

Renewable Energy Outline:

We have provided a large amount of information (maybe too much), but you can explore these topics at the level you feel is most appropriate for your students. We assumed that these topics could be presented to a wide range of students (ages and types of courses); therefore, we have provided depth and detail that will help you become an expert. Please adapt the content to your teaching style and format. We are very interested in your feedback. These modules are living/evolving, and we will update them based upon on your experiences and the feedback you provide to us and make revision/updates available to you. These are listed in order of presentation at the Oswegatchie 2009 workshop.

1. The Solar Resource (PowerPoint presentation with annotated slides)
 - a. Introduction to the solar resource and influences on solar gain
 - i. Latitude
 - ii. Cloud cover
 - iii. Declination
 - b. Converting power to energy
 - c. Introduction to the solar pathfinder
 - d. Overview of solar energy systems
2. Solar Pathfinder Module (laboratory exercise)
 - a. Measuring the solar resource
 - b. Accounting for shade losses
 - c. Estimating yearly energy
3. Power of the Sun (movie quizzes)
 - a. Power of the Sun questions and answer key
 - b. The Silicon Solar Cell questions and answer key
4. Micro Hydroelectricity (PowerPoint presentation with annotated slides)
 - a. The hydrologic cycle
 - b. Micro hydro system overview
 - c. Measuring flow and head
 - d. Power to energy
 - e. Comparison to wind
5. Micro hydro module (laboratory exercise)
 - a. Building a clinometer
 - b. Measuring head and distance
 - c. Developing a stream profile diagram
 - d. Measuring flow in larger streams
 - e. Calculating power and energy

6. Biofuel Resources - Overview – (PowerPoint presentation with annotated slides)
 - a. U.S. Energy sources
 - b. Biomass defined
 - c. Bioenergy defined
 - d. Biomass energy sources/supply
 - e. Biomass conversion processes/pathways (general)

7. Wood Gasification – (PowerPoint presentation with annotated slides)
 - a. Renewable fuel resources: Wood/biomass
 - b. Utilization of wood resources: sustainability
 - c. What is gasification?
 - d. Gasification applications: past, present, future
 - e. Optional topics/concepts: thermodynamics, efficiency, energy density

8. Woodgas Camp Stove – (Activity/lab/experiment(s))
 - a. Brief overview of gasification
 - b. Build a working camp stove
 - c. Utilize the heat (boil water, toast marshmallows, etc.)

9. Principles of Fuel Cells (PowerPoint presentation with annotated slides)
 - a. Batteries vs. Fuel Cells: storage vs. conversion devices
 - b. General overview of fuel cell types
 - c. Introduction to Dr. Schmidt’s fuel cell/“gas battery” experiment (lab activity)
 - d. Relationship of the “gas battery” fuel cell effect to PEM fuel cells

10. “Discovering the principle of the fuel cell at home or in school” laboratory experiment by Dr. Martin Schmidt. (lab manual)
 - a. History
 - b. Instructions for conducting the experiment(s)
 - c. An interpretation of each step in the process, including linking the principle from the experiment with today’s commercial fuel cells