2008 Progress Report
on the
Science and Technology Action Plan for Maine, 2005

Prepared for:
The Joint Standing Committee on Business, Research and Economic Development
123rd 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 5, 2008

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Senator Lynn Bromley
Representative Nancy Smith
Joint Standing Committee on Business, Research and Economic Development
Cross Office Building, Room 208
Augusta, ME 04333

Dear Senator Bromley and Representative Smith:

In 2007, through your leadership, the Legislature enacted a bill which established the Maine Innovation Economy Advisory Board (MIEAB). This Board replaced 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 progress report. Under each objective, benchmark and action from the plan, we report on actions through February 1, 2008.

The Maine Innovation Economy Advisory Board intends to use this report, along with the annual evaluation, the Innovation Index and the upcoming Target Cluster Study, to frame specific recommendations for the Governor and the Legislature for the next biennium. This will be consistent with the legislative charge to the Board.

We look forward to the opportunity to discuss these findings with you.

Sincerely,

Miles Unobsky Theeman
Chair

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 and 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 to produce a progress report yearly on the plan that was approved in 2005. The Board is also to provide state and federal policy makers assistance in advancing research and development capacity initiatives in the State and in developing 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); Bruce Bornstein (PalletOne); 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

Contents

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 Biological 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 first report since the establishment of the MIEAB.

This progress report documents the status of the overall objective, the five key objectives, the 2007 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 two years include:

- Annual funding for R&D increased from $20 million to $26 million for FY09 (before rescission and cuts authorized by the Supplemental Budget)
- A $50 million R&D bond was authorized.
- The Graduate School of Biological Sciences, a joint project of the University of Maine, the Jackson Laboratory and the Institute for Health and Human Genetics, was established.
- The university continued to spin-off companies and the first spin-off from The Jackson Laboratory was launched.
- Several high profile technology companies were attracted to Maine.
- The Legislature continues to acknowledge the importance of investing in the Innovation Economy.

However, many initiatives have languished for lack of budget and/or personnel to undertake the actions described. Several initiatives at the universities, notably those to increase the number of graduate students in science and engineering, and in technology transfer, cannot be implemented within existing resources. Similarly, the many actions requested of the Office of Innovation are beyond the resources of a two-person staff and limited budget.

On the other hand, some new resources became available which were not envisioned when the plan was written. These include the North Star Alliance which has contributed to the Advanced Materials and Composites sector, and the new Cluster Enhancement Fund for MTI.

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 $384 million through the most recent reporting period (2004) for which comparable data is available. This is up 71% since 1999 and state rankings continue to move upwards, indicating progress against our peers.

A $50 million R&D bond was passed by the legislature and approved by the voters in 2007. Because of the competitive nature of the bond and the criteria, including collaboration and economic impact, we expect that these funds will more strongly stimulate industry R&D and move the total R&D spending closer to the ultimate goal.

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

According to the 2007 Comprehensive Research and Development Evaluation, "Maine is making steady progress in building R&D with a positive economic impact."

However, state investment has not reached the $75 million ($35 million general funds and $40 million in bonds) benchmark set in this plan for 2007. It has increased from around $20 million annually to $23 million in FY2008 and $26 million in FY2009. The Maine Technology Institute (MTI) received $4 million of new funding for a Cluster Enhancement Fund for 2008-09. The Maine Economic Improvement Fund (MEIF) also received a $3.0 million increase for the biennium, while the Technology Center budget was cut. In addition, the legislature did pass and the voters approved a $50 million R&D bond that will be expended over the two years 2008-9.

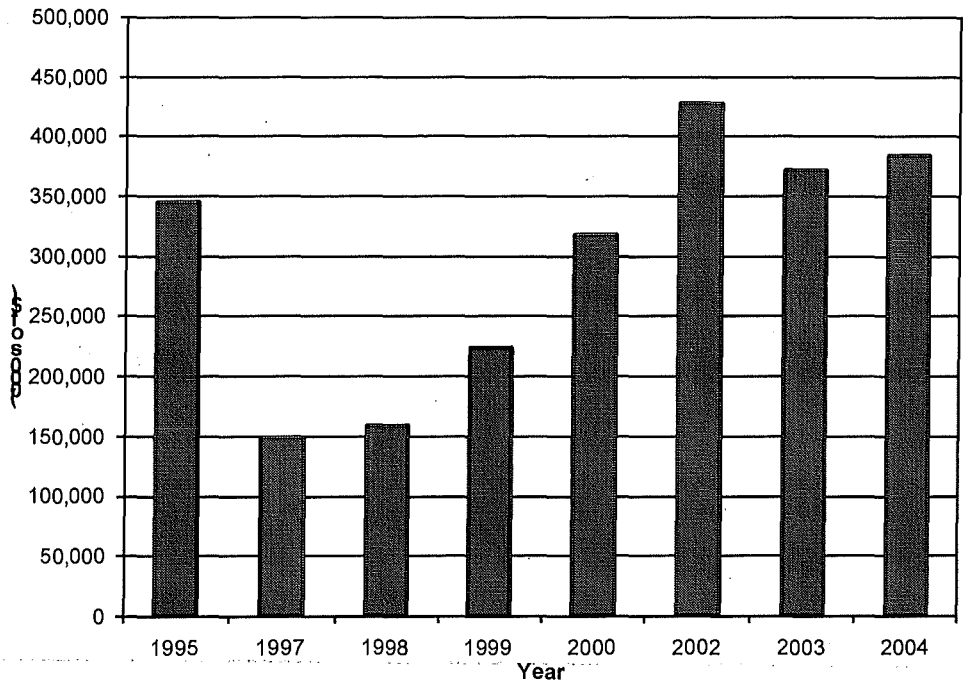
Key Objective Two: *Stimulate a robust R&D enterprise by boosting academic R&D capacity, developing an educated, technically skilled workforce, broadening the impact from the nonprofit research institutions and increasing private sector R&D activity in key strategic areas important to Maine.*

Maine is making steady progress in building R&D scale with a positive economic impact, yet the pace at which university and nonprofit research is being commercialized is slowing than our competitors.[1] Universities and nonprofits have increased their total R&D, while the number of science and engineering graduates has declined slightly over the past five years.

The most recent Maine Innovation Index using 2004 National Science Foundation data shows that our research and development expenditures are split 57 percent industry and 43 percent university and non-profit. The industry R&D share is increasing and we recently moved from 40th in the nation on this indicator in 2004 to 32nd in 2005.

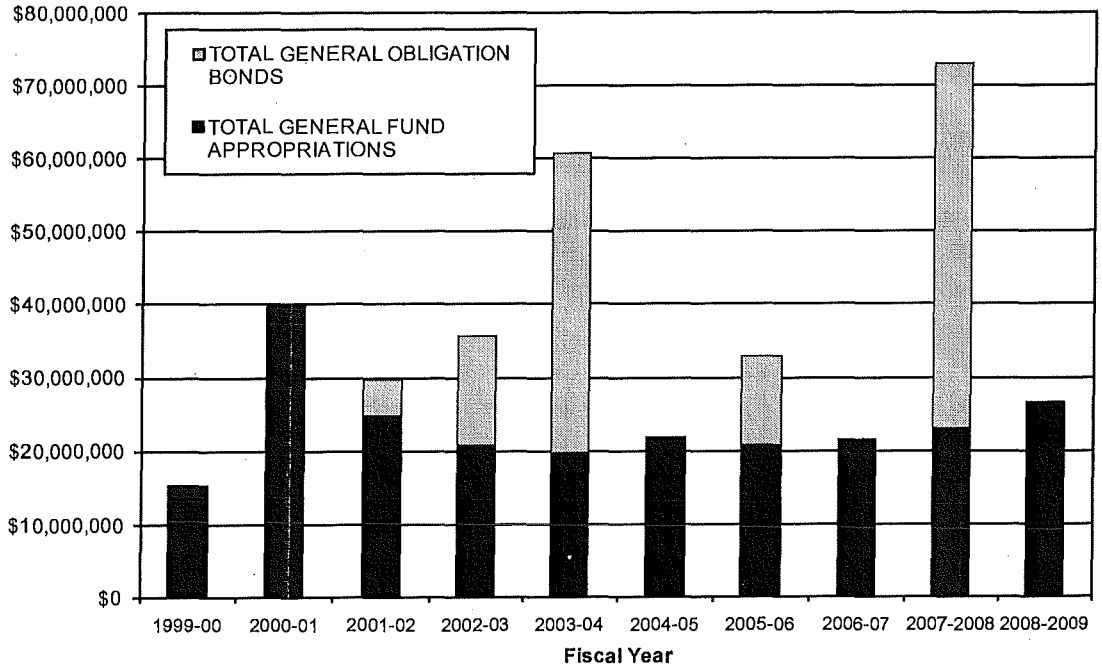
[1] See PolicyOne Research, "Maine Comprehensive Research and Development Evaluation 2007," pages 37 and 42. www.maineinnovation.com.

Total R&D Spending in Maine – 1995-2004



Note: From 1997-2000 & 2002-2004 chart portrays one-year increments; all other years are in two-year increments.

State of Maine R&D Funding – FY1999/00-2008/09



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. In the last biennium, the Governor's budget included new funds for MTI and the MEIF. In addition, the Governor proposed significant new R&D bond funds. When the budget was concluded, MTI had an increase of $4 million for the biennium, MEIF was up $3.0 million and the R&D bond was set at $50 million for MTI.

Innovation and related investments were the focus of the Joint Select Committee on Research, Economic Development and Innovation (REDI) which met over the Summer of 2006; The Brookings Report, "Charting Maine's Future;" the Governor's Council on Jobs and the Economy; and most recently, the Joint Select Committee on Future Maine Prosperity.

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 successes this year in attracting new business to Maine have all been in the innovation sector. In 2007, Notify MD, athenaHealth and Acrobat all announced that they were moving new operations to Maine. In addition, there was a spin-off from Jackson Laboratory, Bar Harbor Biotechnologies. Several major expansions of technology companies are in the works which have not been announced as of this date.

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 ripe 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 Cluster Enhancement Funds has intensified this focus. With a new Cluster report due in March 2008, we look to strategically invest 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 the upcoming Target Cluster Study, to frame specific recommendations for the Governor and the Legislature for the next biennium.

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 progress report. Under each objective, benchmark and action from the plan, we report on actions through February 1, 2008.

The Maine Innovation Economy Advisory Board intends to use this report, along with the annual evaluation, the Innovation Index and the upcoming Target Cluster Study, to frame specific recommendations for the Governor and the Legislature for the next biennium. This will be consistent with the legislative charge to the Board.

Progress Report on Plan

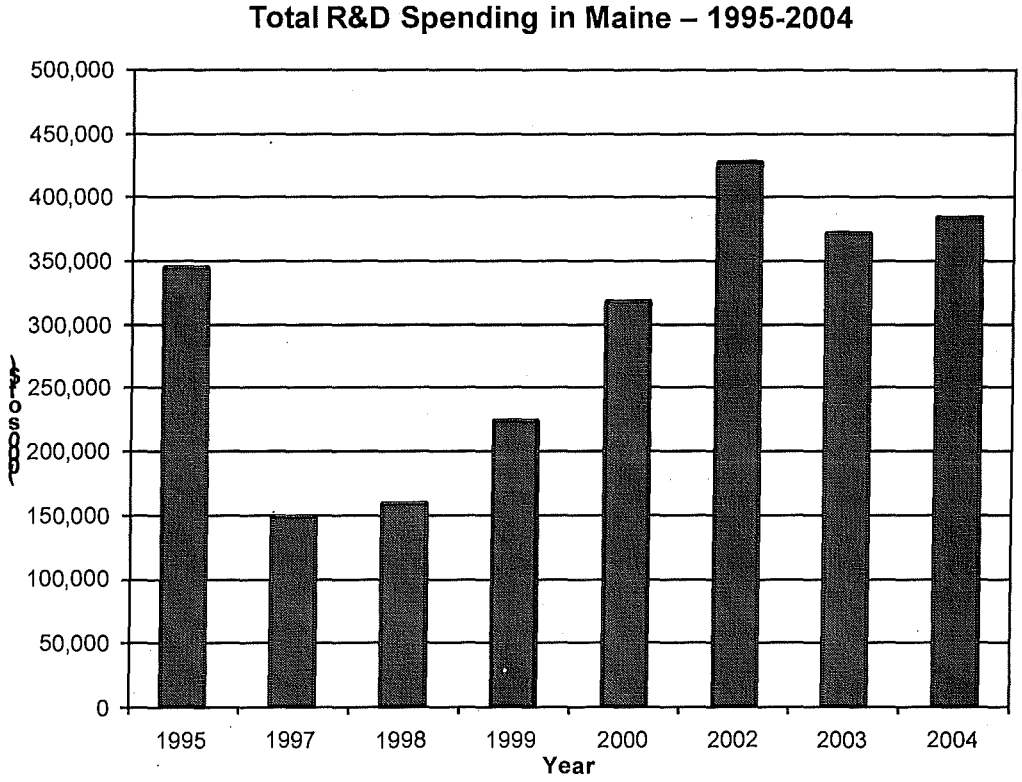
Overall goal: Maine will achieve $1 billion in R&D Activity by 2010

Progress:

According to the 2007 Comprehensive Research and Development Evaluation,

> *"Maine is making steady progress in building R&D with a positive economic impact. Total R&D is up 71% in the past five years and state rankings continue to move upwards, indicating progress against our peers."*

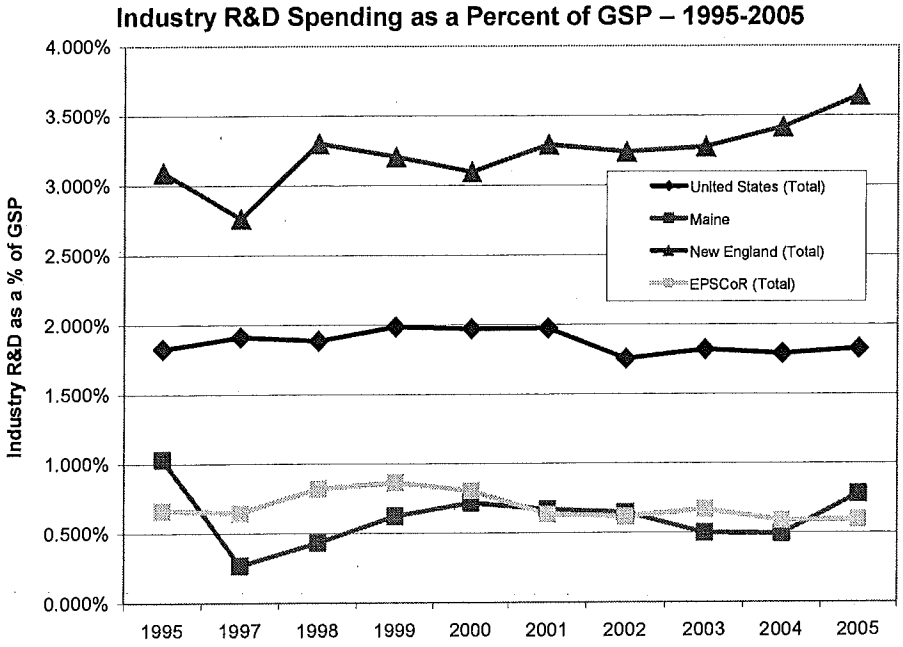
The 2008 Maine Innovation Index includes the chart shown below with National Science Foundation data through 2004. This shows that our total R&D spending in the state was $384 million through the most recent reporting period.



Note: From 1997-2000 & 2002-2004 chart portrays one-year increments; all other years are in two-year increments.

However, a focus on the last ten years shows that 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 2004, the latest year in which comparable data is available, Maine improved its ranking to 41st. In terms of R&D performance by sector, Maine ranks high in not-for-profit nationally (3rd in the country in terms of R&D performed as a

percent of GSP. In 2001, Maine ranked 35th in industry R&D as a percent of GSP, but improved this ranking to 32nd by 2005. This latter statistic suggests that total R&D will also be higher when the 2005 data are available.



Another highlight which promises better results in the near future is the $50 million R&D bond passed by the legislature and approved by the voters in 2007. Because of the competitive nature of the bond and the criteria, including collaboration and economic impact, we expect that these funds will more strongly stimulate industry R&D and move the total R&D spending closer to the ultimate goal.

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

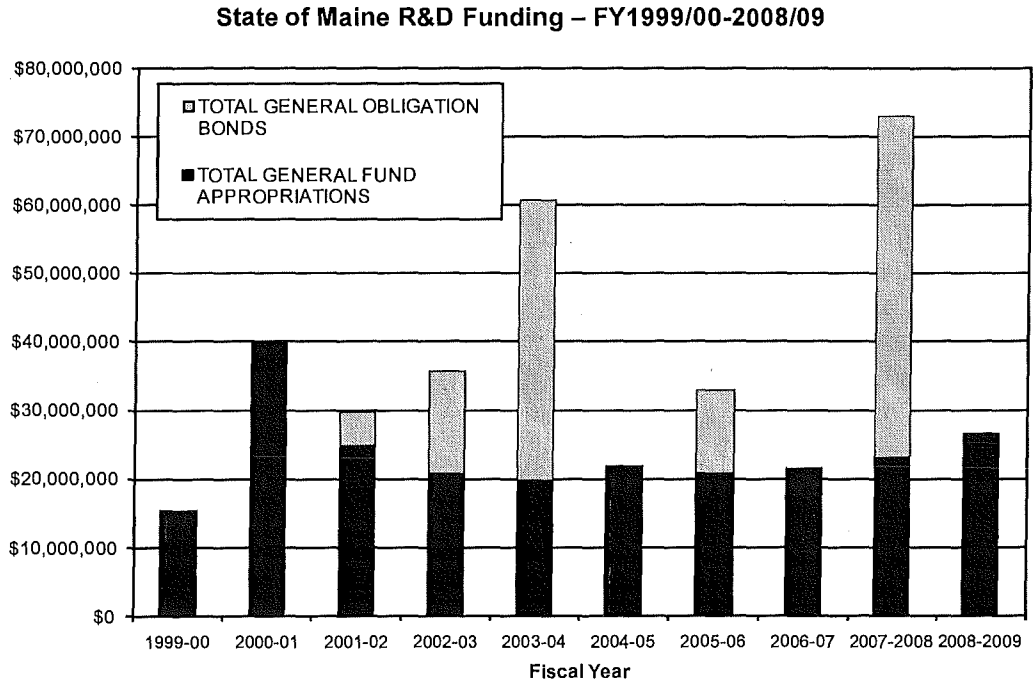
2010 Outcome Desired: State investment in R&D research is $120 million per year, is focused on key strategic areas, and contains a state-sponsored R&D seed fund for emerging ideas and collaborative proposal development.

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 for 2007. 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 million of new funding for a Cluster Enhancement Fund for 2008-09. MEIF received an additional $3.0 million for the biennium; the Technology Centers were cut 25% to $187,500. 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.)



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 will be allocated on a competitive basis and administered by the Maine Technology Institute (MTI). MSTAC 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.

Actions:

- MSTAC 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.*

- 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 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 will be released in March 2008.*

- 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, will use a competitive process administered by MTI to*

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

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 available for faculty and student recruitment.*

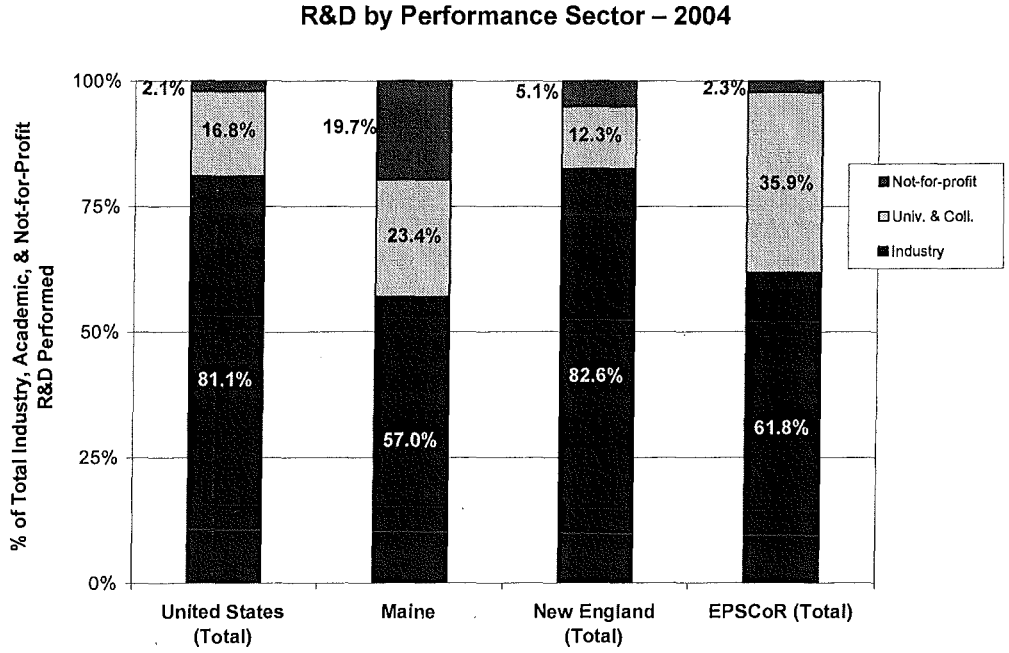
Key Objective Two: *Stimulate a robust R&D enterprise by boosting academic R&D capacity, developing an educated, technically skilled workforce, broadening the impact from the nonprofit research institutions and increasing private sector R&D activity in key strategic areas important to Maine.*

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:



The most recent Maine Innovation Index using 2004 National Science Foundation data shows that our research and development expenditures are split 57 percent industry and 43 percent

university and non-profit. The industry R&D share is increasing and we recently moved from 40th in the nation on this indicator in 2004 to 32nd in 2005.

The 2007 Comprehensive Evaluation shows that Maine awarded 533 graduate degrees in science and engineering in 2005, which is flat essentially since 2002. The institutions surveyed reported 583 faculty in science and engineering with another 26 research faculty, and 702 professional staff engaged in research endeavors. The total of research expenditures at the universities and non-profits in Maine is $118,000,000, down slightly from the previous year.

The licensing benchmark results are mixed. The universities and nonprofits that were surveyed reported a total of $500,027 in licensing revenues in 2007, compared to the benchmark of $400,000, but only 5 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 47 proposals for over $43 million submitted jointly by more than one Maine institution.

The Maine Technology Institute technology transfer fund mentioned in this goal has not been established.

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: *To date, EPSCoR has contributed over $73.9 million to our state R&D capacity since 1992. In 2006, Maine won a $2.3 million NSF RII grant which was shared among multiple institutions. In 2007, we received $633,000 from the Department of Energy, two Department of Defense awards, and a NASA EPSCoR award. More institutions are participating and planning is underway for the 2009 NSF opportunity.*

- 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 (AFUM.) Incentive packages are similarly constrained. There are also budgetary constraints.*

- 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, 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: *This action item was put on hold until the cluster research identifying key areas was done. This report is scheduled to be completed in March 2008.*

- 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 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: *To the extent allowed by the budget, the university will work on this action after the target cluster report is completed in March 2008.*

- 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: *These activities are increasing. Discussions of intellectual property, etc. are conducted at the University of Maine System level, and current policies could benefit from a review and establishment of best practices. 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 will encourage Maine's universities and research institutions to add technology transfer activities and work closely with private companies.*

- 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. 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 in 2006 and the first National NSF/USDA EPSCoR SBIR/STTR meeting in 2007. Maine Institute for Human Genetics and Health (MIHGH) hosted a neurogenetics workshop in 2007. MCED and USM sponsors 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. USM hosted the national, NSF-funded Science Education for New Civic Engagements and Responsibilities (SENCER) in 2007.*

- Maine's research institutions will develop, standardize, update and promote technology transfer processes by the end of 2007.
  Progress: *Technology transfer offices are understaffed and on-going budgetary constraints will continue to prevent adequate staffing. The University of Maine currently has a portfolio of over 90 patents, and USM has executed its first standardized materials transfer agreement; licensing and patent procedures are being developed.*

- 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." The initial outline of the program was developed and reviewed with MTI's program committee. However, it was determined that the potential for execution would rely at least in part on new general fund resources which have not been forthcoming.*

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:

In the last biennium, The Governor's budget included new funds for MTI, specifically for a Cluster Enhancement Fund, and new funds for MEIF. In addition, the Governor proposed a major R&D Bond. When the budget was concluded, MTI had an increase of $4 million for the biennium, MEIF was increased $3.0 million and the R&D bond was set at $50 million for MTI. The Technology Centers were cut 25% to $187,500.

Innovation and related investments were the focus of the Joint Select Committee on Research, Economic Development and Innovation (REDI) which met over the Summer of 2006; The Brookings Report, "Charting Maine's Future;" the Governor's Council on Jobs and the Economy; and most recently, the Prosperity Committee. Selected recommendations from these reports are shown on the next pages.

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 was no R&D Day in 2007 due to turnover in OOI, nor was the ME Tech Show held in either 2006 or 2007.

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 hosted a series of breakfast forums in 2006 for legislators, including a brief presentation on the S&T plan, and then focused on 3 or 4 case studies in a technology that went from Research to Commercialization. The topics were Composites, Marine, Biotechnology, and Biomass.*

Comparison of Recommendations for R&D in Maine (2005-06)

Science and Technology Action Plan for Maine 2005	**Joint Select Committee on Research Economic Development and the Innovation Economy August 2006**	**2005 Evaluation of Maine's Public Investment in R&D (UNC-CH) October 2006**	**Charting Maine's Future: An Action Plan for Promoting Sustainable Prosperity and Quality Places 2006**	**Maine Comprehensive R&D Evaluation 2006 (PolicyOne) February 2007**
Support focused R&D investments that will keep Maine competitive in Maine's targeted technology sectors. Create the equivalent of a virtual Tier 1 statewide research enterprise. Build strategic alliances and research collaborations between and among Maine's research institutions, universities, entrepreneurs and companies.	Recommends a steady increase in ongoing general funds support for R&D over the next ten years. Start at 1% of the total actual general fund revenue of the previous fiscal year and increase by at least 0.02% each year to 3% by 2018-19.	Increase emphasis on commercialization; substantially increase allocations for commercialization-related programs. Future R&D support should incent collaborations between academics, nonprofits and industry R&D performers.	$180 million fund to support job-creating R&D in promising scientific and technical disciplines. Areas for investment are: ▪ Forest products ▪ Agriculture, organic farming and specialty foods ▪ Cold water aquaculture ▪ Marine ▪ Information technology ▪ Biotech ▪ Toxicology ▪ Advanced composite materials ▪ Outdoor recreation and tourism	Accelerate investment in R&D. Future investments in R&D should include a larger percentage for programs that support the private sector.
Target state R&D investments to those strategic areas or clusters with the state's technology intensive industrial sectors with the greatest potential to support jobs and competitive businesses.	Supports bonding as a piece of the R&D investment portfolio. Issue up to $50 million for each of next five years, up to $250 million for competitive grants administered by MTI to stimulate economic growth and job creation through investments in R&D and commercialization		$20 million for a new Maine Cluster Development Fund to foster the business-led partnerships that catalyze cluster-based job creation through collaborative work on key challenges like workforce development and marketing. (Same candidate areas as above.)	Support sector initiatives that address academic and industry research, intra-sector collaboration, commercialization and workforce preparation.
Develop research universities and institutions that are hubs for entrepreneurial activity				Future R&D investments should require more commercialization outcomes from university and nonprofit-performed R&D.
Market Maine's science and technology strengths and assets to existing Maine students and businesses.		Initiate a proactive outreach program to target existing small and medium industries, expanding beyond early-stage firms.		
Maximize Maine's proximity to leading centers of innovation and business in the US				

Science and Technology Action Plan for Maine 2005	**Joint Select Committee on Research Economic Development and the Innovation Economy August 2006**	**2005 Evaluation of Maine's Public Investment in R&D (UNC-CH) October 2006**	**Charting Maine's Future: An Action Plan for Promoting Sustainable Prosperity and Quality Places 2006**	**Maine Comprehensive R&D Evaluation 2006 (PolicyOne) February 2007**
Develop private and public funding sources for early stage R&D companies.	Taxation Committee should study issue of tax reform as it relates to R&D entrepreneurs and businesses.	Increase private R&D commercialization by addressing growth capital scarcity.		
Build a critical mass of entrepreneurial assistance. Develop appropriate business support infrastructure for research-intensive businesses.				
	Convert Maine Science and Technology Advisory Council to a permanent advisory board called the "Maine Innovation Economy Advisory Board." Expand the leadership role of Maine Economic Growth Council in strategic planning for R&D. Amend the evaluation statute to require that an annual progress report by submitted to the Governor and legislature starting Feb. 1, 2008 and each Feb. 1 thereafter.	Establish Maine R&D oversight authority to direct efforts.		
		Track Maine's Gazelles to guide future R&D commercialization efforts.		Workforce needs of research-intensive industries should be studied and curriculum enhancements recommended for Maine universities and community colleges. Technology transfer capacity should be assessed, issues identified and actions recommended to increase outcomes.

OOI had the evaluators for 2005 (University of North Carolina, Chapel Hill) come up and present to the Joint Select Committee on Research, Economic Development and Innovation (REDI) in the summer of 2006. OOI also had the current R&D Evaluation team (PolicyOne Research and RTI International) present to BRED in February 2007 and January 2008.

- 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 123rd 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: *This was not undertaken due to vacancies in OOI in the Fall of 2006.*

- OOI and MSTAC will develop and implement an outreach targeted at current and prospective legislators by the fall of 2006.
  Progress: *OOI worked with existing legislators in 2006 to provide information on the impact of R&D. This included a weekly postcard distributed to the entire legislature that told a R&D story, and included facts on R&D in Maine. OOI also had a fact sheet prepared that was used on a regular basis, and much of that data and language was included in the Governor's re-election campaign and other talking points used by the administration.*

- 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 and 2007 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 and the BRED committee at various times throughout the two 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. The current report in progress is the Targeted Cluster Study which was funded jointly by OOI and MTI and will be distributed electronically in March, 2008. Budget constraints prevent the production of large numbers of hard copies.*

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 successes this year have all been in the innovation sector. In 2007, Notify MD, athenaHealth and Acrobat all announced that they were moving new operations to Maine. In addition, The Jackson Laboratory launched its first spin-off company, Bar Harbor Biotechnologies, and U Maine continued to spin-off both faculty and student led companies. Several major expansions of technology companies are in the works which have not been announced as of this date.

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 or 2007.

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. In 2007, for instance, the MITC International Trade Day was focused on Innovation and the Director of the Office of Innovation, among others, spoke. Several technology companies participated on the 2007 Trade Mission to South Korea and Japan; two exchanges of information and contacts are ongoing in the technology arena with Quebec. In addition, MITC has represented Maine businesses at MEDICA, the medical device international trade show, for two years. MITC, OOI and the Biotechnology Association of Maine collaborated on a booth at BIO 2007 in Boston.*

- 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 met with all trade associations on both strategic opportunities and S&T plan. We talked about what OOI could do, where research needed to be and potential business opportunities.*

  In 2006, OOI worked with Maine and Company on at least one potential expansion of a large biotech company in Portland. In the end, the company needed cash (see the expansion fund failure) and thus, that investment did not happen in Maine. OOI regularly works with Office of Business Development, Maine and Company and the Commissioner on business expansion/start-up and possible attraction targets where technology companies are involved. In 2007, OOI visited at least ten technology companies with the Commissioner.

- OOI will sponsor or host a booth at one regional or national trade show per year targeting research-intensive businesses, starting in 2007.
  Progress: *OOI partially sponsored a booth at BIO 2007 in Boston, although funds for this were not in the budget.*

- OOI or MSTAC will present Maine marketing materials at one international science-based conference per year, starting in 2007.
  Progress: *Not done in 2007. OOI will be working with the Advanced Engineered Composites Center to represent Maine at an April 2008 conference in Montreal, P.Q., CANADA.*

- 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 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}

In 2007, there was some limited progress in having a fund available for working capital for early-stage companies. Through MTI, a small fund was established to support companies after they have received a Development Award. A larger initiative, the Fund of Funds, is currently under consideration by the Legislature.

There is no formal process set up for a network of mentors.

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: *OOI worked with FAME to redirect the Economic Recovery Loan Program to include debt capital to higher risk companies. We also met with Brook Ventures, CEI, MIEX, SEGF and others to increase angel and other investment funds.*

- 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: *We looked at several state programs, including beefing up SBTDC (please spell out) program at MTI. There are lots of successful entrepreneurial support programs around the country, and strengthening the Technology Centers is clearly part of the solution. The Student Innovation Center at U Maine is an example of a successful program to expand entrepreneurial training. OOI is in the process of reviewing alternative models for entrepreneurial support and will propose a new plan to MIEAB by May 2008.*

- 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.*

- 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 in the process of reviewing alternative models for entrepreneurial support and will propose a new plan to MIEAB by May 2008.*

- 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: *OOI has not been invited to participate with the Entrepreneurship Work Group in 2007. However, OOI has worked closely with the DECD Commissioner and Director of the Office of Business Development to discuss show technology-intensive companies will be supported.*

- 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 Todd Keillor and the Patent Program to increase their activities. 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, skyrocketing 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 sale of assets from Verizon to Fairpoint Communications which includes promises of expanded Broadband coverage was approved by the Maine Public Utilities Commission and is awaiting final approval in New Hampshire and Vermont.*

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.

Cluster Initiatives

Progress: *In 2007, the watchword in the technology community was "clusters." The legislature increased the Maine Technology Institute funding by $4 million, in part 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 forthcoming Target Cluster Report will update the 2002 research and will form the basis for many of the new initiatives.*