

# **Engineering and Technology Industry Council Campus Investment Proposal Biennium from July 1, 2011 to June 30, 2013**

**Campus:** Oregon Institute of Technology (OIT)

**Contact Name:** Charlie Jones, Interim Dean of the School of Engineering,  
Technology and Management

**Date of Submission:** January 28, 2010

## **Summary of Proposal:**

OIT's Center of Excellence in Renewable Energy is based on core competencies – BS and MS Renewable Energy degrees so successful that OIT cannot keep up with demand, and the Oregon Renewable Energy Center that underwrites applied research and provides technical assistance to the community – and the benefits of being a statewide polytechnic university with campuses in Klamath Falls, which has unique geothermal and solar attributes, and in Portland with proximity to key industry resources. ETIC's investment in the Center will build capacity, enhance curriculum and laboratories, further expand good industry partnerships, and develop university-industry consortia to promote Sustainable Engineering.

## **Vision and Goals Statement**

OIT's programs and industry-experienced faculty prepare engineers who excel in the workplace. Industry partnerships make OIT a leader in applied research, and new, exclusive degree programs produce graduates who have the skills to harness renewable resources for Oregon's contribution to the national and global economy.

## **Investment Description for Sustainable Engineering at OIT**

### **1. Building University Capacity**

#### **Rationale**

**Demand for OIT's Renewable Energy Programs is outstripping capability.** OIT has the first Bachelor of Science in Renewable Energy Engineering (BSREE) program in North America, and the only one pursuing ABET EAC accreditation. Enrollment has grown from four students to more than 220 in five years, attracting students from more than 25 states and other countries. OIT's focus on true applied research (testing, verification, and assessment) fills an important role in the "long-term approach to economic development" that Oregon InC lists as a goal for Clean Technology industries. OIT leaves fundamental research to other Oregon universities, and concentrates on bringing students face to face with emerging technologies in the

laboratory, at the test bench, and on the shop floor, giving them the experience to be a part of a ready workforce that will take the latest renewable energy technologies into the workplace.

**Need is great for more Sustainable Engineering graduates.** BSREE students and graduates are heavily recruited by utilities, renewable energy developers, and traditional and high-tech companies. Among them are Portland General Electric, Bonneville Power Administration, Vestas, Stantec, Power Engineers, SNC-Lavalin, Johnson Controls, Clear Edge and Enerfin. Other areas such as power electronics, embedded systems, power quality and conditioning, and smart-grid technologies benefit from OIT's Bachelor of Science programs in Electrical Engineering and in Embedded Systems Engineering Technology. One of the reasons that OIT graduates are so highly valued is their agility in dealing with new technologies. OIT embodies the qualities that the Oregon Business Plan describes as necessary for prosperity as "our collective capability to continuously learn and adapt in an ever-changing economic world."

Another challenge facing the industry is the impending retirement of an aging electric utility industry workforce. The October 2009 study, Clean Tech Job Trends 2009, notes that "In the face of mass retirement and adoption of clean technologies, the utility industry's workforce is undergoing a significant transformation, one that will present great opportunities for those hoping to work on the front lines of the clean-energy economy."

### **Investments**

- **Equipping new labs** to provide an array of student applied-research opportunities aligned with current industry challenges, such as distributed power systems testing, power conditioning, and utility-focused energy storage. This includes new geothermal labs in Klamath Falls, using the new power plants as the kind of student research opportunity that the Board of Higher Education's Subcommittee on Sustainability Initiatives believes will "provide Oregon and the University System a competitive advantage, making Oregon a living laboratory for teaching, testing, and practicing new ways of living needed in today's world."
- **Hiring new faculty** to support increased student enrollment, expanded laboratory facilities, and a more robust interdisciplinary curriculum. ETIC investments will improve the student-faculty ratio that has declined with the influx of Renewable Energy students, enrich the curriculum, and increase the number of graduates.
- **Producing an interdisciplinary, project-based sequence of courses** to specifically encourage collaboration among diverse backgrounds and emphasize the team work required to be successful in work situations. (The interdisciplinary approach will restructure traditional undergraduate engineering education to promote an integrated team approach, mirroring the experience in industry.)
- **Supporting OIT leadership** in the REE degree programs, at the Oregon Renewable Energy Center, and in the Information Technology programs. ETIC's continuing support has been vital to continuity, strategic planning, and strong interdisciplinary collaboration that have enabled OIT to build its successful

programs in this field and work toward expansion of sustainability efforts on all fronts.

## 2. Expanding Industry Partnerships

### Rationale

**Oregon needs an educational model that depends on industry partners for practical focus**, as was described in “Carbon-Free Prosperity 2025,” citing the belief of many industry leaders that limited business engagement is a “critical weakness” of research institutions. ETIC investment will allow OIT to expand its industry-directed, hands-on approach to serve more students and produce more well-qualified engineers.

**OIT will further develop its excellent industry partnerships** in the renewable energy engineering field. The far-reaching list of business leaders who volunteer on the REE Industry Advisory Council shows the depth of industry commitment to OIT, and demonstrates that they believe their companies will benefit from their involvement, ensuring that OIT Renewable Energy Engineering graduates meet the needs of the industry. OIT will continue to develop those assets through ETIC investment in staff time and effort toward those specific opportunities. (Some of that effort will be time-limited, such as the initial coordination of new industry/university collaborations, and the development of consortia.)

### Investments

- **Extending industry engagement** through advisory council input, bringing more industry experts to teach, creating more "in the field" internships and sponsored senior projects. ETIC investment will support staffing to coordinate these efforts.
- **Hiring an outreach coordinator** to develop university/industry consortia and manage other aspects of OIT's outreach efforts, as described below. OIT is also currently engaged in discussions with Intel and others about joining a Consortium for Embedded Systems, with global companies and Arizona State University (ASU), and the outreach coordinator will be involved in those efforts as well.

## 3. Strengthening University Collaboration

### Rationale

As a smaller university with limited resources, OIT explores any partnerships with larger institutions that can offer beneficial opportunities for OIT students. (For example, Boise State was awarded \$4.9 million from the U.S. Department of Energy to lead a consortium that includes the University of Utah, OIT, Stanford University and the University of Nevada, to establish a National Geothermal Data System, a project that will employ students as well as advancing the usefulness of the Geo-Heat Center.) The University of Oregon and OIT are in the process of signing a memorandum of understanding that will implement a “4 + 1” Master’s program through which OIT graduates in Renewable Energy, and Mechanical and

Electrical Engineering will be able to enroll in U of O programs in Applied Physics or Chemistry to complete their Master's degrees. OIT and the University of Oregon have been developing other means of collaboration as well as the 4 + 1 program, such as shared lab space.

### **Investments**

- OIT will be using shared laboratory space in the U of O's CAMCOR Lab (Center for Advanced Materials Characterization in Oregon) on a fee basis.
- Part of the work of the outreach coordinator will be to put in place new collaboration efforts with U of O, to manage joint marketing efforts, and to oversee graduate internships.

## **Private Support**

### **Industry Partners**

For a recent application to the Dept. of Energy, eight of OIT's industry partners made commitments to providing student internships for the Renewable Energy program in this and the next biennium. There are representatives of 12 major energy-related corporations serving on the Renewable Energy Engineering Advisory Board and participating actively in planning and program support as well as provision of scholarships and student projects. OIT's two new geothermal power plants in Klamath Falls will be living laboratories, fully resourced to support preparation of work-ready graduates, with the assistance of private sector partners, such as Johnson Controls, Inc.

In the last fiscal year Renewable Energy Engineering, OREC, and IT reported more than \$600,000 dollars in private support, a great deal of it from industry partners, some in the form of software and hardware donations, and some in the form of student scholarships and intern salaries.

### **University-industry consortium**

OIT will utilize ETIC investment in staff to cultivate a university-industry consortium that will set more aggressive goals for internships, undergraduate and graduate applied research projects, laboratory development, and funded support for student projects – increasing overall private support. The consortium will benefit students through meaningful, industry-relevant work experience and financial assistance, while benefiting the companies through increased knowledge and preparation of potential employees, as well as shared research and laboratories operated with support from member companies.

## **Results and Benefits**

### **Short-term**

ETIC investment will help increase the number of BSREE graduates from the current fifteen a year to sixty and will also create a Master's program that will graduate twenty per year by the end of the 2011-2013 biennium.

**The Center for Excellence in Renewable Energy relates directly to ETIC's strategy.** The faculty positions and equipment listed below will complement the strengths of the current faculty and facilities, and build the REE program into the most effective possible source of renewable energy expertise for Oregon's workforce. It will be a true Center of Excellence in the field that will support ETIC's area of Sustainable Engineering by

- leveraging OIT's strengths in attracting students with its hands-on curriculum and opportunities, and
- contributing to doubling the number of work-ready technical graduates by 2020. (By 2020, OIT will increase its Renewable Energy graduates from zero in 1999 to 120.)

**Five new faculty members in the Renewable Energy Engineering program** will be 9-month positions, and with salaries starting at \$120,000 a year, including benefits.

- Power system analysis, protection and control, distributed power system integration, Portland Campus.
- Distributed power system control, embedded load control and switching systems, Klamath Falls.
- Market-driven energy economics, regulation and energy policy, Portland (and doing online courses).
- Power quality and conditioning, Portland.
- Power system monitoring & control, dynamic load control, Klamath Falls.

**New laboratory equipment** will be

- Power System Modeling & Analysis Laboratories in Klamath Falls and Portland with 16 computer workstations, power systems software + equipment, instrumentation & control for a dynamic residential load system.
- Distributed Power Systems Testing Laboratories in Klamath Falls and Portland campuses with hardware, software for building tests systems for grid-interactive distributive power systems such as geothermal, PV and small-scale wind.
- Power Conditioning and Conversion Laboratory in Portland with 16 power electronics workstations; four-channel oscilloscopes, function generators, multimeters, spectrum analyzers and power supplies
- Utility-Appropriate Teaching Laboratory in Portland, featuring fuel cells, batteries, pumped storage and other types of energy storage technologies.
- Five electrical power systems platforms, monitoring instruments, and data acquisition systems for interdisciplinary program research in integrating renewable energy sources to the electrical grid system and researching new system enhancements. Three of the platforms will be in existing Klamath Falls labs, and two will be used by the REE and Mechanical Engineering Technology (MET) programs in Portland.
- Student Project and Research Labs
- Computers for New Faculty and Consortium Coordinator.

### **Medium-term**

The expected results between July 2015 and June 2020 are an increase in Renewable Energy BS and MS graduates from an expected 100 in 2015 to an expected 120 by 2020, when the program's growth potential is expected to have leveled off.

These results indicate a strong increase in institutional educational capacity and productivity, made possible by ETIC investment, increased private support from industry partners that will result from the investment, and increased collaboration with other Oregon universities. These results will move OIT's program toward its strategic goal of being a leader in applied research and a primary contributor to Oregon's role in the national and global economy. Better laboratory facilities and broader faculty expertise will provide more opportunities for OIT faculty and students to engage in externally funded applied research, while better coordinated industry partnerships will increase the number of patents, licenses, and spin-offs.

## **Future Plans & Resources**

### Plans

An important component of the proposed Center of Excellence in Renewable Energy is the strong relationship that OIT has with the companies that hire its graduates and from which come many of its faculty. This relationship has grown between the university and the renewable energy industry during the incubation and birth of the Renewable Energy Engineering degree program. These connections will be nurtured further, as described above in this proposal, to help OIT build the infrastructure and related capacity to produce more graduates ready to be technical leaders in the burgeoning field, which is technically complex, changing quickly, and subject to evolving government policies. OIT will maintain these external connections as its sustainable engineering programs evolve beyond 2013.

### Funding

OIT's long-term funding plan calls for an expansion of these relationships: in number of industry partners and in types of organizations (e.g., high tech, national labs, research organizations, etc.). Doing so will keep OIT on the cutting edge of renewable energy technologies and applications by promoting intellectual exchange. The projected increases in faculty numbers and student enrollment will provide a balance of tuition income to support the programs at a higher level of capability, and externally funded applied research in collaboration with industry will fund student research opportunities in the future.

### Sustainable Technology Park Concept

A key element of OIT's long-range facility and educational plan is a Sustainable Technology Park on the Klamath Falls campus. It will occupy its own site on the campus, combining state-of-the-art sustainable buildings with an array of services and educational programs to promote energy conservation, renewable energy, and sustainability in Oregon by focusing on real-world projects and practical information. It will also symbolize the important role OIT is playing in creating a sustainable future through its practical, hands-on work in education, applied research, and economic development activities. The OIT Sustainable Technology Park will serve the entire state with educational, research, and public information. Moreover, with its focused activities in applied research, economic development, and distance education, its reach can be national and international.

### Future Resources

In addition to cultivating its traditionally strong industrial partnerships in engineering and IT, OIT is also revamping its university-wide development effort. The university will be hiring a major gifts officer within three months and a vice president for development in about six months. The OIT leadership recognizes that renewable energy is the key opportunity for the university in its development and fundraising efforts because of the university's national leadership in renewable energy education, its three decades as a leader in geothermal energy through the OIT Geo-Heat Center, and the unparalleled geothermal and solar resources being deployed at the university's Klamath Falls campus.

Two positive indicators of the potential to raise money are the increasing public awareness of energy and growing private and governmental initiatives to address problems and opportunities. Strategically, OIT is well placed in the landscape of research and education by its focus on true applied research – testing, implementation, demonstration, verification – and by its reputation in technical education of combining a strong theoretical foundation with extensive laboratory and field experience. Its highly competent graduates and strong industry ties have given OIT many good connections in business and government. ETIC seed funding for the proposed Center of Excellence in Renewable Energy would be a vital, strong foundation for an educational and testing program unique in the OUS.

## Proposed Investment and Private Support Forecast (\$M)

		2011-2013 Biennium
1	<b>Sources of funds</b>	
2	Base budget for ETIC-related programs -- all sources except ETIC allocation & private support	\$ 9.33
3	Proposed allocation from ETIC budget (\$M) (3)	\$ 3.98
4	Expected private support (\$M) (4)	\$ 1.00
5	<b>Total (\$M)</b>	<b>\$ 14.31</b>
6	<b>Personnel supported (FTE) (5)</b>	
7	Existing faculty (1)	4.0
8	New faculty(2)	5.0
9	Existing staff (1)	1.5
10	New staff(2)	1.0
11	<b>Total</b>	<b>11.5</b>
12	<b>New positions created (6)</b>	
13	Faculty (2)	5.0
14	Staff (2)	1.0
15	<b>Total</b>	<b>6.0</b>
16	<b>Uses of ETIC funds in line 3</b>	
17	New facilities	\$ -
18	Improvements to facilities (7)	\$ -
19	Laboratory equipment (7)	\$ 1.175
20	Other equipment (7)	\$ -
21	Other one-time expenses	\$ 0.070
22	Existing faculty salaries & benefits (1)	\$ 0.410
23	New faculty salaries & benefits (2)	\$ 1.200
24	Existing staff salaries & benefits (1)	\$ 0.933
25	New staff salaries & benefits (2)	\$ 0.120
26	Services & supplies	\$ 0.072
27	Other	\$ -
28	<b>Total (8)</b>	<b>\$ 3.980</b>
	(1) Hired through June 2011 that will be supported by ETIC funds during 2011-13	
	(2) To be hired with ETIC funds during 2011-2013 biennium.	
	[3] N/A	
	(4) Consistent with ETIC Private Support Policy dated 1-23-02.	
	(5) FTE expressed as percent of full time over 2 years of biennium.	
	(6) FTE on an ongoing basis.	
	(7) Improvements and equipment to be purchased with ETIC funds	
	(8) Totals on line 3 and line 28 should match.	

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

	<b>AY 99</b>	<b>AY09</b>	<b>AY13</b>	<b>AY15</b>	<b>AY20</b>
Undergraduate student credit hours	23,263	23,517	28,009	31,471	42,116
Graduate student credit hours	0	533	1,523	1,900	2,508
Graduation rate, 6-year (3)	29.80%	45.90%	47%	48%	50%
Bachelor's degrees granted	165	183	231	260	348
Master's degrees granted	0	7	20	25	33
PhD degrees granted	0	0	0	0	0
Women graduating (4)	10%	7%	11%	12%	14%
Minorities graduating (5)	7%	11%	13%	14%	16%
Externally-funded research expenditures (See 6.)	N/A	\$0.207	\$0.500	\$0.750	\$1.250
Invention disclosures (7)	0	0	8	11	20
License/options (8)	0	0	2	2	3
License income received (9)	0	0	\$0.050	\$0.065	\$0.100
Spin-off Companies (10)	0	0	2	2	3
National ranking of program or department (11)	N/A	N/A	N/A	N/A	N/A
National ranking of college	N/A	top ten	top ten	top ten	top ten
<b>Notes</b>					
(1) Actuals for 12-month period ending in June of the year shown.					
(2) Forecast for the 12-month period ending in June of the year shown.					
(3) Percentage of undergraduate students who started ETIC-Supported program as freshmen six years earlier who completed an ETIC-supported bachelor's degree (source: OUS retention reports) .					
(4) From engineering, computer science, and other programs directly benefiting from ETIC funding, stated as percent of all those graduating (currently special emphasis on increasing).					
(5) Racial and ethnic minorities who are US citizens or permanent residents, stated percent of US citizens or permanent residents graduating (currently special emphasis on increasing) .					
(6) Total OIT research expenditures in AY99 were \$329,006. Information not available on whether external dollars, and how much spent by ETIC-related departments towards research.					
(7) See Association of University Technology Managers (AUTM) survey definitions.					
(8) Number of license or option agreements executed during the year. See AUTM survey definitions.					
(9) 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. See AUTM survey definitions.					
(10) New companies that were dependent on the licensing of your program's technology for their initiation. See AUTM survey definitions.					
(11) US News and World Report, for Public Universities in the West (Departments not ranked)					