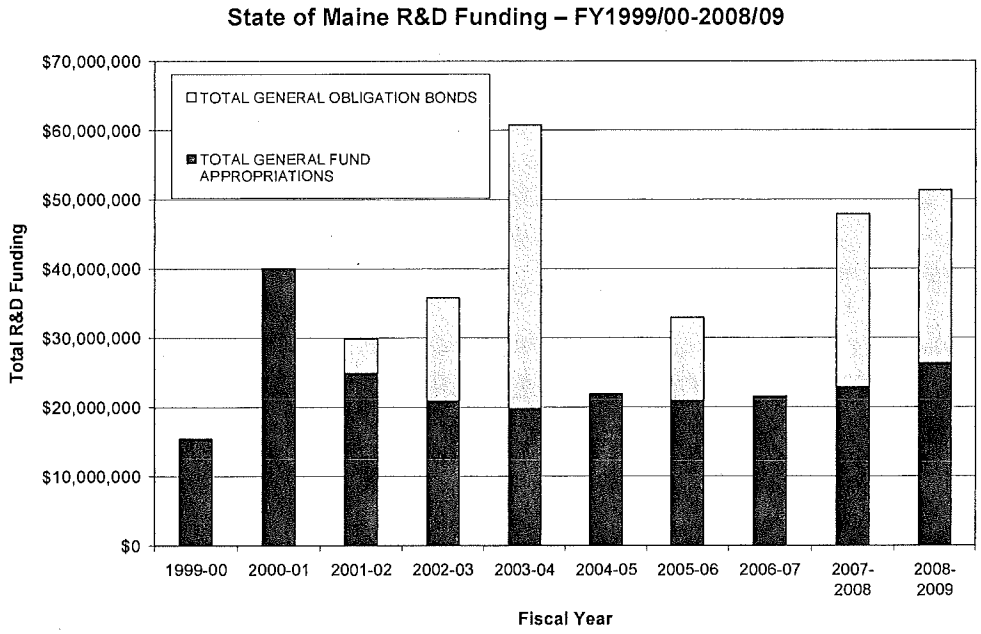
The 2008 Comprehensive Evaluation shows that Maine awarded 204 graduate degrees in science and engineering in 2007, which is much lower than in recent years. The total of research expenditures at the universities and non-profits in Maine is $230,000,000, up significantly from the previous year.

Key Objective Three: *Maine's Legislature and key policy makers recognize, advance and celebrate Maine's R&D investments and strategic priorities.*

Maine's Governor and Legislature recognize the importance of Maine's R&D investment. However, for the next biennium, FY10-11, The Governor's budget included approximately $1.5 million in cuts to MTI, and flat funding for MEIF. In addition, the Governor is expected to propose a major R&D Bond. This is in the context of a major recession, and deeper cuts in other parts of state government.

In his budget package, the Governor said, "This funding level falls short of that which would be otherwise calculated using the formula described above. Careful consideration was made in arriving at the recommended funding levels, as investment in research and development is critical to Maine's economy and future. However, the severe fiscal constraints facing the state taken in conjunction with an increased need for resources across state government have led to an inability to fund up to the prescribed level."





Key Objective Four: *Maine's unique R&D assets and their significance to Maine's economy are used to draw new businesses and investment to the state of Maine.*

The major attraction success this year has been in the innovation sector. In 2008, Boston Financial announced that they were moving new operations to Maine. In addition, Notify MD announced an expansion to a new facility, as did IDEXX and several other technology companies.

Key Objective Five: *Foster growth of research intensive companies through a comprehensive network of services and support.*

Although the Maine Technology Institute and other programs aimed at supporting small research-intensive companies are having excellent results, our goal of a comprehensive network of services and support is far from complete. Initiatives aimed to increase the amount of venture capital funds have not been successful to date. Funding was cut for the Technology Centers, and several other initiatives were not continued. The most recent evaluation points to this element as one most ready for investment.

New Initiatives

Two new initiatives not envisioned in this report are worth mentioning. First, in 2006, the Department of Labor announced that Maine was the recipient of the first of a series of awards called Workforce Innovation and Regional Economic Development (WIRED). Maine's WIRED

grant has resulted in an initiative called the North Star Alliance, a program to support the boatbuilding and marine trades sector with an emphasis on the use of composite materials. This is an excellent example of collaboration among industry, trade associations, university researchers and government.

The second initiative is the new focus on cluster development. While MTI has always invested in clusters, the Brookings Report and subsequently new funds called the Cluster Initiative has intensified this focus. With input from Maine's Technology Sectors and Clusters, a report completed in March 2008, we are strategically investing these new funds in areas of high opportunity and great promise.

Summary

While it is clear that Maine is making progress on its goal to more fully participate in the Innovation Economy, it is also clear that we have not gone as far in this direction as the authors of the Action Plan envisioned. This is a concern as many other states (and countries) continue to make significant investments in research, development and commercialization. The Maine Innovation Economy Advisory Board intends to use this report, along with the annual evaluation, the Innovation Index and Maine's Technology Sectors and Clusters, to frame specific recommendations for the Governor and the Legislature in a new science and technology plan for 2010 and beyond.

Introduction

In 2007, the Legislature enacted a bill which established the Maine Innovation Economy Advisory Board (MIEAB). This Board replaces the Maine Science and Technology Advisory Council (MSTAC) which was the body that wrote the 2005 Maine Science and Technology Action Plan.

Among its duties, MIEAB is required to:

> "... submit a progress report on the innovation economy action plan to the joint standing committee of the Legislature having jurisdiction over business, research and economic development matters and to the Governor by the first Wednesday in March of each year, beginning in 2008 (10 MRSA c.107-D, §949.12)."

This document is the second progress report. Under each objective, benchmark and action from the plan, we report on actions through February 1, 2009.

The Maine Innovation Economy Advisory Board intends to use this report, along with the annual evaluation, the Innovation Index and other reports, to provide the baseline for the new Action Plan that will be completed by January 2010.

Progress Report on Plan

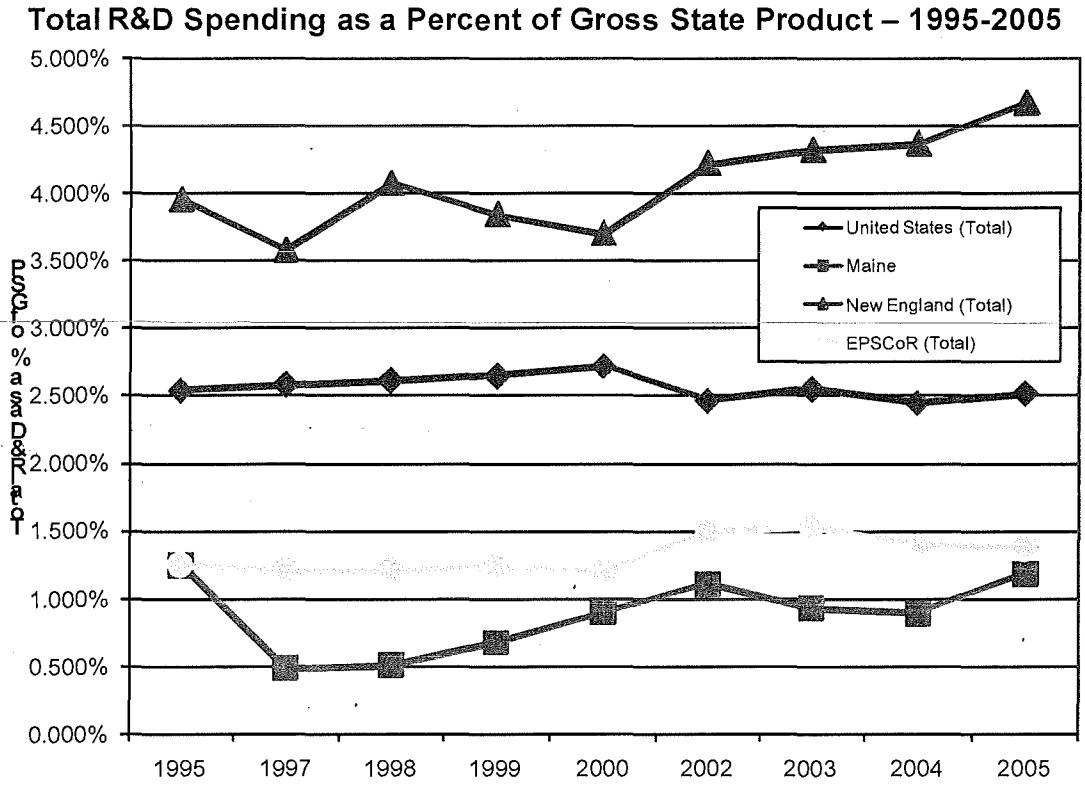
Overall goal: Maine will achieve $1 billion in R&D Activity by 2010

Progress:

According to the 2009 Innovation Index,

> *"In the last ten years, Maine has made progress on building R&D capacity and performance. In 1997, Maine ranked 49th among all states in total R&D as a percent of gross state product (GSP). In 2005, the latest year for which comparable data is available, Maine improved its ranking to 35th."*

The 2009 Maine Innovation Index includes the chart shown below with National Science Foundation data through 2005. This shows that our total R&D spending in the state was $524 million through the most recent reporting period, a 36 percent increase.



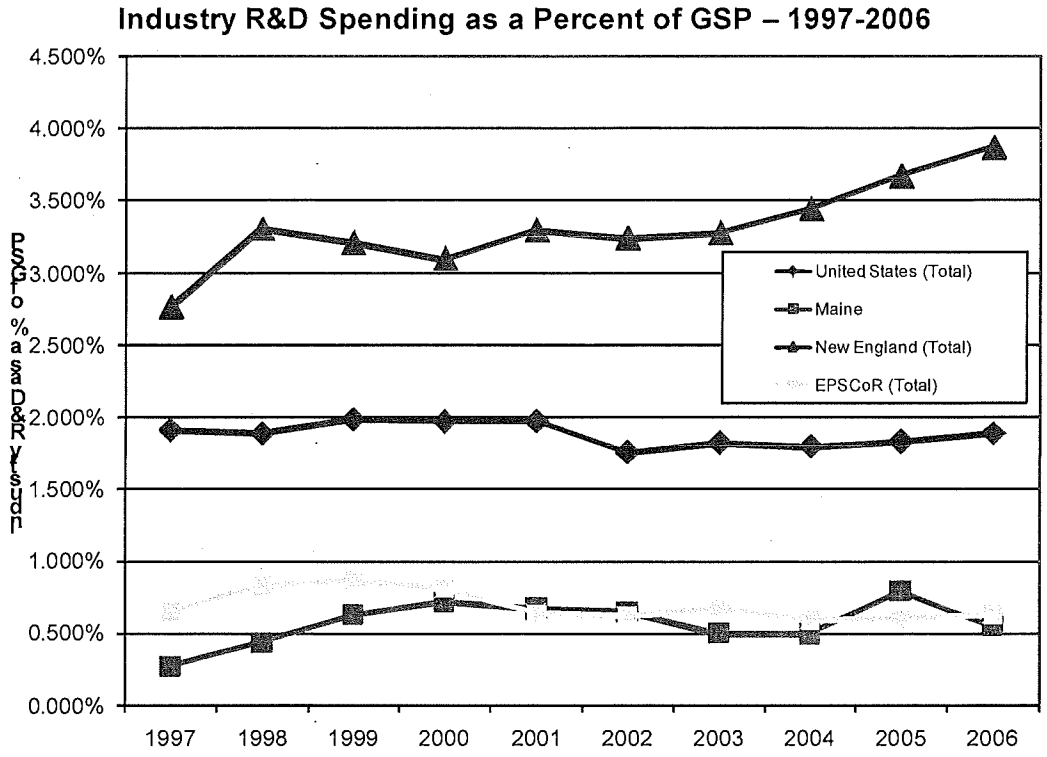
Note: From 1997-2000 & 2002-2005 chart portrays one-year increments; all other years are in two-year increments.

In terms of R&D performance by sector,

- *Maine ranks high in not-for-profit research nationally (3rd in the country in terms of R&D performed as a percent of GSP.*

- *In 2002, Maine ranked 49th in academic R&D as a percent of GSP, and improved to 43rd in 2006.*
- *In 2001, Maine ranked 35th in industry R&D as a percent of GSP, improved in 2005, but in 2006 dropped back to a ranking of 38th.*

This latter statistic suggests that total R&D will also be lower when the 2006 data are available.



In 2007 the voters approved a $50 million R&D bond which was to be allocated on a competitive basis through the Maine Technology Institute. This program was named the Maine Technology Asset Fund (MTAF). The first round of the MTAF was competed in 2008, with almost $30 million awarded. These funds are matched one-to-one, and as expended in the years ahead should contribute to additional R&D in the state.

Key Objective One: *Maine's investments in R&D will stimulate and sustain consistent, competitive growth for Maine's economy.*

2010 Outcome Desired: State investment in R&D research is $120 million per year, is focused on key strategic areas, and contains a state-sponsored R&D seed fund for emerging ideas and collaborative proposal development.

2007 Benchmarks

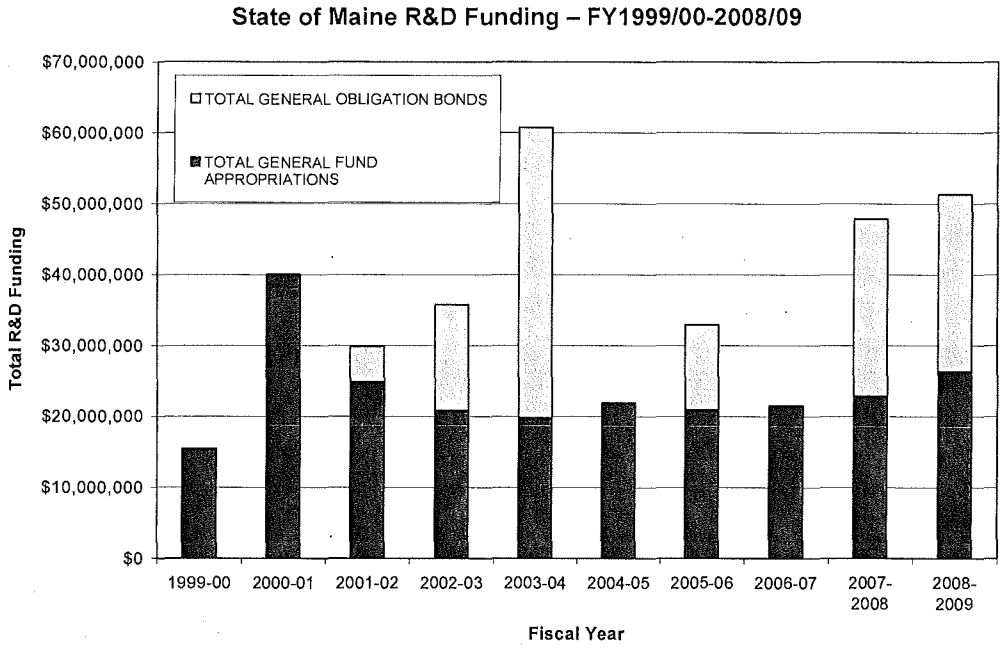
- State investment in R&D tops $75 million annually, including $35 million in on-going general fund support and $40 million in bonds for infrastructure development and expansion.
- Key strategic areas for targeted investments are defined and an objective process created to make funding recommendations for budget and bond initiatives.

Progress:

State investment has not reached the benchmark set in this plan. It has increased from around $20 million annually to $23 million for FY2008 and $26 million in FY2009 (before any cuts allocated in the Supplemental Budget). The Maine Technology Institute (MTI) received $4.5 million of new funding for a Cluster Enhancement Fund for the biennium FY2008-09. MEIF received an additional $3.0 million for the biennium; the Technology Centers were cut 25% to $187,250. In addition, the legislature passed and the voters approved a $50 million R&D bond that will be expended over the two years 2008-9. (This chart shows that entire expenditure in one year.)

The Maine Technology Institute's funding was cut in the FY09 curtailment by approximately $450,000 and there is a proposed cut for the FY10-11 biennium of $1.5 million. The MTI Board aims to fund the proposed biennium reduction with operational savings and the available portion of it unrestricted net assets, projected to be $1 million at the end of FY09, prior to cutting any future awards.

In his budget package, the Governor said, "This funding level falls short of that which would be otherwise calculated using the formula described above. Careful consideration was made in arriving at the recommended funding levels, as investment in research and development is critical to Maine's economy and future. However, the severe fiscal constraints facing the state taken in conjunction with an increased need for resources across state government have led to an inability to fund up to the prescribed level."



There has been a change in attitude since this plan was written. The plan envisioned that MSTAC would set strategic direction for how these funds, especially bond funds, would be allocated. Instead, the $50 million R&D bond is being allocated on a competitive basis and administered by the Maine Technology Institute (MTI). MIEAB (MSTAC's successor) suggested criteria and weighting of criteria to MTI for evaluation of the proposals for the R&D bond fund, the Maine Technology Asset Fund. Final criteria and weighting were established by the Maine Technology Institute Board, and in this way, an objective process was created. The criteria are:

- *Scientific or Engineering Merit and Feasibility (25 points)*
- *Team and Institutional Merit and Commitment (20 points)*
- *Economic Growth and Impact (25 points)*
- *Relevance to Maine's Innovation Economy Needs (15 points) and*
- *Collaboration (15 points).*

Actions:

- MSTAC[1] will recommend the capitalization of a state fund to provide match money for non-state sources of funding.
  Progress: *The Office of Innovation (OOI) in the Department of Economic and Community Development (DECD) presented this idea in 2006 in a budget proposal to the DECD Commissioner and the Governor, but it did not make it into final biennial funding recommendations.*

[1] Throughout this document, we have quoted the 2005 plan which refers to MSTAC, however, those actions have been undertaken by the Maine Innovation Economy Advisory Board (MIEAB), its successor.

- OOI will work with the Legislature to create a seed research fund for early stage data generation and project planning that will lead to federal or private funding proposals, including large, collaborative projects.
  Progress: *This proposal was part of OOI's 2006 recommendation to the DECD Commissioner and the Governor as part of an ESPCoR[2] match and seed fund but the idea did not make it into the final 2008-9 biennial budget.*

- MSTAC will investigate and make recommendations for the creation of a dedicated revenue source for R&D investments to fund current R&D programs, including MEIF, MTI, MBRF, MIF and other initiatives to achieve the overall R&D goal.
  Progress: *OOI met with the University of Maine System about this in 2006, and looked at options, including the Employment Tax Increment Financing program (ETIF) and Pine Tree Zones (PTZ). The DECD Commissioner decided not to pursue this initiative.*

- By spring 2006, MSTAC will define key strategic areas for targeted investments in R&D.
  Progress: *In 2006, OOI sent surveys out to many association groups, and met with each of them to talk about the Science and Technology Action Plan and about the opportunities in each sector. OOI brought this information back to MSTAC for further discussion. In the end, MSTAC decided that there was no real data to support these decisions. As a result, OOI partially funded a cluster study with MTI to help determine where Maine had the highest growth potential. This study, "Maine's Technology Sectors and Clusters: Status and Strategy," released in February 2008, identified 16 clusters of economic activity within the seven targeted technology sectors and made recommendations on how the State could nurture these clusters..*

- By 2007, MSTAC will evaluate proposed state-funded R&D projects to recommend strategic investments.
  Progress: *The $50 million R&D bond that was passed in early 2007 and approved by the voters in November, 2007, uses a competitive process administered by MTI to recommend strategic investments. MSTAC participated in this activity by developing draft criteria for MTI to consider. These criteria were adopted by MTI substantially as proposed by MSTAC.*

- Research institutions and universities will develop faculty and student recruitment to include key strategic areas by 2007.
  Progress: *Recruitment of faculty and graduate students in Maine Economic Improvement Fund (MEIF) sectors has been emphasized. The limited increases in MEIF have diminished the ability of universities to recruit, especially given the increased amount of start-up funds required to be competitive. Also, as our faculty has become more successful in being awarded federal grants, the total amount of required match has increased, diminishing the amount of MEIF available for faculty and student recruitment.*

[2] EPSCoR is the Experimental Program to Stimulate Competitive Research. It is a competitive set-aside program for certain states, including Maine, which historically have received lower levels of federal research funding.

Key Objective Two: *Stimulate a robust R&D enterprise by boosting academic R&D capacity, developing an educated, technically skilled workforce, broadening the impact from the nonprofit research institutions and increasing private sector R&D activity in key strategic areas important to Maine.*

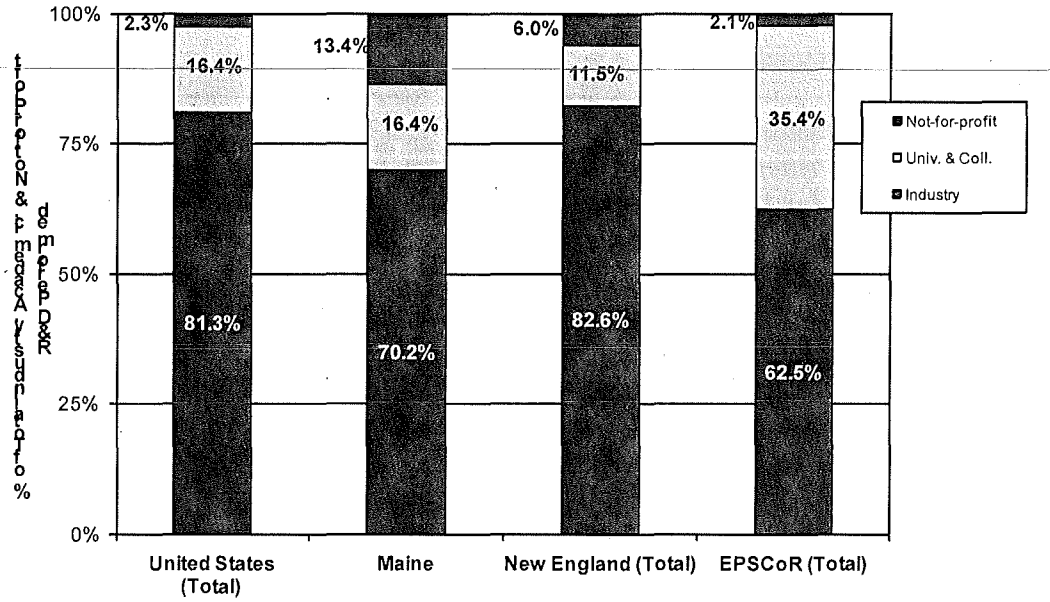
2010 Outcome Desired: Maine's annual R&D activity will be comprised of 75% of private sector R&D and 25% of research university and institutional R&D.

2007 Benchmarks:

- In 2007, Maine universities award 250 graduate degrees in science and engineering, while universities and research institutions support 2000 principal investigators and attract over $150,000,000 in research funding.
- Research institutions and universities collectively achieve $400,000 in funding from licensing revenue and file 15 patent applications per year.
- All institutions requesting state funding will demonstrate collaborative multi-institutional efforts and at least one collaborative proposal for federal funding will be submitted from Maine-based institutions.
- MTI will have at least one applicant for its technology transfer fund that includes a partnership between a private company and a research institution.

Progress:

R&D by Performance Sector – 2005



Note: not for profit includes only that which is federally funded and therefore the contribution by this sector is understated

The most recent Maine Innovation Index using 2005 National Science Foundation data shows that our research and development expenditures are split 70.2 percent industry and 29.8 percent university and non-profit, which is quite close to the benchmark that was set. The industry R&D share is increasing but we dropped from 32nd in the nation in 2005 back down to 38th in 2006.

The 2008 Comprehensive Evaluation shows that Maine awarded 204 graduate degrees in science and engineering in 2007, which is much lower than in recent years. The total of research expenditures at the universities and non-profits in Maine is $230,000,000, up significantly from the previous year. There are over 1200 faculty and 1200 professional researchers employed at the institutions, over the benchmark that was set.

The licensing benchmark results are mixed. The universities and nonprofits that were surveyed reported a total of just over $1,000,000 in licensing revenues in 2008, up 50 percent from the previous year, well over the goal, but only 6 patents compared to the goal of 15.

The new $50 million R&D Bond fund, the Maine Technology Asset Fund, will rely heavily on collaboration as an evaluation criterion. We expect this to cause further upticks in collaboration among the institutions and with Maine companies. The institutions that responded to the survey reported 80 proposals for over $77 million submitted jointly by more than one Maine institution, a significant improvement over previous years.

This year, the NSF EPSCoR proposal included many of the research institutions, meeting the 2007 benchmark. A multi-institutional collaborative NIH IDeA (Institutional Development Award) proposal to support biomedical research and research training was submitted by the Mount Desert Island Biological Laboratory (MDIBL). This proposal includes MDIBL, the Jackson Laboratory, Bates, Bowdoin, and Colby Colleges, College of the Atlantic, The University of Maine, University of Maine campuses at Farmington, Machias, Fort Kent, Presque Isle, and Southern Maine Community College.

The Maine Technology Institute technology transfer fund mentioned in this goal has not been established per se, however MTI has approved a new use of the Development and Seed Grants that will be available to fund the development of technologies that are still in the laboratories of the universities and nonprofit research institutions and is meant to increase technology transfer. This program will start in mid-2009.

Actions:

- MSTAC will work with the universities and research institutions to actively promote and pursue EPSCoR and other opportunities to match state R&D funds for building research infrastructure, submitting two collaborative, multi-institutional proposals each year.
  Progress: *In 2008, we received new funds from EPSCoR totaling over $3.7 million including $633,000 from the Department of Energy, two Department of Defense awards, and a NASA EPSCoR award. A wide number of institutions participated in the development of a single NSF proposal this year. The proposal, entitled "Maine's Sustainability Science Initiative", was submitted in October.*

- The universities and research institutions will report to MSTAC regarding the competitiveness of Maine's faculty start-up and incentive packages and proposals for improvement to national average by 2006.
  Progress: *Currently, the University of Maine is able to offer competitive start-up packages. The University of Southern Maine start-up packages are not competitive with peer institutions, mainly due to limited MEIF funds. Competitive salaries are constrained by negotiated contracts with Associated Faculties of the University of Maine System (AFUM.) Incentive packages are similarly constrained. There are also budgetary constraints. Maine biomedical research institutions that sponsor students from the GSBS offer graduate student stipends at the rate approved by federal funding agencies.*

- The universities will work in collaboration with the biomedical research institutions to complete the formation of the Graduate School of Biomedical Sciences (GSBS) as a multi-institutional graduate school program that supports competitive graduate student stipends and provides graduate training and degree opportunities by the end of 2007.
  Progress: *The Graduate School of Biomedical Sciences (GSBS) was formally approved in January 2006. There are currently 22 Ph.D. students in GSBS, with more than 80 affiliated faculty. Research rotations include functional genomics, neuroscience, biomedical engineering, toxicology, and molecular and cellular biology. The seven institutions are University of Maine, University of Southern Maine, University of New England, Maine Institute for Human Genetics and Health, the Jackson Laboratory, Mount Desert Island Biological Laboratory, and Maine Medical Center Research Institute. Unless a committed source of funding emerges, future classes will have to be reduced by 50%.*

- OOI will work with Maine's private college to develop a program to target their students to consider graduate school in Maine starting with the class of 2008.
  Progress: *OOI has not worked on this action item.*

- The universities and research institutions will ensure graduate stipends are competitive nationally to attract more graduate students beginning in fall 2008.
  Progress: *At the University of Maine, stipends awarded on federal grants are competitive. Stipends for Teaching Assistantships are the lowest of all New England land grant universities. USM is able to provide competitive research assistantship stipends for a limited number of graduate students. Budgetary constraints will prevent this situation from improving.*

- OOI will work with Maine's universities to investigate creating additional graduate degree programs in key strategic areas by the fall of 2007.
  Progress: *OOI has not worked on this action item.*

- OOI will work with the community colleges and universities to align curricula with the needs of high-growth R&D intensive enterprises, as identified by trade associations and business representatives and report to MSTAC by the fall of 2007.

Progress: *OOI has begun work on this action with the information technology sector, working with TechMaine (formerly Maine Software Developers Association). We applied for and were awarded a grant from the Department of Labor in January 2008 which will include a Skills Inventory and a program of worker training using the community colleges and universities.*

In addition, the activities under the WIRED grant for the composites and marine trades industry also are focusing on the skills needs of this sector. OOI, through MTI, is involved along with DECD as a major participant on this grant.

- The university system will increase its research faculty in areas identified as critical to the state's economy starting in the fall of 2008.
  Progress: *OOI has not worked on this action item.*

- MSTAC will recommend a competitive fund for the creation of Innovation Hubs—a collaborative world class research, development and commercialization initiative—for the FY07-08 bond package.
  Progress: *While this concept was discussed, the FY07-08 bond package ended up as a competitive initiative without specific earmarks for any individual project.*

- By the end of 2007, universities and research institutions will minimize institutional barriers that are disincentives for researchers to work with private industry, pursue licensing opportunities and industrial research contracts, and develop and spin off new technologies.
  Progress: *According to the 2008 Comprehensive Evaluation, the technology transfer capacity at Maine institutions varies greatly by institution. A few institutions have made great progress and have sufficient capacity for technology transfer. The rest either lack capacity or have significantly constrained capacity. Budgetary constraints have prevented an increase in staffing of technology transfer offices.*

- MSTAC will continue to encourage Maine's universities and research institutions to institutionalize and reward technology transfer activities to foment the interface between institutions and private companies to commercialize new ideas.
  Progress: *MSTAC suggested the criteria for the new R&D Bond fund competition which stresses collaboration and the commercialization of ideas created through the infrastructure enabled by the funds. This had the effect of encouraging Maine's universities and research institutions to add technology transfer activities and work closely with private companies. All but one of funded proposals from Round One of the MTAF had significant collaboration with the private sector.*

- Maine's business schools will assist the science and engineering departments, research institutions and research-intensive business community to develop business and marketing plans for technologies developed at the research institutions by the fall of 2007.
  Progress: *Current faculty numbers limit this collaboration, and budgetary constraints on faculty numbers will prevent this situation from improving. The Maine Center for*

Enterprise Development's (MCED) co-location at the University of Southern Maine (USM) and the Student Innovation Center and Target Incubator at the University of Maine Orono (U Maine) are developing some joint capacity with the business school faculty/students for business assistance to start-ups.

- Research institutions and universities will identify any remaining institutional barriers to inter-institutional collaboration and work to remove them by the end of 2006.
  Progress: *A number of successful Memorandum of Understanding (MOUs) have occurred e.g., Jackson Laboratory/Maine Medical Center Research Institute/University of Maine; Jackson Laboratory/Eastern Maine Healthcare Systems/University of Maine; Gulf of Maine Research Institute/University of Maine. USM has developed collaborations with the Gulf of Maine Research Institute and the Maine Center for Enterprise Development. The INBRE institutions also have MOUs amongst themselves. However, some systemic barriers remain, which can be resolved with ongoing efforts.*

- Research institutions and universities receiving state funding will seek to establish reliable, easy-to-use, compatible connections for teleconferencing by the end of 2007.
  Progress: *Teleconferencing facilities are available at most research institutions and universities. Scheduling and appropriateness of the facilities remain a challenge.*

- OOI will investigate web-based information sharing and develop a central site for posting science and technology information by the end of 2007.
  Progress: *OOI instituted a monthly e-newsletter aimed at the research community in September 2007. This newsletter, Mainely Innovations, contains funding opportunities, policy reports on science and technology-based economic development, company news and Maine innovation news.*

- Research institutions and universities will host or support at least 5 topical workshops annually that bring together scientists and entrepreneurs from multiple institutions, the public and private sectors, within and outside of Maine.
  Progress: *University of Maine hosted a ME NSF EPSCoR meeting as well Climate Change 21: Choices for the 21st Century in 2008 and Maine Technology Institute hosted an SBIR/STTR meeting in 2008. MCED and USM sponsor ongoing (monthly and annual) entrepreneurial workshops. Similarly, UMaine and the Student Innovation Center and the Target Incubator have hosted regular entrepreneurial workshops for a number of years.*

- Maine's research institutions will develop, standardize, update and promote technology transfer processes by the end of 2007.

  Progress: *According to the 2008 Evaluation, most institutions have Intellectual Property(IP) policies in place, but have not established recurring faculty training and awareness raising processes on technology transfer and IP opportunities.*

  - *Only 3 institutions interviewed have a dedicated patent budget.*
  - *There is evidence of upper administration support for technology transfer and entrepreneurial activity at the University of Maine (Orono), MMCRI, and Jackson*

Labs. Most of the other institutions are focused on growing a research base, and have not begun to focus on the commercialization aspects of the growing research.

- MTI will evaluate and develop a specific technology transfer fund and/or increase the ability of MTI programs to fund technology transfer projects by the end of FY07.
  Progress: *Maine Technology Institute has a strategic plan that includes a specific goal: "Encourage technology transfer and commercialization by Maine companies through a tech transfer award program." An outline of the program was developed and reviewed with MTI's Program Committee, and funds set aside in FY2009. The full Board has adopted this new program for implementation in mid-2009.*

Key Objective Three: *Maine's Legislature and key policy makers recognize, advance and celebrate Maine's R&D investments and strategic priorities.*

2010 Outcome Desired: Strategic areas and proposals from MSTAC are a key component of the Governor's and Legislature's budget and bond proposals.

2007 Benchmarks

- A minimum of 30 key legislators articulate, champion and endorse the R&D strategies recommended by MSTAC, attend the annual R&D Day and the bi-annual ME Tech Show.
- The Innovation Index and R&D Evaluation results are presented to a minimum of 30 key legislators and leadership staffers.

Progress:

For the next biennium, FY10-11, the Governor's budget included approximately $1.5 million in cuts to MTI, and flat funding for MEIF and other key R&D programs. In addition, the Governor is expected to propose a major R&D Bond. This is in the context of a major recession, and deeper cuts in other parts of state government.

While there appears to be strong support for innovation strategies, we cannot at this writing specifically identify 30 legislators who are championing this cause beyond the members of the BRED committee and certain legislative leaders. There has been no R&D Day since 2006, nor has the ME Tech Show been held since 2005.

Annually, the Innovation Index and Comprehensive Evaluation are presented to the Governor and the BRED committee; in 2008, these results were also circulated to all legislators.

Actions:

- OOI will host annual "R&D" informational day seminars for legislators, starting in Spring 2006, with presentations from the authors of the "Evaluation of Maine's Public Investments in Research and Development."
  Progress: *OOI had the evaluators for 2008 (PolicyOne Research team) come up and present to the BRED Committee in January 2008 and January 2009. Legislative leadership was also briefed in 2009.*

- OOI will work with the Maine Development Foundation (MDF) to create a specific R&D investment tour for legislators beginning in 2006.
  Progress: *R&D companies and non-profits were an active part of the MDF bus tours for the 124rd legislative session.*

- OOI will work directly with House and Senate Leadership to create a Legislative R&D day as part of legislative orientation beginning in the fall of 2006.

Progress: *OOI has not worked on this action item.*

- OOI and MSTAC will develop and implement an outreach targeted at current and prospective legislators by the fall of 2006.
  Progress: *OOI has not worked on this action item since 2006.*

- OOI will work with the research institutions, universities, R&D stakeholders and research-intensive businesses to present a coherent, unified message to legislators on the importance of R&D to the state's economic future focusing on the importance of (i) R&D investments in general; (ii) long-term, growing support; and (iii) targeted investments, by the Spring of 2007.
  Progress: *Throughout the 2006, 2007 and 2008 legislative sessions, OOI, MTI and the University presented a coherent, unified message about the importance of R&D to the state's economic development. The three organizations testified together to the REDI committee, the Council on Jobs and the Economy, the Prosperity Committee, Appropriations and BRED committees at various times throughout the three years.*

- OOI will annually publish and distribute the Innovation Index.
  Progress: *OOI publishes the Innovation Index each year in January. In addition, the Index is posted on the OOI website, www.maineinnovation.com.*

- OOI will annually publish and distribute the "Evaluation of Public Investments in Research and Development" and discuss results with legislators, MSTAC and the public.
  Progress: *OOI publishes and distributes the "Evaluation of Public Investments in Research and Development" annually in February and posts the document on its website. The results are presented to the Governor, Commissioner of DECD, MSTAC (now MIEAB) and the BRED committee as a minimum each year. In addition a press release is prepared each year and circulated to major media outlets in Maine. Budget constraints prevent the production of more than 50 hard copies each year.*

- OOI will present and make available other reports and studies as requested and outlined in this plan.
  Progress: *Done. "Maine's Technology Sectors and Clusters: Status and Strategy," funded jointly by OOI and MTI, was distributed electronically in March, 2008, and is available on the website.*

Key Objective Four: *Maine's unique R&D assets and their significance to Maine's economy are used to draw new businesses and investment to the state of Maine.*

2010 Outcome Desired: Location and/or expansion of 8 new research intensive businesses in Maine.

2007 Benchmarks:

- Maine's graduating college and university seniors and alumni learn and routinely inquire about the state's burgeoning R&D enterprise.
- Attendance at ME Tech Show reaches 750.
- Three new research-intensive businesses locate and/or expand operations in Maine.

Progress:

The major attraction success this year has been in the innovation sector. In 2008, Boston Financial announced that they were moving new operations to Maine. In addition, Notify MD announced an expansion to a new facility, as did IDEXX and several other technology companies.

There is no measurement mechanism for assessing whether or not Maine's graduating seniors or alumni are inquiring about the state's R&D enterprise, but both the Target Technology Center and the Maine Center for Entrepreneurial Development are working closely with student entrepreneurs who are starting companies in the tech sector.

The ME Tech Show was not held in 2006, 2007 or 2008.

OOI is working closely with the technology associations to discuss the possibility of working more closely together along the lines of a Technology Council of Maine.

Actions:

- OOI will develop fact sheets describing: (i) Maine's science and technology assets; (ii) key strategic areas and opportunities for research-intensive business development and growth; (iii) prototypical cost of doing business comparisons; and (iv) real estate, workforce and research availabilities, and cost, by fall of 2006.
  Progress: *OOI worked with the industry in 2006 to develop fact sheets, but budgetary constraints prevented completion of this action. The workforce and real estate pieces were not done.*

- OOI will promote internship opportunities for Maine high school students at Maine's universities, research institutions and technology-based businesses.
  Progress: *OOI was unable to work on this action item due to personnel constraints.*

- OOI will showcase Maine's R&D community at five job fairs, science and technology-based conferences and business forums held in Maine.

Progress: *OOI did not attend job fairs, but continues to speak across the state to many business and other groups on the Science and Technology Plan, and the impact of R&D on the Maine economy, and the promise it offered to Maine's innovation based economy.*

- OOI will annually promote opportunities in Maine's innovation-based economy to graduates of Maine's colleges and universities through alumni associations.
  Progress: *OOI was unable to work on this action item due to personnel constraints.*

- OOI will work to promote the bi-annual Maine Tech Show as a showcase for Maine's entire R&D enterprise.
  Progress: *Maine Tech Show has not been held since 2005.*

- The state will create a business development and attraction fund for R&D intensive commercial enterprise with substantial and immediate economic impacts for implementation in 2007.
  Progress: *Fiscal constraints have prevented this action from being completed.*

- Assist and encourage the association between Maine businesses and other similar businesses on an international basis.
  Progress: *OOI works closely with the Maine International Trade Center to provide international technical assistance. There is an MOU between MTI and MITC and also between MITC and the Technology Centers.*

- OOI will provide information to industry trade associations for national trade conferences, newsletters and other events starting in 2007.
  Progress: *Not done.*

- OOI will work with the trade associations and Maine and Company to follow-up possible leads beginning in 2006.
  Progress: *OOI continues to meet with the technology-related trade associations on a regular basis. Specifically, OOI is working with TechMaine (formerly Maine Software Developers Association), Midcoast Regional Redevelopment Authority (MRRA) and Maine and Company to develop a plan for the attraction of "domestic outsourcing opportunities" for information technology. This effort is funded by the BRAC-IT grant.*

- OOI will sponsor or host a booth at one regional or national trade show per year targeting research-intensive businesses, starting in 2007.
  Progress: *There are no funds available for this action.*

- OOI or MSTAC will present Maine marketing materials at one international science-based conference per year, starting in 2007.
  Progress: *Not done.*

- OOI will work with the Office of Tourism to enhance the tourism marketing message by including Maine's economic opportunities in targeted science and technology areas for the 2008 campaign.

Progress: *OOI has initiated discussions with the Office of Tourism about this subject. The 2008 strategic plan for Tourism includes a focus on culinary-based travel which will support the specialty foods cluster that is part of the Forestry and Agriculture Sector.*

Key Objective Five: *Foster growth of research intensive companies through a comprehensive network of services and support.*

2010 Outcome: Maine reaches the top 25, compared to other states as measured in the CFED Development Report Card for the states for: venture capital investments, SBIC (Small Business Investment Corporation) financing, loans to small businesses; employment growth, job growth due to new businesses; technology industry employment; and change in new companies.

2007 Benchmarks:

- Maine's funding continuum includes an investment fund designed to provide working capital for early-stage research-intensive companies.
- A network of 10 experienced entrepreneurs actively participate in offering advice time and guidance to Maine's research-intensive companies.
- DECD has business support personnel and services dedicated to and knowledgeable about research-intensive ventures.

Progress:

According to CFED (www.cfed.org), Maine's rankings for 2007(latest available as of February 2009) on the measures listed above are:

- *Venture capital* 29^{th}
- *SBIC loans* 12^{th}
- *Loans to small business* 37^{th}
- *Employment Growth – long term* 19^{th}
- *Employment Growth = short term* 29^{th}
- *Job Growth due to new business* 39^{th}
- *Technology industry employment* 35^{th}
- *Change in new companies* 38^{th}

The Fund of Funds (LD 1215, 123rd) initiative did well in the legislature, passing both houses unanimously, but was vetoed by the Governor. The bill has been re-introduced in the 124th legislature (LD 1).

There is no formal process set up for a network of mentors. However, OOI has introduced legislation in the 124th to include this as an action item for the Technology Centers.

DECD Office of Business Development specialists regularly support MTI clients. We are exploring additional options for training, etc. which will increase the efficacy of this resource.

Actions:

- OOI and MTI will investigate successful state and private programs for high risk financing and MSTAC will develop recommendations for developing a high risk funding program for the fall of 2006.
  Progress: *While several alternatives have been identified, such as the fund of funds approach, none have been adopted.*

However, the Maine Technology Institute has expanded its activity connecting Maine technology companies with capital through expanded collaboration with the Maine Angel Network, via joint outreach presentations and networking meetings that introduce MTI-funded companies and seed stage investors. It has also expanded its Accelerated Commercialization Fund investments as its portfolio of companies has matured.

- MSTAC will seek to increase Maine's banking and lending institutions' understanding and financing of research intensive companies.
  Progress: *OOI has made some limited progress on this issue through discussions in the financing community about the Fund of Funds.*

- OOI will convene meetings of private and public financial institutional, endowments and retirement funds to consider models and develop a funding pool for early stage, pre-profit, minimal asset research-intensive companies in 2006.
  Progress: *OOI did not work on this item due to personnel constraints.*

- OOI will investigate successful state programs for entrepreneurial management recruitment and development, recommend programs for development in Maine, and report back to MSTAC by the fall of 2006.
  Progress: *OOI evaluated the entrepreneurial and leadership program in Kansas in 2008, and recommended changes to the Technology Centers program as a result. Legislation is pending.*

- OOI will work with existing resources such as Entrepreneurship Working group, MTI Maine Tech Trackers, Small Enterprise Growth Board, Technology Centers, trade associations and business schools to contact and recruit Maine's retiree community, existing successful entrepreneurs, and business school alumni clubs for entrepreneurial expertise by the fall of 2007.
  Progress: *OOI has not pursued this action. However, legislation in the 124th will enable the Technology Centers to be a focal point for this activity.*

- OOI will investigate other state's models for intensive, focused business assistance to develop a proposal for review by MSTAC and DECD by the fall of 2007.
  Progress: *OOI is proposing a new plan for entrepreneurial support to the legislature and this action was supported by MIEAB.*

- OOI will participate with the Entrepreneurship Work Group to ensure technology intensive businesses needs are address through the development of the "business first" model currently being used as a pilot program in the Mid-Coast region.
  Progress: *The Entrepreneurship Work Group has not met in two years.*

- Research institutions and universities will identify internal road blocks to evaluating technologies for commercialization or licensing potential and directing those technologies into opportunities with the greatest potential for sustained success by the fall of 2007.

Progress: *OOI has encouraged both the universities and the nonprofits to assess their technology transfer operations and to work closely with a contractor and the Patent Program to increase their activities. MTI funded a two-year cluster award to the Center for Law and Innovation for a technology transfer expert who worked with a number of Maine's smaller biomedical and marine research institutions in Maine to educate them about the opportunities associated with technology transfer and helped several of them to develop technology transfer policies and processes. Some progress has been identified, yet significant funding challenges exist in terms of patent expenditures and technology transfer personnel.*

External Forces Critical to Economic Prosperity

The Science and Technology Action Plan mentioned a number of issues external to the innovation community, but of critical importance to its success. Several are discussed below.

Cost of Doing Business

Progress: *Since the writing of the Science and Technology Action Plan, some progress has been made on the issue of the cost of doing business in the state of Maine. The major reform has been the repeal of the Business Equipment Tax Relief (BETR) program. On other fronts, however, costs for electricity and other energy sources have been a significant issue.*

Wireless Telecommunication and Broadband Infrastructure

Progress: *Connect ME is leading on this issue and has made several grants to local organizations. In addition, the pending transfer of assets from Verizon to Fairpoint Communications includes promises of expanded Broadband.*

Human Resources

Progress: *In 2007, OOI worked closely with the Maine Mathematics and Science Alliance and others to sponsor a STEM Summit which was held January 24, 2008. This important event focused on the needs of the P-K-20 system to produce more science, technology, engineering and mathematics students and enhance the workforce to support the growth of technology-intensive industries in ME.*

New Initiatives Not Foreseen in 2005

North Star Alliance

Progress: *Maine's North Star Alliance Initiative is an industry focused economic development initiative devised to drive business and create jobs in coastal Maine. The initiative includes business, R&D, education, and workforce development centered on Maine's boatbuilding, marine, and composite industries. Organized by "pillars," the Initiative is a partnership of ME Department of Labor, the Department of Economic and Community Development, including the Office of Innovation and Maine Technology Institute; and a wide variety of trade associations and companies.*

The key elements of this project all relate to the science and technology plan because the targeted cluster is one of the bright lights of the technology community in Maine. Activities include strong relationships between the Advanced Engineered Wood Composites Center (AEWC) at the University and companies throughout the state, new funding through MTI for four companies in the sector, numerous Seed Grants and Development Awards for the inclusion of new composites technology in traditional

boatbuilding companies, and a cluster award to strengthen the Maine Composites Alliance and a potential merger with the Center for Composite Technology, a Technology Center.

On January 11, 2008, the Mark V.1 was launched at Hodgdon Yachts in East Boothbay. This was the culmination of a collaboration among Hodgdon, the university through AEWC, DECD, MTI and many other companies, as well as support from the federal delegation. It is possible that this event could mark the path to the establishment of a significant market for small combatant craft for the US military as well as foreign military sales.

BRAC-IT

Progress: *DECD and Maine Department of Labor (MDOL) wrote a proposal for and were awarded a $2 million grant to support the transition of secondarily affected workers from the closing at Brunswick Naval Air Station into the information technology cluster. We worked with TechMaine, Midcoast Regional Redevelopment Authority and Maine and Company to write a strategic plan for attraction of domestic low-cost in-sourcing opportunities to Maine, to identify skills and infrastructure needed and identify training needs and providers.*

Cluster Initiatives

Progress: *In 2007, the watchword in the technology community was "clusters." The legislature increased the Maine Technology Institute funding by $2.28 million to fund a Cluster Enhancement initiative in FY2009. MTI has been funding cluster projects for some time, but 2007 saw an increase in activity in many new and emerging clusters. The report, "Maine's Technology Sectors and Clusters" updated the 2002 research and will form the basis for many of the new initiatives. MTI launched a new Cluster Initiative Program in late 2008 and is currently reviewing the first round of proposals.*