

# Wind & Solar Construction Workforce

Dr. Jerry Hudgins, *University of Nebraska-Lincoln*

John Liewer, *Northeast Community College*

Charles Nelson, *Nelson Industrial Construction & Engineering*

*Moderator: Kurt Stradley, LES*



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Nebraska  
Wind & Solar

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RESOURCES



# Wind and Solar Careers:

How the University of Nebraska  
and the Wind for Schools  
Program Support these Careers

Jerry Hudgins

Electrical & Computer Engineering Department

University of Nebraska



# Wind Energy Careers



# Project Development

- Attorney
- Power Marketer
- Financial Manager
- Power Systems/Transmission Engineer
- Project Engineer
- Regulatory Expert
- Resource Scientist
- Environmental Scientist
- Civil Engineer
- Quality Engineer
- Land Acquisition Specialist
- Meteorological Technician

# Component Manufacturing

- Attorney
- Research Engineer
- Aerospace Engineer
- Design Engineer
- Sales Engineer
- Electrical Engineer
- Engineering Manager
- Industrial Engineer
- Quality Engineer
- Buyer
- Logistician
- Salesperson
- Assembler and Fabricator
- Trade Worker
- Transportation Worker

# Construction

- Project Manager
- Project Engineer
- Industrial Engineer
- Mechanical Engineer
- Civil Engineer
- Electrical Engineer
- Quality Engineer
- Construction Manager
- Trade Worker
- Construction Worker



## Operations

- Attorney
- Asset Manager
- Mechanical Engineer
- Electrical Engineer
- Quality Engineer
- Site/Plant Manager
- Environmental Science Technician
- Wind Technician
- Meteorological Technician

## Education, Training, & Research

- Professor
- Research Scientist
- Research Engineer
- Analyst and Researcher
- Training and Development Manager
- Technical Trainer/Instructor



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# Solar Energy Careers

# Manufacturing

- Materials Scientist
- Environmental Engineer
- Mechanical Engineer
- Electrical Engineer
- Industrial Engineer
- Process Control Technician
- Quality Assurance Specialist
- Instrumentation and Electronics Technician
- Advanced Manufacturing Technician
- Computer Numerical Control (CNC) Operator

# Project Development

- Lawyer with Solar Expertise
- Solar Project Developer
- Solar Utility Procurement Specialist
- Electrical Inspector with Solar Expertise
- Code Official with Solar Expertise
- Building Inspector with Solar Expertise
- Solar Marketing Specialist
- Solar Sales Representative
- Solar Site Assessor

# System Design

- Software Engineer
- Solar Energy Systems Designer
- Power Systems Engineer
- Structural Engineer
- Utility Interconnection Engineer
- Residential PV System Designer
- Engineering Technician
- IT Specialist

# Installation & Operations

- Solar Instructor
- Solar Installation Contractor
- Solar Fleet Manager
- Electrician with Solar Expertise
- Solar PV Technician (commercial/utility)
- Solar Project Manager
- Solar Service Technician (residential)
- Solar PV Installer
- HVAC Technician with Solar Expertise
- Plumber with Solar Expertise
- Roofer with Solar Expertise
- Solar Crew Chief
- Solar Assembler / Basic Installer

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# Wind for Schools Program: Career Development

Nebraska Wind for Schools Program Consortium

AMERICAN CORN GROWERS FOUNDATION  
BAIRD HOLM  
EDF  
GERONIMO  
HDR  
DAN MCGUIRE, CONSULTANT  
NEBRASKA FARMERS UNION FOUNDATION  
NEBRASKA PUBLIC POWER DISTRICT  
NEXTERA ENERGY  
NORTHEAST COMMUNITY COLLEGE  
JOHN O'CONNOR, INDIVIDUAL  
OLSSON ASSOCIATES  
RE DEVELOPMENT  
SEMPRA  
VANGUARD SOLUTIONS



Jerry Hudgins  
WAC Director



Dan McGuire  
WAC Facilitator

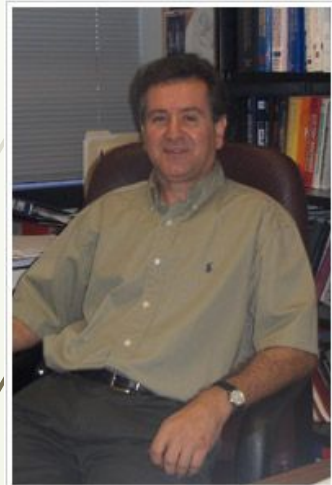
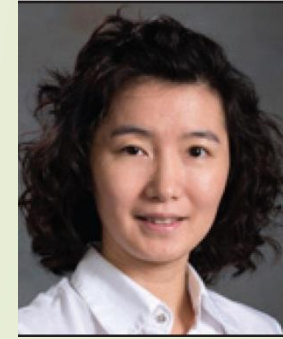


# The Consortium Oversees Activities of the Nebraska Wind Applications Center (WAC)

- Wind resource and energy usage analysis
- Siting and permitting help for Schools
- Overseeing the installation of the power and the data acquisition system
- Performance data analysis
- **Teacher training for Wind Energy Science and Systems**
- **Curriculum samples for teachers**
- **University Activities**
  - Student projects
  - Research
  - Technical Symposia on electrical systems in wind energy

# Other Nebraska WAC Faculty

- Dr. Liyan Qu, electric machine and power converter designs.



- Dr. Sohrab Asgarpoor, specializing in power system reliability and distributed generation systems.

- Dr. Wei Qiao, specializing in distributed generation systems, wind turbine monitoring, and grid connection issues.





# Wind for Schools Participant Map



- 24 Nebraska Schools participating

Bancroft Rosalie Public  
Bloomfield Community  
Crawford Public  
Creighton Community Public  
Diller-Odell Public  
Elkhorn Valley District  
Garden-County Public  
Hastings Public  
Hayes Center Public  
Hyannis Public  
Kimball Public  
Laurel-Concord Public  
Logan View Public  
Loup City Public  
Meridian Public  
Mullen High  
Norfolk Public  
Norris Public  
Papillion-La Vista South Public  
Pleasanton Public  
Riverside Public  
Superior Public  
West Holt High  
West Point Public

Estimate that 8% of all Nebraska public school students (K-12) have been exposed to some curriculum aspect through the WfS program

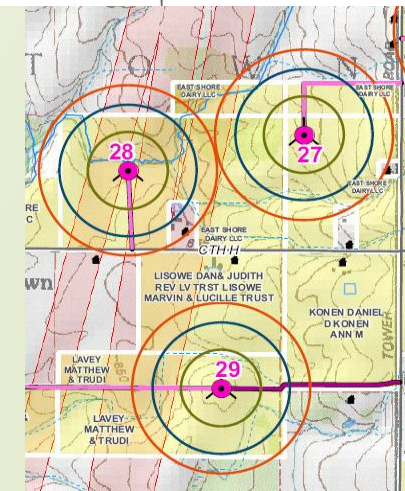
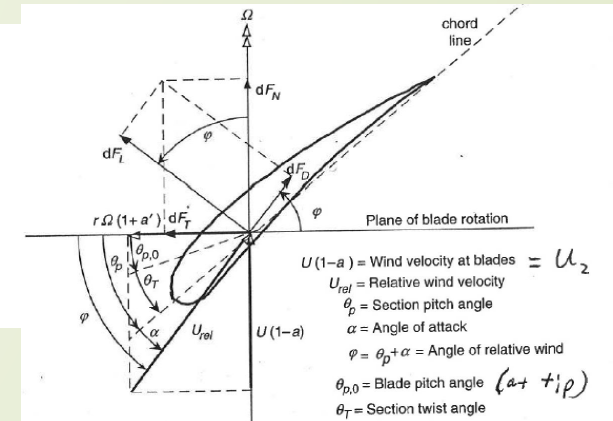
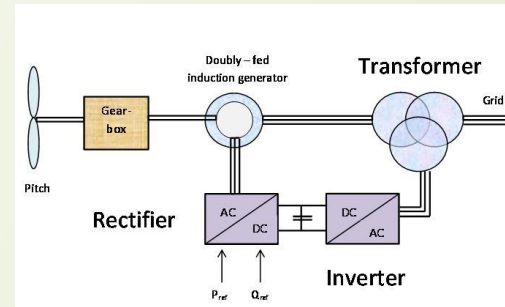
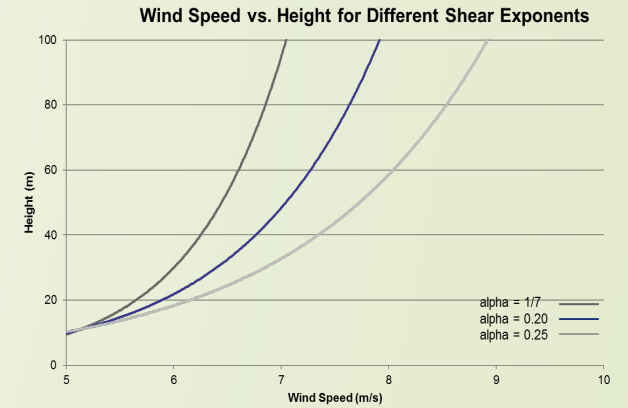
“Bancroft-Rosalie Community Schools have used the WfS curriculum in science, math, and other courses to provide our students with an understanding of careers connected to engineering, construction, wind turbine technicians and other possibilities in the wind energy industry. WfS is an effective program for career development. It serves our students and the industry very well.”

*Jon Cerny, Superintendent,  
Bancroft-Rosalie Community*

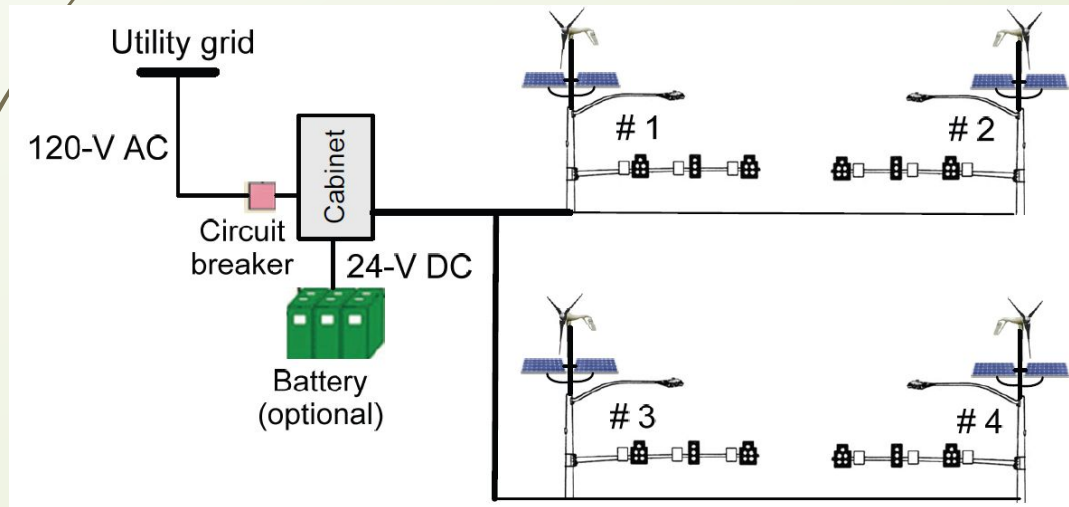
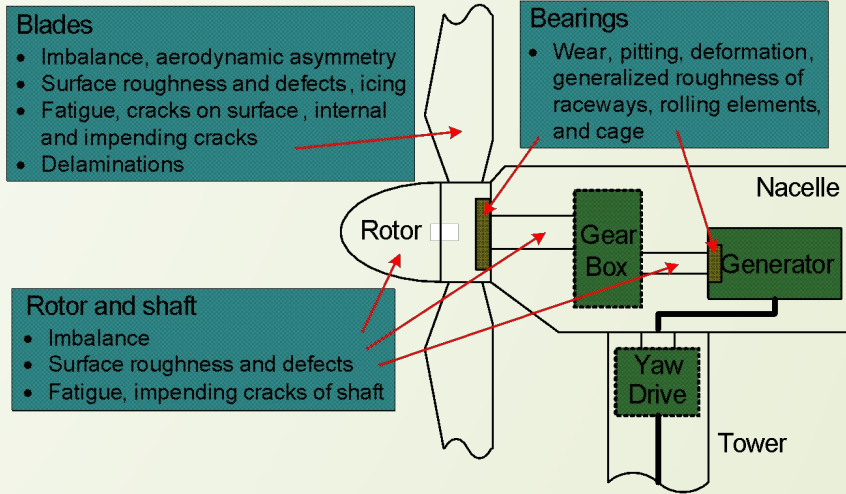


# Curriculum Content – Wind Energy Systems in ECE Department

- WIND CHARACTERISTICS, DATA ANALYSIS, AND RESOURCE ESTIMATION
- AERODYNAMICS OF WIND TURBINES
- WIND GENERATORS
  - Induction Machines
  - PM (synchronous) Machines
- POWER CONVERTERS
  - dc/dc converters
  - Inverters
- Control of Wind Turbines
- SITING
  - Environmental Impacts
  - Technical Considerations
- INTEGRATION INTO THE ELECTRIC POWER GRID
- WIND VALUE AND ECONOMICS
  - Avoided Costs
  - Net Metering
  - Renewable Portfolio Standards, RPS (or Renewable Energy Standards, RES)
  - Green Tags
  - Jobs and Economic Development Impact (JEDI) Models
- PUBLIC POLICY ISSUES



# More than 300 undergraduate and 60 graduate students have had direct contact with wind energy curriculum and projects at the University of Nebraska





# Wind Energy Technology

October 17, 2018

**Northeast**  
community college

Northeast  
community college

# First Wind Energy Training Efforts 2005-2008

10 Kilowatt American  
Energy



3 Kilowatt Turbine



3 Kilowatt Southwest  
Turbine



# Wind Energy Program Diploma – 2009 Associates - 2011



# First AAS Wind Energy Degree Program in Nebraska

- Residential, mid-sized and commercial turbines





# Opportunity

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## OCCUPATIONAL OUTLOOK HANDBOOK

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Occupational Outlook Handbook >

### Fastest Growing Occupations

EN ESPAÑOL | PRINTER-FRIENDLY

**Fastest growing occupations:** 20 occupations with the highest percent change of employment between 2016-26.

Click on an occupation name to see the full occupational profile.

OCCUPATION	GROWTH RATE, 2016-26	2017 MEDIAN PAY
<a href="#">Solar photovoltaic installers</a>	105%	\$39,490 per year
<a href="#">Wind turbine service technicians</a>	96%	\$53,880 per year
<a href="#">Home health aides</a>	47%	\$23,210 per year
<a href="#">Personal care aides</a>	39%	\$23,100 per year
<a href="#">Physician assistants</a>	37%	\$104,860 per year
<a href="#">Nurse practitioners</a>	36%	\$103,880 per year
<a href="#">Statisticians</a>	34%	\$84,060 per year
<a href="#">Physical therapist assistants</a>	31%	\$57,430 per year
<a href="#">Software developers, applications</a>	31%	\$101,790 per year
<a href="#">Mathematicians</a>	30%	\$103,010 per year
<a href="#">Physical therapist aides</a>	29%	\$25,730 per year
<a href="#">Bicycle repairers</a>	29%	\$28,390 per year
<a href="#">Medical assistants</a>	29%	\$32,480 per year
<a href="#">Genetic counselors</a>	29%	\$77,480 per year
<a href="#">Occupational therapy assistants</a>	29%	\$59,310 per year
<a href="#">Information security analysts</a>	28%	\$95,510 per year
<a href="#">Physical therapists</a>	28%	\$86,850 per year
<a href="#">Operations research analysts</a>	27%	\$81,390 per year
<a href="#">Forest fire inspectors and prevention specialists</a>	27%	\$37,380 per year
<a href="#">Massage therapists</a>	26%	\$39,990 per year

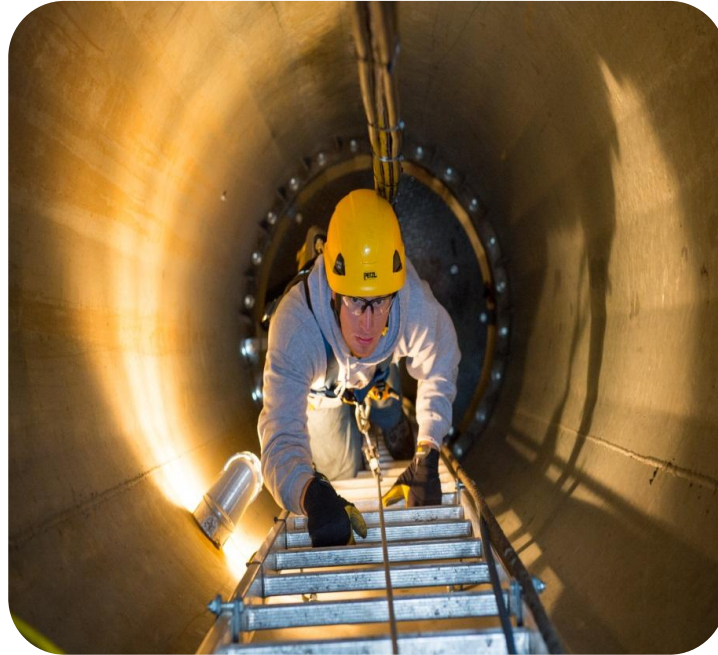
Last Modified Date: Friday, April 13, 2018

- Fundamentals of Electricity
- Wind Energy Fundamentals
- Blue Print Reading
- Safe Access & Rescue First Aid & CPR



# Climbing Exercises

- Rappelling
- Fall Protection
- Equipment Inspection
- Rigging



# Indoor Training Area

- Repetitive Skill Development
- Endurance
- Evacuation and Rescue training



# Commercial Turbine Climbing

Having a lot of fun

Tour



Climb Test



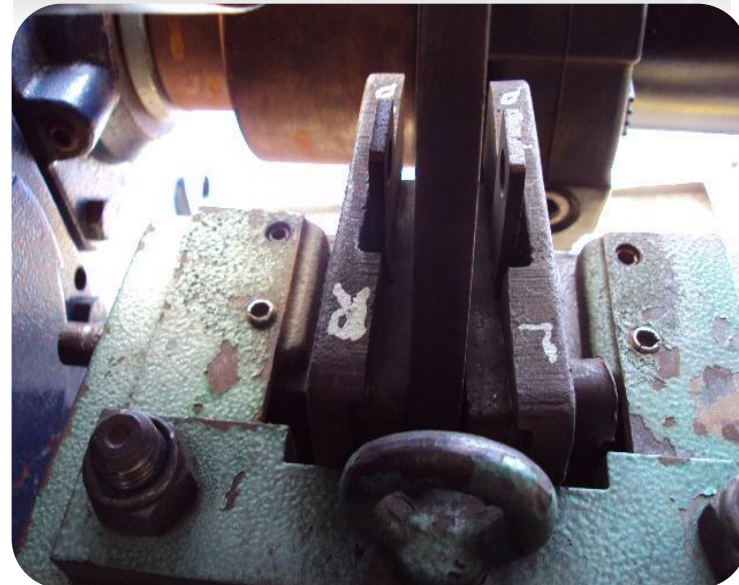
- Electrical and Operations Safety
- Mechanical and Fluid Fundamentals
- Motor Controls



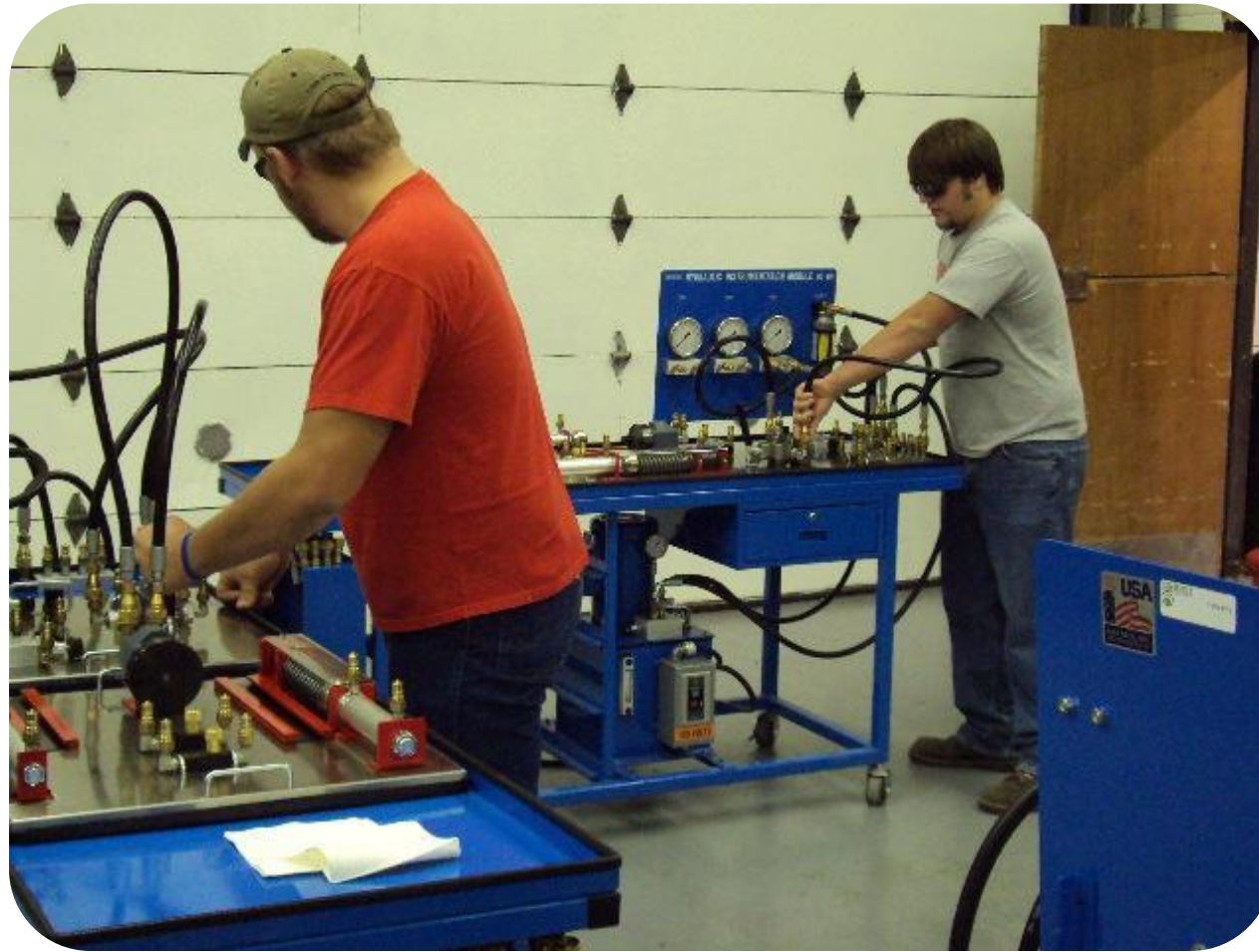
**Brake Pad Replacement**



**Actual Hands-on Experience**



# Hydraulic Systems

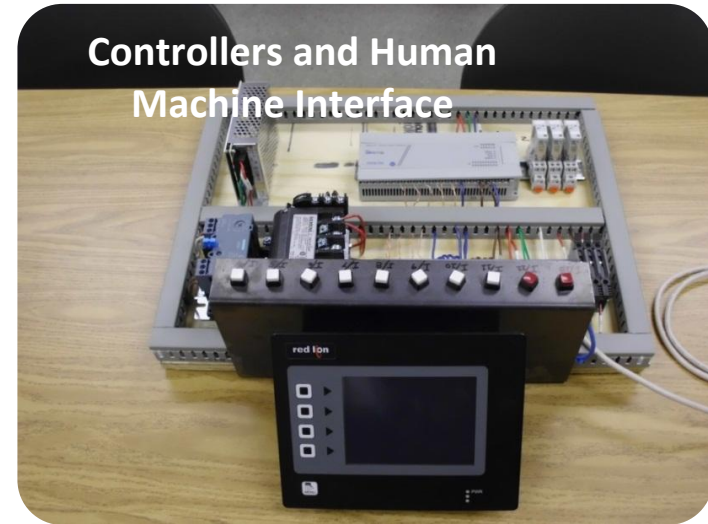


# Proper Torque Procedures





- Control Systems
- PLC/Electronics
- Generators
- Turbine Siting
- Mechanical Systems II
- Airfoils



# Certifications



- Multimeters
- Precision Measurement
- Torque
- Communications

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# AWEA & NOCTI Standards



# Denmark



- Travel Abroad
- Global Awareness



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Where the Power of  
Wind is Harnessed...

We're Northeast.

Wind Energy at

**Northeast**

community college

Norfolk, Nebraska

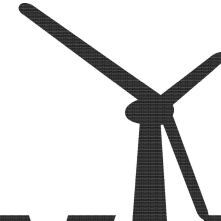
[northeast.edu](http://northeast.edu)

# Nelson Wind Turbine Division Builds Foundations Throughout U.S. & Canada

- Over 3,300 Foundations
- Providing Over 6,800 MW of Power
- Wind Farms up to 150 Turbines



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