

Tools and Equipment

Components and Equipment

1. Breakers (station service, vacuum, oil, and field)
2. Metal clad switchgear
3. Electrical controls
4. Generators and PMGs (Permanent Magnet Generator)
5. Shop machinery
6. Hand tools
7. Battery charges & inverters; station and auxiliary battery banks
8. Stator
9. Rotors
10. DC exciters/sold state excitation
11. Fractional horsepower motors
12. Annunciators and alarms
13. Auxiliary equipment
14. Distribution panels
15. Transformers (current, potential, distribution)
16. Auxiliary generating equipment and auxiliary generator controls
17. Isolated phase busses
18. Oil pump motors, starters and controls
19. Relays
20. Neutral ground devices
21. Switch boards, panels
22. Switching and grounding equipment
23. Distribution circuits
24. UPS power supplies
25. Condition Monitoring Equipment
26. Voltage regulators

27. Motor starters and circuits
28. Motors & Generators; AC and DC motors
29. Accumulator charging —compressed gasses
30. Blade/pitch balancing tools
31. Fiber Optics equipment
32. Relay circuits
33. Inspection tools
 - a. Boroscope
 - b. Thermal cameras
 - c. Precision measuring tools—micrometers, calipers, gauges
34. PLCs and PLC programs (programmable logic controller)
35. Portable generators
36. Lightning arrestors
37. Emergency lighting
38. LVDT (Linear Variable Differential Transformer) and proximity position sensing and indication
39. Instrumentation systems and devices

Wind Farm Environment

1. Outdoor lighting circuits
2. Indoor lighting circuits
3. Ventilation systems
4. Conduits, wire cable
5. Overhead and underground wiring, including triplex
6. Remote control circuitry
7. Remote telemetry unit (RTU)
8. Heat Exchangers
9. Security Systems
10. Emergency lighting

11. Cable trays
12. Ground Fault Interrupters (GFI)
13. Grounding and bonding systems
14. Communication systems
15. Branch circuit panels and feeders and over current devices
16. Power utilization circuits, devices and equipment

Tools, Meters and Monitoring Instruments

1. Amp Clamp
2. Megger
3. Phase rotation meter
4. Capacitor tester
5. Oscilloscope
6. Machine shop tools
7. Hand tools
8. Electric hand tools
9. Micro-Ohm meter
10. Recording equipment/data acquisition equipment/data loggers
11. Manometer
12. Multi-meters
13. Hydraulic torquing tools
14. Mechanical torque wrench
15. Skidmore and torque log

Cranes & Rigging

1. Hand signals
2. Lifting and leveling of a load
3. Tag lines with a suspending load
4. Service hoist
5. Cribbing and it's use



D A C U M

Profile

Cerro Coso Wind Technician

Panel Members:

- Kathy Alfano, CREATE
- Suzie Ama, Cerro Coso
- Larry Board, Cerro Coso
- Jill Board, Cerro Coso
- Nikki Cummings, Worldwind
- Laura Hinkle, Sierra Sands Unified School District
- Robert Johnston, Kern Community College District
- Valerie Karnes, Cerro Coso
- Linda Parker, Kern Wind Energy Association
- Jon Powers, Cal Wind
- Eric Preher, NextEra Energy
- Kathy Salisbury, Cerro Coso

- Jennifer Schwerin, Cerro Coso
- Angela Sellers, Cerro Coso
- David Teasdale, Kern Community College District
- Bev Thompson, Tehachapi High School
- Larry Venner, EnXco
- Ivan Vamla, World Wind Service
- Jack Wallace, Frontier Pro
- Dale Whinery, Kern Community College District
- David Winchester, NextEra Energy
- Adolfo Zavala, EnXco

Facilitator:

- Dennis Faber, Principal Investigator, TIME Center



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Knowledge and Skills

1. Ability and willingness to work in all weather conditions
2. Read and interpret technical manuals, protocols, procedures and regulations (reasonably high level)
3. Written and verbal communicate skills
4. Math Skills
 - a. Working knowledge of measurements, layout, computation formulae, functions
 - b. Basic logic
 - c. Add, subtract, multiply, and divide in all units of measure
5. Basic computer skills
 - a. Complete forms
 - b. Manage files
 - c. Office productivity tools—word processing, spreadsheets, presentation, data bases
6. Take initiative and work without direct supervision
7. Bi-lingual skills (English & Spanish)
8. Work with people of other cultures, age, gender, and beliefs
9. Professional conduct, respectfulness, courteousness
10. Customer service—skills to meet customer needs.
11. Hydraulics and pneumatics
12. Gear Boxes
 - a. Characteristics of gearboxes;
 - b. types of gear systems in gearboxes;
 - c. Maintenance;
 - d. Filters;
 - e. Cleanliness, impurities
 - f. Lubrication, pumps; shaft end plates;
 - g. Gear teeth condition
13. Lubrication—oil and grease; oil base (soap, clays, synthetic, animal byproduct);
 - a. Impurities;
 - b. byproducts;
 - c. self lubricators; grease gun;
 - d. maintenance and troubleshooting;
 - e. sampling;
 - f. types of lubricants and uses;
 - g. lubrication methods;
 - h. contamination control;
 - i. effects of poor lubrication
14. Yaw Systems—Function of Yaw control system including: wind vane, anemometer, yaw angle (alignment vs. misalignment), auto rewind function, yaw brakes and Yaw drive system
15. Principles of shaft alignment
16. Fasteners and torquing
17. Material Safety Data Sheets (MSDS)
18. Weather patterns
19. Torque principles
20. Science and engineering theories and concepts
 - a. Basics physics
 - b. Behavior of matter
 - c. Gasses and liquids
 - d. Mechanical energy
21. SCADA Basics
 - a. Operability and limitations of physical infrastructure
 - b. General components and connections
 - c. Data extracted from components
 - d. types of data collection and data use in industry
 - e. Computer process applications and networking
22. Basic understanding of how a wind turbine detracts and dissipates lightning
 - a. Understand proper grounding techniques, theory, significance
 - b. Bonding & grounding and lightning protection
23. Wiring diagrams, schematics, US, European and Japanese component symbols
 - e. Introductory mechanical engineering concepts
 - f. Levers, pulleys, machines
 - g. Renewable energy processes and industries
 - h. Environmental stewardship
 - i. Machines, friction, and bearings
 - j. Overview of power generation delivery grid systems from generation to end user including VARS (volts, amps, reactive)
 - k. High voltage electrical safety standards; OSHA 1910-33, NFPA 70-E
 - l. Aviation terminology and basic aerodynamics (physics)
 - m. Instrumentation and control logic theory
 - n. Fiber optics
 - o. Basic rigging
24. Electrical/ Electronics Theory
 - a. Understand and comprehend basic electrical theory.
 - b. AC/DC voltage and current principles; resistance (series & parallel circuits), inductance, and capacitance
 - c. Power generation principles
 - d. Electrical components such as: motor starters, manual switches, control relays, transformers, motor controls
 - e. Basic Wiring
 - f. Analog and digital signals
 - g. PLC's—basic functions and applications
25. Motors & Generators—basic theory and operation
26. Personal protective equipment

Physical Requirements and Work Requirements

1. Ability to perform manual work, i.e.: standing, stooping, and walking.
2. Ability to lift up to 50 lbs.
3. Ability to climb a ladder 260+ feet above the ground without assistance on a frequent basis.
4. Ability to work outdoors in extreme cold and heat for extended periods of time from towers and platforms.
5. Pass drug and alcohol screening requirements
6. Drivers license and acceptable driving record
7. Criminal background clearance