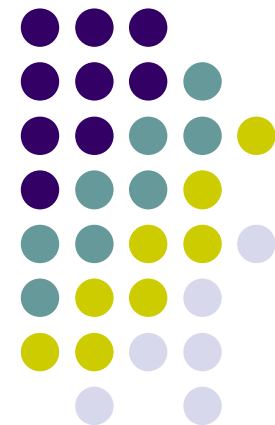


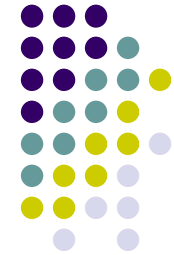
Wind Development Training in Maine

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Mapping available training

- Review of course listings at 32 academic institutions in Maine
 - 4-year; 2-year; Certificate programs
- Email survey to 46 Maine companies
 - 26 responses
 - Small support firms to full-service engineering firms
- Interviews with 20 individuals
 - Educators
 - Engineers
 - Company owners
 - Wind industry experts

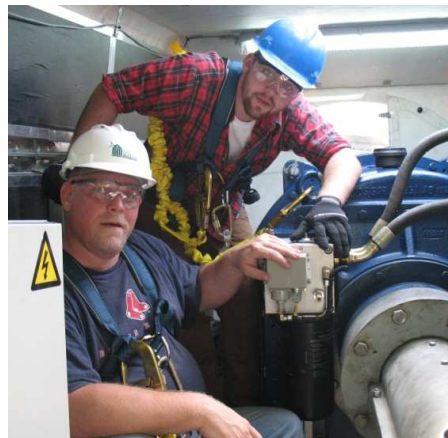
An emerging industry



- The wind industry nationally and internationally is a highly dynamic field – with an emerging understanding of the skills needed
- Definitions vary – e.g. “small” or “community” wind vs. commercial scale; onshore / near shore / offshore / deep water installations; one-time vs. permanent jobs; direct vs. indirect jobs
- Quality of data to assess transferable training is variable

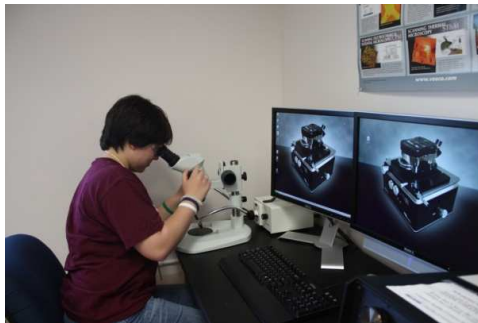


= Direct Training





= Transferable Skills



Academic programs



- Four directly relevant to wind technology (one is in development)
- Eight with at least one course in wind energy, or the overall program is heavily focused on energy / power
- 50+ where skills are directly applicable to wind or may be transferable

Maine *programs* that focus on the wind sector



- **Wind Power Technology** – Northern Maine Community College; 2-year AAS
- **Renewable Energy and the Environment** – Online MS; in development by U Maine Orono
- **Composites** – Maine Advanced Technology Center; focus on blades
- **High altitude safety and rescue** – private companies collaborate to train Maine companies and fire departments using NFPA standards

Examples of programs that include *courses on energy / wind*



- **Electrical Engineering Technology** – U Maine at Orono: electrical controls, power engineering
- **Power Engineering Operations, and Power Engineering Technology** – Maine Maritime Academy: turbines & power plants, power control electronics
- **Department of Civil Engineering** – U Maine at Orono: includes a course on materials / blades
- **Small Vessel Operators** – Maine Maritime Academy: workboat operations, ocean survival, and other skills for servicing oil rigs
- **Electrical Technology / Safety & Rescue** – Kennebec Valley Community College: installation of small wind towers, including tower climbing safety.

Academic institutions with direct or transferable training



- University of Maine Orono – UMO
- University of Southern Maine – USM
- College of the Atlantic – COA
- Maine Maritime Academy – MMA
- Husson University
- Unity College
- Central Maine Community College – CMCC
- Eastern Maine Community College – EMCC
- Kennebec Valley Community College – KVCC
- Maine Advanced Technology Center – MATC
- Northern Maine Community College – NMCC
- Southern Maine Community College – SMCC
- Washington County Community College – WCCC
- The Landing School
- New England School of Metalwork

Examples of programs with *transferable skills*



- **Advanced Composites** – Husson, MATC, USM, UMO
- **Automotive / Engines** – CMCC, EMCC, NMCC, SMCC, WCCC
- **Construction Management** – UMO, USM
- **Control Systems & Design** – NMCC, USM, UMO
- **Electrical Engineering Technology** – CMCC, EMCC, KVCC, NMCC, SMCC, USM, UMO
- **Foundations** – EMCC, SMCC, UMO
- **Industrial Technology / Precision Manufacturing** – CMCC, EMCC, KVCC, NMCC, SMCC, UMO, USM
- **Marine Sciences & Engineering / Offshore** – COA, MMA, MMA/BIW, The Landing School
- **Safety & Rescue** – NMCC, MMA, construction firms
- **Welders & Fabricators** – NE School of Metalwork, NMCC, WCCC, EMCC, construction firms
- **Wildlife Ecology / Environmental Monitoring** – Unity, UMO, engineering firms

Catalog of training

Keyed to
supply
chain

Contact
info

Degrees
& grads

	A	D	E	F	G	H	I	K	L	M	N
	Provider	Program Name or Department	Keywords: Wind Industry Supply Chain	Wind Industry Occupations	Website	Address	Contact	Degree(s) awarded	Prerequisites	Number of Graduates	Notes
1	University of Maine, Orono	Mechanical Engineering	Mechanical Engineering; Components; Blades; Precision Manufacturing	Mechanical Engineers; Component Designers	http://www.umaine.edu/mecheng/	5711 Boardman Hall, Orono, ME 04469	Mohsen (Mo) Shahinpoor, Ph.D., P.E.; 207-581-2143	BS, MS, PhD	HS diploma/ GED	31 in 2007-08; 39 in 2006-07; 41 in 2005-06	Dean of Engineering notes two courses that focus on blades. The ME program is also teaching a lot of robotics related to precision manufacturing.
18	University of Maine, Orono, with Southern Maine Community College	Maine Advanced Technology & Engineering Center (MATEC)	Composites; Precision Manufacturing	Composites Engineers; Composites Technicians; Precision Manufacturing Engineers; Precision Manufacturing Technicians	http://www.engineering.umaine.edu/files/2009/07/june-2009-newsletter.pdf	Currently operating in space rented from BIW.	Dean of Engineering, Dana Humphrey	Will eventually offer degrees from SMCC and/or U Maine - AAS and MS in Composites; AAS in Advanced Machining; MS in Renewable Energy & Environment.		na	Under development by UMO and SMCC. Program will eventually offer a progression from 1-year certificates, to 2-year Associates degrees, to a Master of Science in Renewable Energy & the Environment. U Maine Dean of Engineering notes when it is fully operational, about 80% of this program will be applicable to wind. In development.
29	Maine Maritime Academy	Power Engineering Technology	Power Plants; Turbines & Engines; Installation & Operations; Maintenance & Repair; Safety & Rescue	Power Plant Technicians	http://engineering.mma.edu/get.htm	101 Dismukes Hall, Pleasant Street, Castine, ME 0442	Mark Libby (Chair) 326-2369	BS; Certificates	HS diploma/ GED		Includes courses on turbines as well as marine and onshore power plants. Heavy emphasis on all aspects of power plants. Safety at sea is included. "How to fix everything in a remote environment (at sea) is integral to the program. Students do two 3-month co-ops at power generation facilities. 20-30% of grads now go to work in land-based environments.
34	Maine Maritime Academy and Bath Iron Works	Ship Design and Ship Production	Offshore; Marine Engineering	Design Engineers	http://dean.mma.edu/newscatalog/ship_production.htm	101 Dismukes Hall, Pleasant Street, Castine, ME 0442	Mark Libby (Chair) 326-2369	AS	Offered to employees of General Dynamics Corporation at Bath Iron Works Shipyard.		Ship Design and Ship Production, are offered via a satellite program for apprentices of Bath Iron Works. Courses offered on-site in Bath. Program administered by the Engineering Department at MMA.
35	Maine Maritime Academy and Bath Iron Works	Marine Engineering Technology	Offshore; Marine Engineering	Marine Engineers	http://www.mmainmaritime.edu/academics/index.php?cl=Academics&c2=MET	101 Dismukes Hall, Pleasant Street, Castine, ME 0442	Mark Libby (Chair) 326-2369	BS	HS diploma/ GED		
53	Kennebec Valley Community College	Precision Machining Technology	Welding & Metal Fabrication; Precision Manufacturing; Component Manufacture; Component Repair	Welders; Precision Machinists	Precision	92 Western Avenue, Frye Whitney Wing Rm 100 Fairfield, Maine 04937	Steven Davis; 207-453-5151	AAS, Certificate	HS diploma/ GED		Skill set would be directly relevant to turbine parts manufacture; students learn precision machining, including CNC. Classes including welding, and metallurgy. Mid-State Machine and KVCC partnered to create Mid-State's first Quality Center project in 2006.
					http://www.cianbro.com/HealthSafety/Safety/						Covers safety regarding cranes, rigging, and water

Keyed to wind supply chain



	A	B	C	D
	Provider	Program Name or Department	Keywords: Wind Industry Supply Chain	Wind Industry Occupations
1	University of Maine, Orono	Civil Engineering	Civil Engineering; Construction; Towers & Structures; Blades; Composites	Civil Engineers; Composites Engineers
2	University of Maine, Orono	Construction Management Technology	Site Preparation; Road Construction; Construction; Foundations; Installation & Operations; Project Management	Project Managers; Construction Project Managers; Wind Development Directors
3	Maine Maritime Academy	Marine Transportation Operations	Offshore; Marine Transport	Marine Transportation Operators; Marine Transport Specialists
4	Maine Maritime Academy and Bath Iron Works	Ship Design and Ship Production	Offshore; Marine Engineering	Design Engineers
5	Husson University	Marine Composites	Composites	Skilled tradesmen
6	Eastern Maine Community College	Diesel, Truck and Heavy Equipment; Marine Transport	Engines & Turbines; Vehicle Operations & Maintenance; Generators; Heavy Equipment; Marine Engines	Heavy equipment operations & maintenance; Engine installation, maintenance, repowering; Marine Engine operations & maintenance
12	Kennebec Valley Community College	Electrical Lineworker Technology	Field Work	Lineworkers with high-altitude / harsh environment experience; Field Workers
17	Southern Maine Community College	Heavy Equipment Operations	Heavy Equipment Operations & Maintenance; Construction	Heavy Equipment Operators
25	Bath Iron Works (Cross listed with Maine Maritime Academy)	Ship Production- Machinist Concentration	Machining; Precision Manufacturing; Component Manufacture	Machinists; Precision Manufacturers
44	Maine company	Training related to construction, precision manufacturing, and marine transport.	Offshore; Marine Transport; Composites; Precision Manufacturing; Components	
49				

Insights about academic training



- The Maine community college and university system offers a broad array of courses that are transferable to the wind industry sector
- Many programs already have strong internship, co-op, or on-site training components. Examples:
 - Bath Iron Works and Maine Maritime Academy offer joint training in power plants, and marine engineering
 - Kennebec Valley Community College has developed a Machinist Development Program with a local firm that has made turbine components
 - A number of Maine academic programs provide internships with New England power and utility firms such as Bangor Hydro and Central Maine Power
- Very little instruction today is specific to wind, with Northern Maine Community College's Wind Power Technology program the exception
- Despite absence of "wind" programs, at the community college level there is strong interest and a track record of providing instruction specific to the needs of employers
- At the university level programs relevant to wind are in development

Survey of training at Maine firms



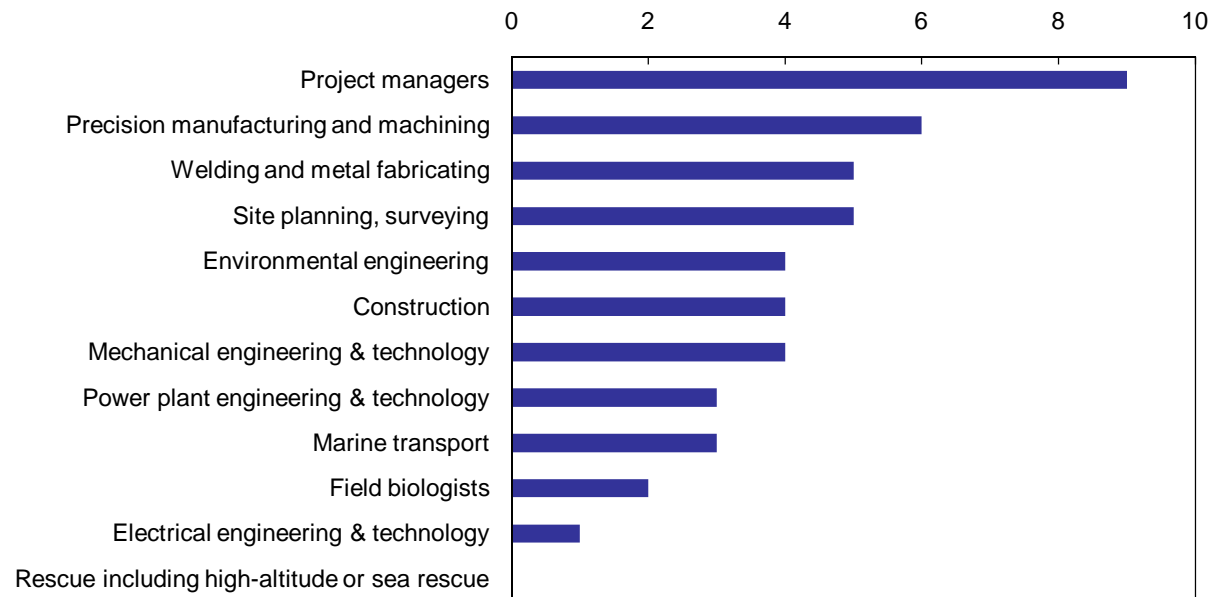
- Survey sent to 46 members of the Maine Wind Industry Initiative and other companies involved in Maine wind installations
- 26 responses received (57%)
- Survey conducted by email December, 2009
- Companies range from small firms hoping to offer support services if the wind industry develops, to full-service national engineering firms already involved
- Survey questions based on twelve “skill sets” – areas of expertise associated with the wind industry

Summary of training at firms



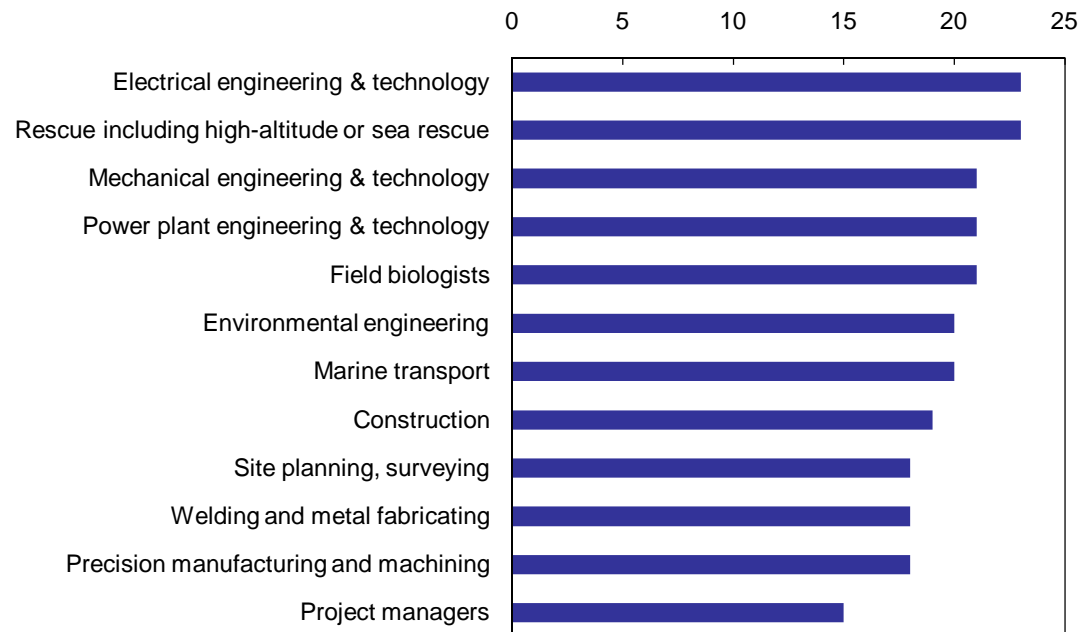
- Project Management is the skill set where the most firms – 38% of survey respondents – offer training
- The three skill sets that are next “most trained” are:
 - Precision Manufacturing and Machining
 - Welding and Metal Fabricating
 - Site Planning / Surveying
- However well over 50% of respondents across all twelve skill sets indicate they do not train in that area, or the skill set is not applicable to their current business
- Most training is internal

Number of companies offering training – across 12 skill sets (26 respondents)

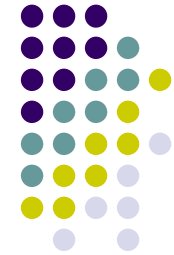




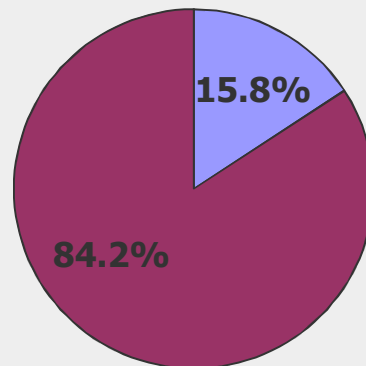
Number of companies indicating training not offered/applicable – across 12 skill sets (26 respondents)



Percent of companies having difficulty finding trained workforce



Has your company experienced difficulty finding trained workforce in any of the job categories listed above?



■ Yes we have

■ No, we have resources internally or have successfully secured them when needed

Project Management insights from Maine companies



- Of twelve skill sets potentially transferable to the wind industry, Project Management is the one for which the most companies said they provide training (38%).
- Those offering Project Management training are typically the larger consulting and design firms.
- Informal conversations also support an interest in Project Management. Typical comments:
 - Yes, you can train for these skills. Professional Engineers can benefit greatly from project management training.
 - Project managers with offshore experience are in high demand and “can pretty much write their own ticket.”
 - Projects within the American Recovery and Reinvestment Act of 2009 (ARRA) will require skills/certifications in project management.

General insights from Maine companies



- Other research findings indicate several skill sets that are highly relevant to the wind industry – notably electrical, mechanical, and power plant engineering and technology; field biology; and safety & rescue skills. These were among the “least trained” at the Maine companies we surveyed.
- Training in three skill sets was offered by five or more respondents – Precision Manufacturing & Machining, Welding and Metal Fabrication, and Site Planning / Surveying. These are all skills used in multiple industries and are not unique to the wind sector.
- Internal training is often part of a national curriculum, such as the National Center for Construction Education and Research (NCCER) or the National Fire Protection Association (NFPA).
- In general the companies surveyed were not experiencing difficulty finding skilled workers in the sectors in which they currently operate.

Interviews



- Twelve Maine community college department chairs
- Three Maine department chairs in 4-year institutions
- Five Maine companies
- Conversations with companies outside Maine at industry events

Insights from interviews



- Electrical, mechanical and power plant skills – three technical areas most relevant to the wind industry – are the focus of many programs in Maine
- All levels of technical skills in electrical engineering are strongly in demand and transferable
- Project Managers able to handle overall coordination and complex projects are in high demand
- “Non-academic resume” also highly valued – veterans, hobbies, ability to work in adverse conditions, hands-on experience
- Jobs in this industry may be global – regional, national, and international placements are common
- NMCC’s Wind Technology Program is one of ten national programs based on AWEA core curriculum

Insights: Academic interviews



- Interviews with Department Chairs at 4-year institutions
 - Unique training in selected areas such as composites, blade & tower design, and maritime engineering
 - DeepCWind, Advanced Structures and Composites Center, and new blade test facility at UMO all provide focal point for academic training
 - Master of Science in Renewable Energy and the Environment may become a focal point at the graduate level
- Interviews with Department Chairs at Maine community colleges
 - Willing and anxious to train for the skills currently needed by local companies
 - Regularly add modules and hands-on experiences/equipment to their programs as they see need – e.g. marine engines, generators, robotic arms, multi-axis CNC machines, wind turbine towers
 - Department chairs consistently noted their aim is to offer programs leading to jobs for their graduates – several expressed some concern about how many sustainable jobs the wind energy sector will create

Insights: Industry interviews



- Interviews with companies in Maine
 - The current level of activity in the wind sector is small – a handful of land-based installations and the maintenance of those turbines
 - Manufacture of wind sector components has occurred in Maine, however current production appears to be minimal or at a standstill (more may be uncovered since our interviews with companies were limited)
- Conversations with companies in the wind industry outside Maine suggest employers look beyond the academic resume:
 - Veterans are valued in the wind industry – work ethic, discipline, teamwork, ability to solve problems as they arise
 - Hobbies – woodworkers, boat builders, motorcycle enthusiasts
 - Ability to work in the field in adverse conditions is highly valued – weather, steep terrain, “at height,” offshore

Summary



- The wind industry in Maine is currently small, but there is active interest and an apparent readiness to respond if the market emerges
- “Transferable skills” appear key to serving an emerging industry
- Maine institutions offer a variety of courses with transferable skills, many with co-op experiences, internships, or other “on the job” components
- Transferable skills taught in Maine are applicable to both land-based and offshore installations
- Maine has one of ten national programs at the Associate Degree level to train wind technicians in an emerging industry-standardized core curriculum
- Maine is developing graduate programs in renewable energy relevant to wind
- Maine companies offer training modules related directly and indirectly to the wind sector – most are in-house

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