

**Engineering and Technology Industry Council
Campus Investment Proposal
Biennium from July 1, 2009 to June 30, 2011**

Campus: Oregon State University

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Date of Submission: January 31, 2008

Date of Revised Submission: August 28, 2009

Summary of Proposal:

Oregon’s industries need local access to top engineering talent: this means the best work ready engineers, world class research collaborators, and academic programs attractive to top people. OSU and other ETIC collaborators have made progress on addressing this need: at OSU this progress includes higher quality graduates, growth to 25th in BS degrees, doubling research, and significant increase in spin outs. Yet Oregon industry needs remain unmet. OSU will help by becoming a top-25 producer of BS through PhD degrees, research impacts, and spin outs, all to benefit Oregon.

Vision Statement

We strive to create the world’s best work ready engineers by innovating engineering education, collaborating in research, and driving research results into application. Our goal is to deliver the graduates, BS through PhD, and research results seen at America’s top 25 engineering schools. Then Oregon will have a prosperous future thanks to top engineering talent that will enable Oregon to be globally competitive and remain a high quality place to live.

Aspirational Peers

UC Santa Barbara, University of Washington, and Purdue University represent our aspirational peers in the near term and, in the case of Purdue, long term.

Program	BS Degrees	MS Degrees	PhD Degrees	Research Expenditures		Number of Faculty	
UC SB	286	138	107	\$81M		189	
UW	731	308	107	\$92M		191	
Purdue	1238	461	209	\$122M		300	
OSU	592	131	32	\$25M		114	

Data are for 2006.

Long-term Goal

While our long term goal remains the delivery of the impact of the America’s top 25 engineering colleges by achieving comparable results, flat or declining State support will not allow achievement of that goal. Oregon State University administrators have decided that the layoff tenure and tenure-track faculty will not be a part of their strategy for managing declining state support. As a result the College of Engineering will use private funds to help fill the budget gap and will continue to pursue private support to help meet our goals. We will make the following contributions to ETIC’s goals:

- Total degrees will grow to 1.3x by 2013 and to 1.3x by 2020, vs. 1999 levels.
- Research will grow to 2.7x by 2013 and to 3x by 2020, vs. 1999 levels.

- Our research collaborations with Oregon industries and SRCs, innovations that deliver the best work ready engineers, and stepped up commercialization of research results will all increase Oregon's competitiveness.
- Our track record of delivering results, existing world class faculty, and demonstrated ability to leverage ETIC investment into significant private investment will enable our goals to be met.

Investment Description

Strategy to Achieve Top 25 Impact Goals

1. Transform Culture and Innovate Processes

- **Innovate education to create the best work ready graduates.**
 - Create hands on Platforms for Learning™ that follow curriculum.
 - Mentor design teams across disciplines to develop leadership/team skills
 - Give students global experiences that prepare them to work across cultures
 - Strengthen MECOP/CECOP and other forms of internship opportunities to develop graduates with skills in close alignment with industry needs.
 - Create a curriculum in commercialization for engineering graduate students
- **Collaborate to grow research impact**
 - Establish and strengthen collaborative research clusters
 - Help build Oregon's Signature Research Centers described in the Oregon Innovation Council's *2007 Innovation Plan*.
 - Leverage Oregon industry partnerships
- **Drive Research into Applications**
 - Transfer new product and process technologies
 - Commercialize technology as new companies
 - Guide Oregon's progress on technological challenges that affect our prosperity, such as infrastructure/transportation and energy

2. Double Number of Top Producing Faculty to Deliver Output Metrics

- **Build on OSU's base of productive faculty**
 - The addition of 112 faculty will grow OSU Engineering to 235 faculty and enable OSU to deliver top-25 output of degrees (BS through PhD) and research. This goal will depend on state and private support of our goal.
- **Recruit top faculty**
 - Align recruiting with Oregon industry needs, OSU research cluster strengths, Oregon's development of Signature Research Centers, and Oregon's new focus on alternative energy, transportation, and sustainability as shown in the table below.
 - Capitalize on recent recruiting success. During 2002-7 OSU replaced 28% of engineering faculty with top talent and more than half of our faculty were hired in the last 10 years. We have successfully attracted both recent PhD graduates from top schools and established researchers eager to join our high performing faculty. These recruitment efforts often produce multiple top candidates ready to accept positions.
 - Match hiring rates of comparable schools. OSU will hire eleven new faculty during the remainder of 2007-2009.

Allocation by research cluster and results for 112 new faculty

OSU Research Cluster (See Appendix III)	Hires	Oregon Industry & University Collaborations	Measurable Results			
			Research \$M/year		Enrolled Graduate	
			Current	2020	Current	2020
Energy Systems Establish Energy Independence	10	PGE, Oregon DOE, EPRI, Westinghouse, BPA	2	10	25	130
ONAMI Ensuring Oregon's Leadership in the Small Technology Industry	17	HP, Intel, Xerox, Altman-Browning	4	15	40	155
Biological & Environmental Ensuring a clean, healthy environment	13	Bend Research, AVI, SIGA, Amgen, ODEQ, ODOT, ODWR	1.7	8	20	130
Infrastructure & Transportation Ensuring a viable infrastructure to support economy growth	23	ODOT, AGC, Hoffman Construction, CH2M-Hill, David Evans & Associates	5.4	30	80	235
Mixed Signal - Integrated Systems Securing Oregon's leadership in the face of world competition	5	Intel, Tektronix, Maxim, Mentor Graphics, Texas Instruments, Pixelworks, Triquint, Marvell	2.5	8	50	155
Intelligent Information Systems Creating Innovative Solutions	14	Intel, IBM, Microsoft, HP	3.5	13	50	140
Computer Graphics and Visualization Helping Innovate Display Systems	4	Summit, Planar, Pixelworks, In Focus	0.5	2	20	70
Autonomous Systems Creating intelligent mobile observational systems	9	Garmin, Hood Technologies, Cloudcap, ODOT, Mentor Graphics	1.5	8	40	120
Emerging Areas including Open Source (collaborative with PSU & UO)	17		2.9	26	195	165
Totals	112		24	120	520	1300

3. Recruit and Retain the Best Students

- Undergraduate Recruitment:** OSU Engineering's recent focus on innovative research and work-ready graduates has increased the number of top students recruited from both inside and outside Oregon. We award nearly twice as many top Engineering scholarships than in 1999, more than half of OSU Honors College students are engineering students and our highly selective MECOP program is attracting students from across the nation. We are also diversifying the undergraduate engineering student population through our Ambassador program. During 2007 student Ambassadors met with more than 1900 high school students across Oregon to increase awareness of engineering. OSU also created a visitation program so that high school counselors and high school teachers can learn about OSU's engineering program and its assets.
- Undergraduate Retention:** We are initiating a number of new programs specifically directed at first-year students with special emphasis on retaining women and underrepresented minorities. Examples include:
 - o A first year women-only Footsteps program before classes begin

- A Mentor-Mentee program that connects first-year students with junior or senior engineering students
 - Transitional Learning Communities (TLC) for freshmen show students the linkages between their classes and help them form student groups.
 - A community college transfer program. Community colleges supply about 40% of our BS graduates. To help ensure the success of this student cohort, we focus first on successful transition to OSU engineering. This is accomplished through semi-annual program meetings with community college faculty on site at OSU and routine visits with students and staff in the community colleges to assist with advising and transfer question. We have also streamlined our professional school application process and placed the process online.
 - A focus on academic success for at risk students. We are working within OSU to promote the academic success of all of our students through focused access to the Academic Success Center and their academic learning service courses. Next year, we will pilot an early intervention process with freshmen and sophomore students to connect them with “near-peer” support when they encounter academic difficulties. We have instituted a more formal, early intervention process to identify upper-division students with academic difficulties to help them locate and utilize the right assistance.
- **Graduate Student Recruiting**
 - Top quality PhD students: We will encourage our own top students to enroll as graduate students and coordinate an annual graduate student recruiting visit for students from across the country – building on a program we have developed since 2005. We will also recruit high quality international students from top universities where we have built relationships in recent years, e.g. the top universities in China, India and Thailand.
 - Increased Masters degree enrollment: We currently offer an online masters degree in Radiation Health Physics and plan to expand to additional disciplines by offering a Master of Engineering degrees on line. We are assessing the feasibility of on line delivery of our Master of Business and Engineering (MBE) in Construction Engineering Management, an MBE degree in Sustainable Engineering, and Master of Engineering degrees in selected niches related to our research cluster strengths. We believe these efforts will help us grow the number of masters degrees.

4. Expand Infrastructure to Support Growth

In 2004, OSU Engineering occupied approximately 400,000 gsf (gross sq. ft.) of space. In 2005, the Kelley Engineering Center (150,000 gsf) opened and OSU/ONAMI aquired 20,000 gsf of Hewlett Packard Corvallis B-11 bringing the total to 570,000 gsf. Over the next six years we plan to add an additional 200,000 gsf, bringing the total to 770,000 gsf, by:

- Complete renovation of Apperson Hall to a state-of-the-art Kearney Hall with approximately 33,000 gsf in offices, classrooms, computer labs and graduate student space (to open December '08). This effort is financed with \$12M in private funds.
- Build out of approximately 40,000 gsf for OSU/ONAMI research and office space in HP B-11. This effort will be financed with \$9.5M in bonds already approved.
- Two new buildings are planned for 2015 and 2018 to house the Schools of Chemical, Biological and Environmental Engineering (CBEE) and Mechanical, Industrial, and Manufacturing Engineering (MIME), respectively, and together will include roughly 135,000 gsf of office, laboratory and classroom space.

5. Future Success Indicator: Progress from Past Investments

- **Innovate education to create the best work ready graduates.**

- The quality of our innovations is indicated by international recognition and student success. In 2007, the TekBots team was recognized for leadership in engineering innovation by IEEE. TekBots is now used by several universities across the globe because of its unique way of delivering hands on learning to electrical engineering students.
 - Hands on experiences are pervasive across OSU engineering including privately funded early research internships and K-12 outreach programs where engineering students teach engineering to middle and high school students.
 - During the past 3 years, 40 OSU engineering student teams placed in the top 3 in their respective competitions spanning all disciplines.
 - Currently, we have three international partners engaged in collaborative global design projects. For example, in fall 2008, a team composed of U.S. and German students will jointly design a Formula SAE car.
 - Private investment has launched a Communications Platform for Learning that extends through the curriculum with the goal of improving oral, written and new media communication skills of our graduates.
 - And this year, the 100 member companies of the MECOP/CECOP program will hire nearly 400 interns.
- **Collaborations that grow research impact**
OSU Engineering has established collaborative research clusters with broad impact. These clusters form the basis for OSU Engineering’s involvement as co-founders of ONAMI and BEST Signature Research Centers (SRC). These also help grow collaborations with PSU, UO, OHSU, Pacific Northwest National Labs, and industry.
 - **Research Results Driven into Applications**
The impact of OSU Engineering’s research has significantly increased. New companies have been formed, technology has been licensed to existing companies, and OSU’s research directly impacts solutions to Oregon’s transportation and physical infrastructure problems. following is a summary of 18 impacts achieved during the past 3 years:
 - Licenses of OSU technology to existing companies: **4**
 - New companies founded on basis of OSU technology: **8**
 - New companies in progress: **3**
 - Significant impacts on infrastructure and transportation issues: **3**
 - **Delivery of Key Output Metrics**
OSU has a demonstrated track record of hiring top faculty. Since 1999, 18 junior faculty have won early career awards and 19 senior faculty have been named Fellows of Professional Societies, a highly selective distinction (e.g. IEEE fellows are 0.1% of Members). OSU faculty have delivered significant growth in degrees and research summary table and trend lines below show this progress on metrics and our forecasted results per this plan.

	Degrees						Research, \$M	
	BS		Graduate		Total			
	Goal	Actual	Goal	Actual	Goal	Actual	Goal	Actual
OSU 1999	--	389	--	154	--	543	--	12.3
OSU 2007	545	586	218	141	771	720	27	26.7

BS degrees have mostly exceeded plans while Masters degrees have fallen short of plan projections causing OSU to miss graduate degree targets even though PhD degrees have grown. Specific actions outlined above will help grow Masters degrees and get OSU back on track per the forecast:

- Private support for graduate fellowships
- Increased delivery of on-line graduate degrees
- Attraction of additional top faculty
- Continued and expanded prospective graduate student visitations

Private Support

Private investment in OSU's top 25 initiative leverages state funds to create new infrastructure, fund scholarships and fellowships that help recruit the best students, fund faculty development and endowed positions, creates new programs that improve the quality of our graduates and keeps the college moving toward its goals in the face of base funding short falls. By June 30, 2007, OSU Engineering had received **\$102M** total private investment in its top 25 initiative. These funds leveraged state funds to help advance the College of Engineering including Weatherford Residential College (Austin Entrepreneurship Program partnership with College of Business); the Kelley Engineering Center, Kearney Hall (a complete renovation of Apperson Hall); scholarships and fellowships to recruit the best students, seed funds and endowments for faculty; programs including TekBots, the RC Wilson Master of Business & Engineering, OSU Women & Minorities in Engineering.

During the period 2007-2011, OSU will raise an additional **\$40M**, bringing the accumulative total to **\$143M** private investment in its top 25 goal or a 1.2 to 1 match to the proposed accumulative total of \$116M ETIC investment from 1999-2011. This additional \$40M will have the following impact:

- **\$30M** during 2007-09 will support infrastructure projects including addition to the nuclear engineering building, endowments for faculty, and student scholarships and fellowships.
- **\$10M** during 2009-2011 will be directed toward infrastructure and support for faculty and students.

Strengths-Weakness-Opportunities-Threats (SWOT) Analysis

- **Strengths: OSU is ready to move to the next level of impact**
 - Strong reputation for delivering work ready graduates
 - Strong culture of collaboration, noticed by faculty from the nation's best programs
 - Faculty who are entrepreneurial and willing to take risks to increase speed and transform the program
 - An established track record of success at growing both graduates and research faster than the top 25 averages.
 - Leading fund raising efforts at OSU, including the new Capital Campaign
 - Growing impact by spinning out new companies from research results
- **Weaknesses: External Views are Mixed**
 - Reputation of Oregon weak funding of higher education could impact recruiting efforts
 - Research growth requires gaining market share and depends upon the availability of federal research funding which is dependent on a political process
 - National reputation of OSU Engineering is lagging reality as measured by innovations and impact
- **Opportunities: Momentum**
 - OSU is emerging as a leader in new company formation from academic research. We could be seen as distinctive in this area and this would help elevate our reputation

- OSU’s heavy involvement in Oregon’s Signature Research Centers will help grow research. Targeting new hires in these areas will create opportunity for Oregon.
- Web-based distance master of engineering program is an untapped opportunity for OSU and will increase the number of graduate degrees produced
- Early signs of recruitment success with top out of state students signal opportunity to increase quality of undergraduates.
- **Threats: Competition is not waiting for OSU to make a move**
 - Many other states are making greater investments in engineering education. For example, the University of Utah and Utah State University recently announced a combined total of 47 new faculty hires in engineering for 2008.
 - Global competition: the speed of improvement and growth in engineering education is accelerating worldwide, not just in the US.
 - Oregon’s under funding of higher education may lead to too little too late.

Results and Benefits

A summary of growth in metrics that drive our impact are shown below, showing that with the proposed investment and continuation, OSU will reach its top 25 goals by 2020.

	BS Deg.	MS Deg.	PhD Deg.	Research Expenditures		Number of Faculty
OSU 2000	408	118	14	\$13M		103
OSU 2006	592	131	32	\$25M		114
OSU 2013	540	130	32	\$32M		124
OSU 2020	750	350	120	\$120M		235
Top 25 Avg. ‘06	685	430	158	\$128M		228

Achieving these measurable goals will provide the following benefits to Oregon industry:

- The best work ready engineers at all levels with knowledge and skills aligned with industry needs acquired through solid fundamentals, hands on learning, and direct internship experiences.
- Research collaborations that deliver solutions to industry’s needs for innovation of products, processes, or services.
- Spin outs of new technology into existing companies and new ventures creating new jobs for Oregonians.

Future Plan & Resources

The following table summarizes the targeted investment required to increase OSU’s engineering faculty to critical mass and to provide the infrastructure needed for growth.

Biennium	ETIC Operating Funds	Capital Investment by State	Private Investment	New Faculty Appointed	Total Faculty
07 - 09	\$18.5M	\$9.5M COPs	\$30M	16	123
09 - 11	\$17.4M	0	\$10M	0	123

Targeted funding directed by ETIC is an important component of OSU’s ability to achieve its long term goals for engineering and impacting the prosperity of Oregon. Based upon past trends, it is highly unlikely that OSU will have access to additional resources from enrollment funds for this purpose. Engineering faculty are funded by OSU for the 9 month academic year and compete for research funding to support the remaining three months, to support graduate and undergraduate student researchers, and to cover additional expenses associated with their research. Consequently, replacement of the costs of faculty hired with ETIC funding can only occur from future increases in engineering graduate differential tuition rates, future increases in undergraduate differential tuition rates (if allowed by the Legislature), and future success in raising private endowment funds for engineering faculty. Accordingly a small fraction of the proposed cost will be replaced and OSU will continue to depend upon ETIC allocations to support its top-25 engineering initiative.

Proposed Investment and Private Support Forecast

		Base Budget
1	Sources of funds	
2	Base budget for ETIC-related programs -- all sources except ETIC & private support	31,714,018
3	Proposed allocation from ETIC budget (\$)	17,761,665
4	Expected private support (\$)	10,000,000
5	Total (\$)	59,475,683
6	Personnel supported (FTE)	
7	Existing faculty (1)	44.0
8	New faculty(2)	0.0
9	Existing staff (1)	10.0
10	New staff(2)	0.0
11	Total	54.0
12	New positions created	
13	Faculty (2)	0.0
14	Staff (2)	0.0
15	Total	0.0
16	Uses of ETIC funds in line 3	
17	New facilities	
18	Improvements to facilities	
19	Laboratory equipment	
20	Other equipment	
21	Other one-time expenses	1,250,000
22	Existing faculty salaries & benefits (1)	12,774,952
23	New faculty salaries & benefits (2)	
24	Existing staff salaries & benefits (1)	1,695,094
25	New staff salaries & benefits (2)	
26	Services & supplies	1,108,388
27	Other (3)	933,231
28	Total	17,761,665
	NOTES:	
	(1) Hired through June 2009 that will be supported by ETIC funds during 2009-11 biennium.	
	(2) To be hired with ETIC funds during 2009-2011 biennium.	
	(3) Consists of: graduate assistant support; university administrative fee; and UG Program support.	

Metrics Forecast (for programs/departments receiving ETIC funding):

Assumes flat ETIC funding

	Actuals		Projected		
	AY 99	AY07	AY11	AY13	AY20
Undergraduate student credit hours	52,690	59,677	58,000	56,000	54,000
Graduate student credit hours	12,870	18,378	17,500	17,500	17,500
Graduation rate, 6-year in percent (1)	40/63	45/66	45/65	45/65	45/65
Bachelor's degrees granted	390	586	530	540	550
Master's degrees granted	123	106	130	130	130
PhD degrees granted	27	35	31	32	32
Women graduating, percent of total graduates	13	16	15	15	15
Minorities graduating, percent of total graduates (2)	8	14	14	12	12
Externally-funded research expenditures	12	26.7	31	32	35
Invention disclosures (3)	22	23	25	25	25
License/options (4)	0	3	3	3	3
License income received, \$000 (5)	16	75	75	75	75
Spin-off Companies (6)	0	2	2	2	2
National ranking of College of Engineering (7)	51	40	40	40	40
Notes/instructions					
(1) Actuals for AY 99 and AY07; percent of ETIC cohort completing ETIC-related bachelors degree/percent of ETIC cohort completing any bachelors degree at OSU					
(2) Racial and ethnic minorities who are U.S. citizens or permanent residents, stated as a percentage of all U.S. citizens or permanent residents graduating.					
(3) Per Association of University Technology Managers (AUTM) survey definitions.					
(4) Per AUTM - number of license or option agreements executed during the year. See AUTM survey definitions.					
(5) License issue fees, payments under options, annual minimums, running royalties, termination payments, the amount of equity received when cashed in, and software end-user license fees equal to \$1000 or more, but not research funding, patent expense reimbursement, valuation of equity not cashed-in, or end-user license fees less than \$1000. Per AUTM survey definitions.					
(6) New companies that were dependent on the licensing of your program's technology for their initiation. Per AUTM survey definitions.					
(7) Innovation Impact - see Appendix I (assumes constant norming values over time)					

At this level of funding, OSU would capitalize on the gains achieved in 2007-2009 in student recruitment and retention programs and new faculty hires that will help us achieve modest increases in output metrics. Other engineering programs are not waiting for us to catch up and this level of funding will signal that Oregon is not committed to building a top 25 engineering college. This would adversely affect our ability to recruit and retain top faculty, to garner private support and not just delay but potentially reverse our progress. OSU's commitment to ensuring Oregon's future prosperity by delivering the talent and the ideas needed for a vibrant economy will only be achieved through emergence of a large new state investment at a future biennium and/or unknown significant private investment.