

WIND CONCEPTS LEARNING SYSTEM

950-WC1

Introduction to Wind Power Systems
Objective 3: Describe the Role of Wind Power in the Global Energy Portfolio

Wind power is growing tremendously in several countries due to the limited and expensive supply of fossil fuels. Currently there is 159 billion kilowatts (kW) of installed wind power capacity globally. Out of that 159 billion kW, 39 billion kW was installed in 2009, which is a growth rate of approximately 31%.

Some areas like North America and the European Union (EU) have set targets to stimulate wind power growth. For example, the United States wants 20% of its electricity generated from wind by 2030.

Wind Power Growth

Top 10 Countries by Growth Rate

Mexico	372.9
Turkey	139.9
China	113.0
Morocco	104.0
Brazil	77.3
Hungary	69.3
New Zealand	62.5

Wind Power

...ment of air ... due to changes in pressure and ... ed by the sun, ... generated by air ... ed. Devices such ... wind turbines ... power into ... electrical power.

Wind Turbine Production
Objective 2: Describe the Operation of a Wind Turbine Yaw System

Yaw Adjustment

Yaw refers to the rotation of a horizontal axis wind turbine (HAWT) nacelle. The yaw system controls this rotation so that the rotor is always facing into the wind as it changes direction. This rotation is important so that the rotor blades receive the maximum amount of energy from the available wind. It also reduces wear on the wind turbine components from uneven location of the rotor.

Wind Turbine Siting
Skill 1: Interpret a Wind Resource Map

Procedure Overview

Indiana - Annual Average Wind Speed at 10 m

In this procedure, you will identify values on a wind resource map. You will also use wind speed data and the wind resource map to determine if a location is suitable for a wind turbine.

Wind Speed m/s

>10
10
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
<4.0

WIND TURBINE TECHNOLOGY™

CURRICULUM IS THE KEY TO LEARNING

Learning Topics:

- Wind Power Systems
- Utility-Scale Wind Power Systems
- Small Wind Power Systems
- Wind Power Industry
- Wind Turbine Aerodynamics
- Wind Power Characteristics
- Wind Turbine Ratings
- Wind Turbine Capacity & Availability
- Wind Resources
- Wind Resource Measurement
- Wind Plant Siting
- Wind Plant Economics

Wind energy is a significant source of power whose use is growing dramatically. The Department of Energy has set a goal for 20% of electrical energy used in the United States to be from wind power by 2030. Wind farms can be found throughout the world – from cold, arctic conditions to the tropics, from beaches to mountains to oceans. Understanding the basics of how we can harness wind energy is essential for technicians, engineers, installers, designers, builders, and others who want to apply wind technology either in large utility-scale turbine farms or in small wind applications.

Amatrol's 950-WC1 Wind Concepts Learning System introduces students to a broad range of basic concepts in wind energy technology. Students learn how wind power systems work and what it takes to generate electrical power with wind. The 950-WC1 acts as a foundation for students enrolled in wind-specific as well as general renewable energy programs. Wind Concepts includes student curriculum in PC-based, interactive multimedia format as well as an instructor's assessment guide.



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DESIGNED FOR LEARNING

Introduction to Wind Power Systems
Objective 9: Describe the Basic Operation of a Small Wind Turbine System

Grid Connected System

Grid-connected Systems

A grid-connected wind turbine supplies power primarily to an end user, with any extra power supplied to the utility grid. The balance of system components ensure that the power transmitted to the end user and grid is conditioned to the specified utility grid power. The balance of system components are also responsible for supplying the end user with grid power when the wind turbine cannot supply enough power.

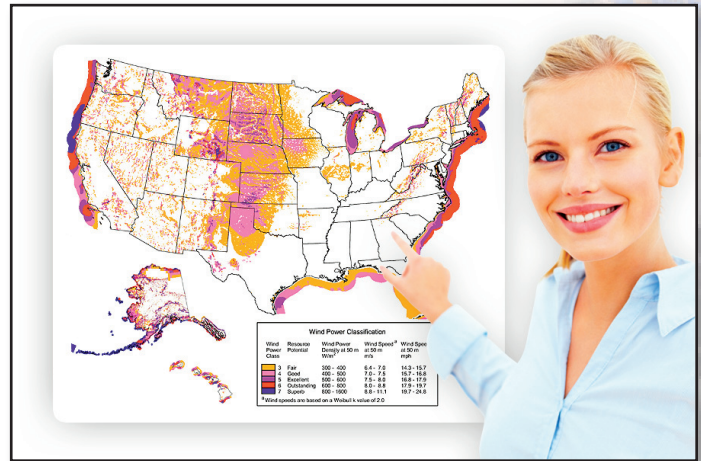
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Interactive, Engaging Multimedia

Amatrol's interactive multimedia provides an engaging, stimulating experience for students. The Wind Concepts Learning System includes interactive computer-based instruction with both theory and hands-on tutorials consisting of text, digital video, voice, online self-review tests, interactive simulations, color diagrams and color photos. Amatrol's strong interactive multimedia includes visual, auditory, and text based learning styles to reinforce each other in well organized learning segments.

Using Wind Technology to Capture Wind Energy

Siting a wind farm or turbine is important. With utility-scale wind turbines costing several million dollars, understanding how much energy you can produce from the turbine in a specific location is key. The amount of wind available at different heights varies tremendously and is shown in courses utilizing maps like the one shown to the right. In the 950-WC1, students gain knowledge and skills in applying science and mathematical skills. Amatrol's Wind Concepts teaches students about many of the factors involved in the critical turbine siting decision.



The Many Types of Wind Power Systems

Wind power is harnessed by a broad array of wind power systems. The most striking difference is between residential or small wind and utility-scale turbines. While each have their place in the energy landscape, they are very different in both application and design. Understanding the fundamentals of these various systems and how they are used is a good base from which to launch a strong knowledge of wind power. Amatrol's 950-WC1 Wind Concepts teaches students about the range of wind power systems and how they are applied.

Introduction to Wind Power Systems
Objective 2: Describe Two Size Categories of Wind Turbines

Small and Utility Scale Wind Turbines

Small Scale

Utility Scale

Wind turbines have two major size categories: small scale and utility scale. Small scale wind turbines are primarily used for residential and commercial applications, while utility scale wind turbines supply power to a utility grid.

Photo courtesy of DOE/NREL

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Small and Utility Scale Wind Turbines

Offshore

Onshore

Photo courtesy of DOE/NREL

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TECHNICAL DATA

Student Curriculum

PC-Based Multimedia, 1 Seat, M20011.
Includes (3) interactive multimedia curriculum modules covering wind power systems, utility-scale wind power systems, small wind power systems, wind power industry, wind turbine aerodynamics, wind power characteristics, wind turbine ratings, wind turbine capacity and availability, wind resources, wind resource measurement, wind plant siting, and wind plant economics

Instructor's Assessment Guide, C20011

Additional Multimedia Seats Available