

# **ALTERNATE ENERGIES**

***PERT INDUSTRIALS.....for a better way to teach***

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# NEW FROM PERT

# GENERATING CLEAN ELECTRONS

**GENERATING CLEAN ELECTRONS**  
GT-1500

## GENERATING CLEAN ELECTRONS TECHNOLOGY PROGRAM

The GT-1500 Clean Electron Generation Panel provides students an introductory hands-on interactive experience with the 3 leading sources of alternative energy generation technologies.

- **Basic Wind Turbine Operation**  
Installing and testing a wind turbine.

**Off-Grid Wind Turbine Systems**  
Configuring and testing off-grid installations.

**Wind Power System Design**  
Design/create a wind turbine

- **Basic Solar Power Operation**  
Installing, combining and testing solar panels.

**Advanced Solar Panel Systems**  
Configuring, testing and operating off-grid solar installations.

**Solar Power System Design**  
Design/create a solar charging system for portable hand-held devices.

- **Basic Fuel Cell Operation**  
Connecting a fuel cell for electrical generation

**Advanced Fuel Cell Operations**  
Configuring, testing and operating off-grid fuel cell installations.

**Adding a Fuel Cell to an Alternative Power System**  
Connecting a fuel cell into alternative energy systems for off-grid operations.

- **Combining Wind and Solar Power Systems**  
Configuring and testing combined alternative energy systems for off-grid operations.

Reinforced with Hands-on Labs



**STEM**  
"Science, Technology, Engineering & Mathematics"



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# BIOFUELS

## BIOFUEL TECHNOLOGY PROGRAM



### Alternative Energy Generation

- History of fossil fuels
- Environmental concerns
- Electric grid
- Alternative energy sources

### Energy and Power

- Types of energy
- Potential and Kinetic energy
- Power math
- Transportation fuels

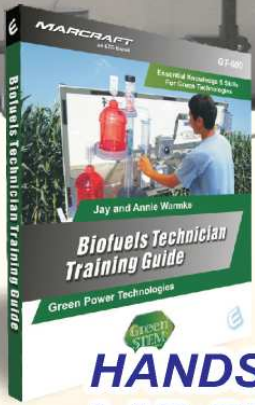
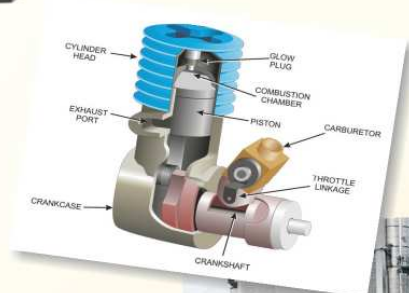
### Biomass and Biofuels

- Biomass and biofuels basics
- Types of energy produced
- Pyrolysis
- Gasification
- Anaerobic Digestion
- Ethanol, Biodiesel & green diesel
- Limitations to overcome

### Small Scale Bio-Energy Production

- Wood gas generators
- Backyard ethanol
- Backyard Biodiesel
- Safety and quality control
- By-product management

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## HANDS-ON LAB GUIDE



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# FUEL CELLS

## FUEL CELL TECHNOLOGY PROGRAM



FUEL CELL  
GT-3000

### Alternative Energy Generation

- History of fossil fuels
- Environmental concerns
- Electric grid
- Alternative energy sources

### Energy and Power

- Types of energy
- Potential and Kinetic energy
- Voltage and current
- Electrical loads
- Electrical power consumption
- Power math
- Making electrical connections

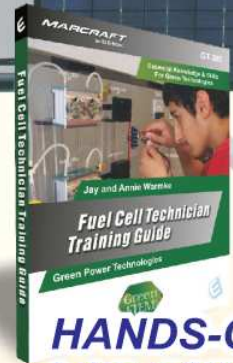
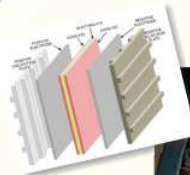
### Fuel Cells

- History of fuel cells
- Hydrogen production, storage and transportation
- Types of fuel cells
- How fuel cells work
- Fuel cell systems
- Future of fuel cells

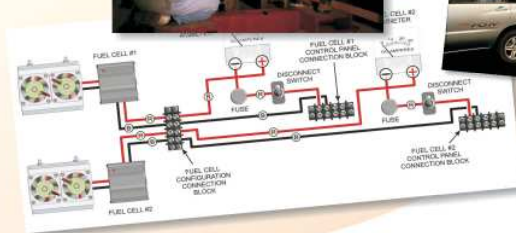
### Building Codes and Compliance

- National Electrical Codes
- International building codes
- Underwriters Laboratories
- EPA
- OSHA
- National Fire Protection Association

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**HANDS-ON  
LAB GUIDE**



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# NEW FROM PERT

# HYDRO POWER TECHNOLOGY PROGRAM



**HYDRO POWER**  
GT-5000

## Alternative Energy Generation

- History of fossil fuels
- Environmental concerns
- Electric grid
- Alternative energy sources

## Energy and Power

- Types of energy
- Potential and Kinetic energy
- Voltage and current
- Electrical loads
- Electrical power consumption
- Power math
- Making electrical connections

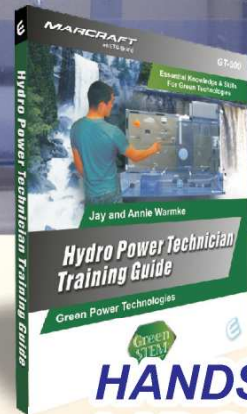
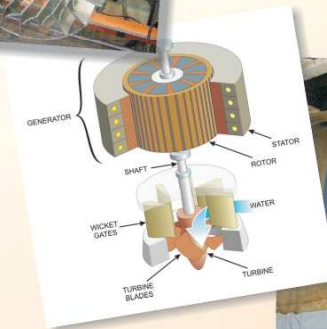
## Hydro Power

- History of hydro power
- Hydro power terms
- Measuring head and flow
- Microhydro power systems
- Turbines
- Maintenance
- Economics of microhydro power

## Building Codes and Compliance

- National Electrical Codes
- International building codes
- Underwriters Laboratories
- EPA
- OSHA
- National Fire Protection Association

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# SMART GRID

## SMART GRID TECHNOLOGY PROGRAM



### Energy and Power

- Types of energy
- Potential and kinetic energy
- Voltage and current
- Electrical loads
- Electrical power consumption
- Power math
- Making electrical connections

### Smart Grid Operations

- The power grid
- Power quality and outages
- Generation and storage options
- Distributed power equipment/cogeneration
- Energy distribution vs. bulk storage
- Demand response & power storage management

### Functions of a Smart Grid

- Smart grid communications
- Meter management systems
- Smart meters
- Residential, municipal and commercial grids
- Support for demand & automated adjustments
- Smart grid development
- Research and regulation
- Dealing with renewable energy

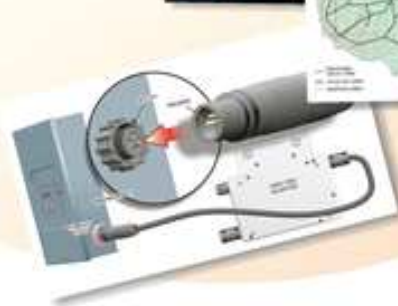
### Building Codes and Compliance

- National Electrical Codes
- Underwriters Laboratories
- EPA
- OSHA
- National Fire Protection Association

### Understanding Blueprints

- Schematic drawings
- Working drawings
- Symbols and scaling

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## SOLAR PV TECHNOLOGY PROGRAM

### Alternative Energy Generation

- History of fossil fuels
- Environmental concerns
- Price convergence

### Energy and Power

- Types of energy
- Potential and kinetic energy
- Voltage and current
- Electrical loads

### Passive Solar systems

- Angular and reflective light
- Passive solar heating
- Passive solar cooling and shading
- Convective and evaporative cooling

### Active Solar Systems

- Photovoltaics
- PV modules and ratings
- Inverters and metering
- Thermal heating and collection

### Design & Installation of Residential Scale Photovoltaic Systems

- Mounting PV modules
- Array orientation
- Battery systems and wiring
- PV charge controllers
- Grid-tie metering

### Troubleshooting PV Systems

- Locating and isolating bad panels
- Locating bad terminals, wiring and connectors

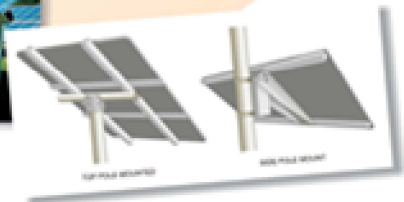
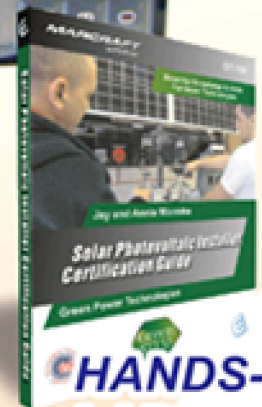
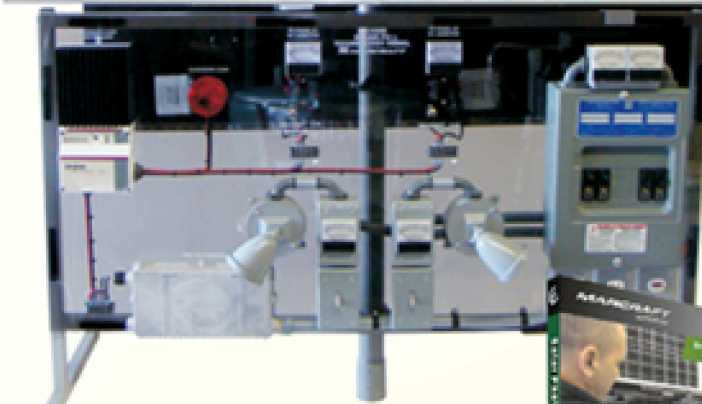
### Building Codes and Compliance

- National Electrical Codes
- Underwriters Laboratories
- OSHA
- National Fire Protection Association

### Understanding Blueprints

- Schematic drawings
- Working drawings
- Symbols and scaling

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## WIND TURBINE TECHNOLOGY PROGRAM

### Alternative Energy Generation

- History of fossil fuels
- Environmental concerns
- Price convergence

### Energy and Power

- Types of energy
- Potential and Kinetic energy
- Voltage and current
- Electrical loads

### Wind Power Technology

- Global and localized wind patterns
- Windmills and electricity
- Measuring and scaling wind speed
- Calculating wind energy
- Wind farms

### Wind Turbine Design

- Rotor blades and shaft design
- Pitch, flaps, yaw and furling
- Towers types and design
- Balance of design

### Design & Installation of Residential Scale Wind Turbine Systems

- Site suitability
- System sizing
- Load determination
- Installation and safety
- Grid-tie metering

### Troubleshooting Wind Turbine Systems

- Locating bad terminals, wiring and connectors
- DC storage control

### Building Codes and Compliance

- National Electrical Codes
- Underwriters Laboratories
- OSHA
- National Fire Protection Association

### Understanding Blueprints

- Schematic drawings
- Working drawings
- Symbols and scaling

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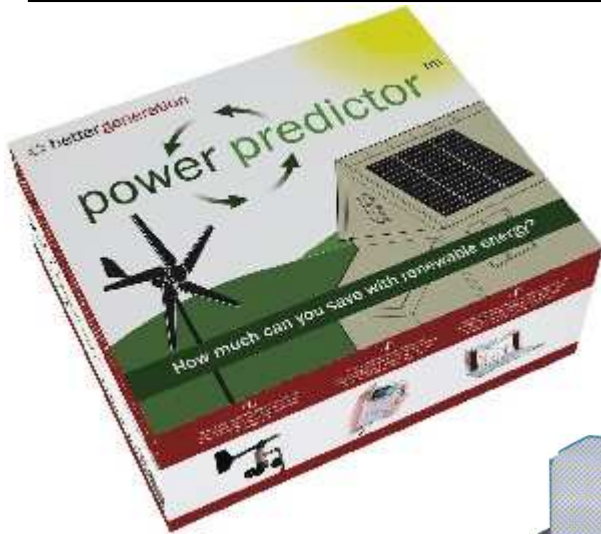
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# WHICH IS THE BEST RENEWABLE ENERGY FOR ME?



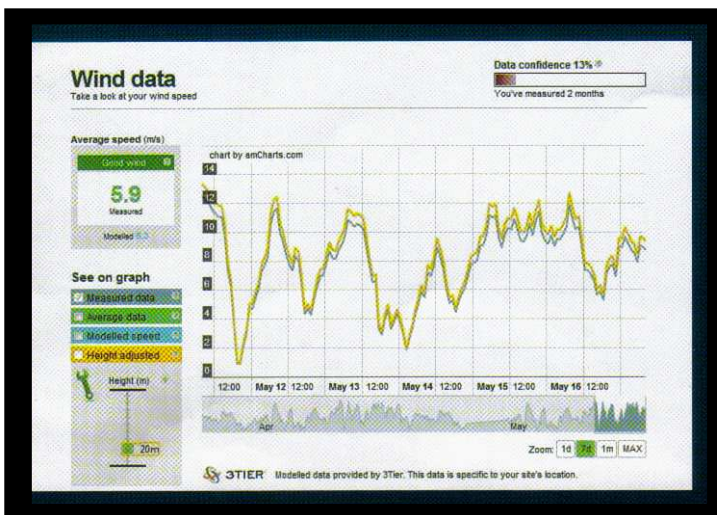
Hardware contains a three cup anemometer, a wind vane, polycrystalline PV solar panel and a weatherproof data logger



1. Once installed at your chosen location , you simply leave it for as long as possible

2. Remove the memory card from the data logger, insert it into your USB port and upload the data to the website

3. The intuitive web based software will make an informed decision for you



Price includes a two year licence

The Power report provides you with a list of recommended equipment based on investment cost, power requirement or CO<sub>2</sub> saving. It can also be used in a simulated environment.

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## ENVIRONMENTAL MONITORING

### ENVIRONMENTAL MONITORING TECHNOLOGY PROGRAM



#### Measuring the Environment

- Monitoring air quality
- Radon gas
- Carbon monoxide and combustible gases
- Carbon dioxide
- Volatile organic compounds
- Airborne lead
- Asbestos
- Monitoring water quality
- Radon in water
- Heavy metals
- Pesticides
- Environmental pH water assessments
- Sound and noise pollution
- Light and UV radiation
- Environmental pH soil sampling
- Lead pollution in soil

#### Building Codes and Compliance

- National Electrical Codes
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