Needs Assessment White Paper:
Training for Careers in Wind Turbine Technology

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1 Introduction

Interest in renewable energy sources and specifically wind energy is not new; however, recent world events have rekindled an interest in developing alternatives to petroleum based fuels from sources such as wind, sun, organic materials and water. As these technologies develop, new job opportunities are being created and pose a unique opportunity for workforce development to be at the forefront of training skilled employees to meet the upcoming job demand.

At this time there are 55 wind turbine technicians employed by the Mid-Columbia wind industry and anticipated demand is estimated at 300-430 additional technicians within the next few years

Currently there is not a training program for wind turbine maintenance technicians on the West coast, the closest being in Minnesota; creating an ideal opportunity to fulfill an unmet workforce need. A partnership of wind energy businesses along with the Region 9 Workforce Response Team, Columbia Gorge Community College, Mid-Columbia Council of Governments, and the Region 9 Workforce Investment Board joined together to form a consortia to identify ways to meet this need for skilled workers.

The partnership obtained funding for this project through an Oregon Department of Community Colleges and Workforce Development Employer Workforce Training Fund Consortia Building Project Grant.

The goals of the Needs Assessment were:

- Work with the wind energy industry to determine the occupational demand for workers.
- Identify needed skills and qualifications to develop a training program to produce qualified employees.
- Design curriculum and a course of study at Columbia Gorge Community College.

To develop the Wind Turbine Maintenance Technician Training, a consortium of workforce and wind energy industry representatives was convened. Consortia members met to address the current and future workforce needs of the Pacific Northwest wind/energy industry and determine the most effective way to prepare the workforce to fill the growing demand for skilled workers. While focusing first on the wind industry, the project also identified skill sets common to technicians in other renewable fields such as hydro, biofuel and solar.

Renewable energy projects present a significant economic opportunity for the local, regional and state economy. The State of Oregon has committed to “promote the efficient use of energy resources and the development of a diverse array of permanently

sustainable energy resources" as documented in a report to the Oregon Economic and Community Development Department[1] . The State is encouraging the growth of the renewable energy industry through tax credits, low interest loans and other incentives.

This Wind Turbine Maintenance Technician Training project supports the growth of this industry cluster by providing the skilled workforce needed to maintain and operate wind turbines.

The project was overseen by the Mid-Columbia Council of Governments, an intergovernmental agency providing a variety of services to the counties of Gilliam, Hood River, Sherman, Wasco and Wheeler.

2 Training Needs Assessment: Wind Energy

2.1 Methods

In order to facilitate the consortium meetings and data gathering, planning sessions were held with a Wind Energy Consultant, Columbia Gorge Community College (CGCC) and the Mid-Columbia Council of Governments (MCCOG). The purpose of these meetings was to prepare content, identify potential attendees and prepare agenda's for the Wind Turbine Industry Consortia meetings.

A total of 4 consortia meetings were held including using telephone conferencing to make it easier for industry representatives to participate. These meetings were facilitated by an expert in the wind turbine industry to increase understanding of the industry. The meetings were designed to accomplish the following outcomes:

- Prepare a workforce needs assessment of the wind/energy industry,
- Identify specific skills, training and education needed to fulfill this need.
- Determine the type of training best used to create these skilled workers.

Using the needs assessment and industry priorities, Columbia Gorge Community College designed a Wind Turbine Maintenance Technician Training with curriculum necessary to train workers at the entry levels industry indicated it needed.

Opportunities for a certificate program, internships, on-line learning and just-in-time training were also explored and developed by the consortium. The consortia reviewed degree and training programs in place elsewhere in the nation to identify best practices for consideration.

CONSORTIA MEETING DATES AND OUTCOMES:

[1] Renewable Energy: An Oregon Economic Opportunity-A report to the Oregon Economic and Community Development Department by the Oregon Business Association and the Oregon Environmental Council, March 25, 2005.

May 26, 2006	Identification of Skills and Education Levels
June 21, 2006	First Draft of Needs Assessment Report
July 6, 2006	Content Guide for Curriculum Development
October 11, 2006	Final Curriculum Refinement and Finalization

Part of the design process included the Electronics Engineering Technology Instructor at CGCC visiting a wind farm as a job shadow participant to get hands on experience with the maintenance of a wind turbine in a real world setting. The job shadowing occurred in August 2006, parallel with meetings between the consultant, CGCC and MCCOG in further refinement of the curriculum.

2.2 Participants

Consortium Members: Appendix A shows the consortium members with key roles described below.

Industry Consultant-Western Wind Power: Western Wind Power is a small-medium project company specializing in community and land owner cooperative renewable energy projects. The company is involved in creating a community wind market in the Pacific Northwest. The principal worked for Northwestern Wind Power as development and operations manager of the 24 megawatt Klondike Wind Farm in Sherman County, Oregon and was project manager of a 10-mile transmission line connecting the wind farm into the local grid.

Mid-Columbia Council of Governments (MCCOG): The project was managed by MCCOG and the Region 9 Workforce Investment Board. MCCOG serves as fiscal agent for the Region 9 Workforce Response Team and performed this role for the Wind/Energy Industry Career Pathway project. MCCOG is a Title 1B Service Provider within the Region 9 area known for being client driven; outcome oriented, a valuable partner and investor of community resources, highly organized, collaborative, and was able to perform these key support services for the program in a highly effective manner.

Columbia Gorge Community College (College): The College developed curriculum, identified alternative training delivery systems including the potential for on-line offerings, evening classes, shortened schedules, sequential modules versus academic schedules and create strategic partnerships with other community colleges, the university system and other training partners. The College serves 6,900 individuals in its various programs - including college transfer, professional technical, basic skills development, business and industry training, and community education.

Region 9 Workforce Investment Board (Board): The Board served as advisor for the project giving business representatives an opportunity to provide input into the project. Representatives from education, workforce training, and economic development also sit on the Board and was key to making this project a success.

2.3 Findings

As a direct result of input from the industry partners the following findings were identified:

- Skills needed for an entry level basic technician would be best accomplished through a 6 month non-credit course.
- Training to allow entry into the profession at the mid level could be accomplished through a one-year intermediate level course.
- By offering a 2-year associate degree program participants would gain skills and knowledge necessary to become an advanced level technician or operator.

Appendix B documents the job requirements specific to three levels of wind turbine mechanics: entry level or wind smith, intermediate level or wind mechanic and advanced level or wind technician. The use of the job titles varies amongst companies but the levels are fairly common across the consortium companies. Wind Turbine Mechanics and Technicians are commonly responsible for operations, maintenance, repair and replacement of equipment on a wind farm. The curriculum for the training program was designed to create employees with the knowledge and skills needed to perform these functions.

It was mutually determined that the goal of offering the training program starting Fall 2006 at CGCC was not realistic, due primarily to the needs of the academic community and the complexity of establishing a new program from the ground up. All the partners agreed that winter term 2007 would be a more appropriate start date for the program The mid-level diploma course and the two year associates degree program are currently under review by Portland Community College for accreditation.

Through this grant, the College is also creating strategic partnerships with other community colleges, the university system and other training partners along with identifying alternative training delivery systems including the potential for on-line offerings, evenings, shortened schedules, sequential modules versus academic schedules. By working together and building a collaborative delivery system, an economy of scale will allow businesses in remote locations to train their employees in a cost-effective manner.

CGCC will work within existing venues such as Portland Community College, Office of Community Colleges and Workforce Development, vocational and education forums

along with the workforce development system to create a collaborative statewide capacity to deliver this career pathway training across the state.

In addition, CGCC is currently designing an Innovative Technologies career pathway building on the highly successful Electrical Engineering Technician program using Intel and other private sector dollars; this model of a private/public partnership is being replicated with this project.

3 Occupational Projections: Wind Energy

This section reports the key occupational projections for wind energy.

3.1 Regional

The Mid-Columbia region of Oregon and Washington is seeing a rapid increase in the number of commercial wind farms and this growth is expected to continue over the next five years. Currently the region has over 550 MW of renewable wind energy capacity operating and more on the way. These wind farms currently employ 55 technicians and anticipate demand is on the rise. Approximately 4,300 MW of wind power is projected to be on-line within the next few years and more projects across the West are planned, creating a new demand for skilled wind industry workers. Of this amount, 700 MW will be on-line by the end of 2007.

The American Wind Energy Association views wind energy as one of the "most promising new sources of manufacturing jobs for the 21st century"[2]. Within this region, the wind industry represents the largest job growth potential. Using the current industry supplied ratio of 7-10 full time technicians and 1 supervisor, per 100 MW of energy produced**, an estimated 300-430 additional technicians will be needed within this region alone in the next few years**

Actual need for workers is likely to be much higher across the Pacific Northwest and as data is available this report will address the state and larger geographical areas anticipated growth in renewable energy facilities. Currently there is not a training program for wind turbine maintenance technicians on the West coast; creating an ideal opportunity to fulfill an unmet workforce need.

[2] American Wind Energy Association-News Release: Wind Industry Eyes Record Year of Growth, Job Creation.

Table A: Current Projects in Region

County	Project Name	Developer	Number Turbines	Production	Manufacturer	Partners
Benton, WA	Nine Canyon	Energy Northwest	50	48.1 MW	Bonus Turbines	
Gilliam	Condon	SeaWest	85	49.8 MW	Mitsubishi	BPA
Sherman	Klondike (Phase I)	Northwestern Wind	66	24.0 MW	GE	BPA, PPM Energy
Sherman	Klondike (Phase II)	PPM		75.0 MW		PGE
Umatilla	Eurus Combine Hills	Eurus		41.0 MW		PacifiCorp, ETO
Umatilla	Stateline	FPL	350-400	177.0 MW	V47 Vestas	PPM Energy
Umatilla	Stateline	FPL		123.0 MW		
Umatilla	Vansycle Windplant	FPL		24.5 MW		PGE
	Nine Canyon Phase II	Energy Northwest		15.6 MW		
			Total:	578 MW		

Sources: Paul Woodin and Renewable Northwest Project

Table B: Current Technicians

County	Project	# Technicians
Umatilla	Stateline & Vancycle	25
	9 Canyon	12
	Condon	9
Sherman	Klondike	9
	Total	55

Table C: Planned Projects in Region

County	Project Name	Developer	Production
Community Projects			5-10 small projects
Gilliam	Arlington	Columbia Energy Prt	4.9 MW
	Arlington	Columbia Energy	104 MW

		Prt	
	Lifeline		1200 MW
Gilliam	Leaning Juniper	PPM	104 MW
Gilliam/Morrow	Willow Creek	Invenergy	72 MW
Klickitat	Cannon		450 MW
	White Creek	Last Mile	150-200 MW
	Big Horn	PPM	200 MW
	Wild Horse	Horizon	229 MW
	Klickitat County	Windtricity Ventures, Guascor	125 MW
Morrow	Shepards Ridge	Lifeline	100 MW
Sherman		PPM	600 MW
		PGE	400 MW
		Orion	200 MW
Umatilla	Eurus Combine Hills Phase II	Eurus	59 MW
	Stateline Expansion 1 of 2	FPL	184 MW
	Stateline Expansion 2 of 2	FPL	19 MW
Union	Elkhorn	Horizon	104 MW
			4,355 MW

3.2 National

According to the US Department of Energy, domestic as well as international markets for renewable energy systems are growing. The U.S. Department of Energy anticipates domestic and international market increases for renewable energy systems and in his 2006 State of the Union speech, President Bush announced a 22 percent increase in clean-energy research, including wind technology. According to a U.S. Government Accountability Office report on renewable energy[3] U.S. wind power generating capacity quadrupled between 1990 and 2003 and the Department of Energy projects this source to continue growing at a much higher rate than other sources of electric power, with the potential to represent about 6 percent of total U.S. energy production.

Nationwide, total wind power capacity reached 10,492 megawatts in 2006[4]. The U.S. wind energy industry is on track to install a record 2,750 megawatts (MW) of generating capacity in 2006, which will produce about as much electricity as is used by the entire

[3] United States Government Accountability Office Report: Renewable Energy-Wind Power's Contribution to Electric Power Generation and Impact on Farms and Rural Communities, September 2004.
[4] American Wind Energy Association-Wind Energy Projects in the United States, September 2006.

state of Rhode Island and help strengthen energy security, the American Wind Energy Association (AWEA) stated in its Third Quarter Market Report.

Several jobs are common to the renewable energy industry such as communications, community outreach, sales/marketing, and business support[i]. Others are unique to the type of renewable energy source.

The wind industry employs both professional and skilled workers in a variety of capacities.

	Jobs Needed[5]
New Wind Projects	Business, meteorological to help identify sites, engineering to plan and build, construction workers
Existing Projects	Mechanical and electrical technicians commonly referred to as: "wind energy mechanics, wind energy technicians, or windsmiths" to operate and maintain the turbines.
Research and Development	Mechanical, electrical and aeronautical engineers with advanced degrees plus experienced technicians

4 Other Renewable Energy Occupational Projections

Interest in renewable energy is not new; but recent world events along with improved national and state economic incentives have rekindled an interest in developing alternatives to petroleum based fuels from sources such as wind, sun, organic materials and water. As these technologies develop, new job opportunities are being created and pose a unique opportunity for workforce development to be at the forefront of training skilled employees to meet the upcoming job demand. Throughout the State of Oregon numerous feasibility studies are being conducted to determine the feasibility of renewable energy projects. The primary technologies under consideration are biomass, small scale hydro and additional wind projects.

This project supports the advancement of and innovation in the renewable energy industry, by creating a skilled workforce to meet the industry's need.

5 Summary

[5] U.S. Department of Energy-Energy Training and Renewable Energy, Careers in Renewable Energy

The project will be sustained through the development of the program at Columbia Gorge Community College, with workers or employers paying tuition and associated costs of the certificate and/or degree program. Private sector investment into a training facility will be explored as part of the consortium meetings and will further enhance the sustainability of the career pathway.

Our wind industry partners have committed time as participants in the consortium to assist with the development of the Wind Turbine Maintenance Technician Training curriculum. This represents an estimated minimum match of $6,000 with the anticipation of additional resources from new partners and as the specifics of the training project are developed including an investment in the onsite training aspects.

Appendix A: Consortium Members

Name/Organization	Contact Information
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APPENDIX B: WIND TURBINE MECHANIC QUALIFICATIONS

Wind Turbine Mechanics and Technicians are responsible for operations, maintenance, repairs and replacement of equipment on a wind powered generation plant.

Job Requirements	**Entry Level (Wind Smith)** ***Non-Credit – Full-Time Course***	**Intermediate Level (Wind Mechanic)** ***1 Year – Covers Basics***	**Advanced Level (Wind Technician)** ***2 Year – Associate in Arts Degree***
Experience		12 months related experience or wind industry training.	Minimum 12 months related experience or wind industry training.
Education	High School Diploma or GED. Able to do metric/millimeter conversions. Math abilities desired: geometry, equations, algebra Weights and Balance course.	One year college or technical school certificate. Able to do conversions to and from metric system. Math abilities desired: geometry, algebra. Aviation course would help; Hydraulics training.	Advanced courses or 2 year degree. Able to do conversions to and from metric system Math abilities desired: geometry, electronics math equations, algebra
Computers	Basic knowledge and use of computers including word processing, spreadsheets, email and use of the internet.	Intermediate computer skills utilizing word processing, spreadsheets, email, facility control, management and reporting systems, including use of computerized diagnostic and troubleshooting tools.	Advanced computer skills utilizing word processing, spreadsheets, email, facility control, management and reporting systems, including use of computerized diagnostic and troubleshooting tools. Ability to use digital cameras; able to utilize 2D drawing program

Job Requirements	**Entry Level (Wind Smith)** ***Non-Credit – Full-Time Course***	**Intermediate Level (Wind Mechanic)** ***1 Year – Covers Basics***	**Advanced Level (Wind Technician)** ***2 Year – Associate in Arts Degree***
Equipment	Familiarity with maintenance and electronic testing equipment: voltage testers, amp clamps, megohmmeters,, hydraulic torquing, and various hand and/or power tools. Understanding of cranes and rigging. Ability to read schematics.	Familiarity with maintenance and electronic testing equipment: voltage testers, amp clamps, megohmmeters, infrared testers, hydraulic torquing, alignment and various hand and/or power tools. Basic knowledge and Experience with cranes and rigging procedures.	Familiarity with maintenance and electronic testing equipment: voltage testers, amp clamps, oscilloscopes, megohmmeters, infrared testers, hydraulic torquing, alignment and various hand and/or power tools. Detailed knowledge and Experience with cranes and rigging procedures. Automotive curriculum.
Mechanical	General maintenance oriented knowledge of hydraulics, gear boxes and machine inspection, lubrication, nuts and bolts	Working knowledge of the fundamentals of hydraulics, gear box analysis and inspection, lubrication, alignment, nuts and bolts. Fiberglass repair. Blade pitching; weights and balance. Fiberoptic, phase motors.	Advanced knowledge of hydraulics, gear box analysis and inspection, lubrication, alignment, nuts and bolts; extensive knowledge of tools and tool use. Diesel
Electronics	Basic knowledge of AC/DC circuits, high voltage, transmission switching, test generators, lockout and tagout. US and ISO electrical symbols.	Working knowledge of AC/DC circuits, low voltage, transmission switching, test motors and generators, lockout and tagout, end connectors.	Advanced knowledge and applications of AC/DC circuits, high voltage, transmission switching, test motors and generators, lockout and tagout.
Wind Industry Specific	Some knowledge desired.	Familiar with blade pitching and wind farm operations.	In depth knowledge of blade pitching, wind speed measurement, and operations of wind farms.

Job Requirements	**Entry Level (Wind Smith)** ***Non-Credit – Full-Time Course***	**Intermediate Level (Wind Mechanic)** ***1 Year – Covers Basics***	**Advanced Level (Wind Technician)** ***2 Year – Associate in Arts Degree***
English Language Ability	Clear and readable printing	Knows fundamental terminology of wind turbines and their operation	Ability to read and understand technical manuals
Physical Effort Ability	Ability to climb 260 foot towers and lift up to 70 lbs and work in confined spaces. Ability to work in extremely adverse weather conditions.	Ability to climb 260 foot towers and lift up to 70 lbs and work in confined spaces. Ability to work in extremely adverse weather conditions.	Ability to climb 260 foot towers and lift up to 70 lbs and work in confined spaces. Ability to work in extremely adverse weather conditions.
Other	Some familiarity with electrical and climbing safety. Ability to conduct oneself in a professional business like manner	Familiarity with safety issues: tower rescue, approach, clothing. Able to prepare business and technical communications. General knowledge of meteorology.	Advanced knowledge of safety issues: tower rescue, approach, clothing and personal protective equipment. Possess ability to communicate business and technical information, explain terminology, public relations skills. Ability to read and understand MSDS
Desired	EMT Certification	EMT Certification	EMT Certification

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