**Macomb Community College Transportation and Energy Technology 126.09
09EE0001124**

Final Report for Period Ending 12/31/2010

The project objectives for this project were to create the laboratory facilities to deliver recently created and amended curriculum in the areas of energy creation, storage, and delivery in the transportation and stationary power sectors.

The project scope was to define the modules, courses and programs in the emerging energy sectors of the stationary power and transportation industries, and then to determine the best equipment to support instruction, and procure it and install it in the laboratories where courses will be taught.

Macomb Community College had a curriculum development grant through the Department of Education that ran parallel to this one where the energy curriculum at the school was revised to better permit students to gain comprehensive education in a targeted area of the renewable energy realm, as well as enhance the breadth of jobs addressed by curriculum in the transportation sector. The curriculum development and experiment and equipment definition ran in parallel, and resulted in what we believe to be a cogent and comprehensive curriculum supported with great hands-on experiments in modern labs.

The project has been completed, and this report will show how the equipment purchases under the Department of Energy Grant support the courses and programs developed and amended under the Department of Education Grant. Also completed is the tagging documentation and audit tracking process required by the DOE. All materials are tagged, and the documentation is complete as required.

Phase I

The energy technology areas of regional interest where the College has programs are:

- Renewable Energy - Wind, Solar Thermal, Solar PV, Geothermal and Biomass
- Electric Drive Transportation- Plug In, Hybrid, Fuel Cell and Battery Technology
- Smart Grid- Metering, Plug In stations, Energy Storage, and Line Design
- Conservation- Environmental monitoring, Weatherization, Sustainable Building Technology

These areas of interest are addressed in the following credit and non credit programs the College offers:

- Automotive Technology
- Automated Systems-Mechatronics
- Electronic Engineering Technology
- Electrical-Industrial Maintenance
- Information Technology
- Entrepreneurship and Small Business
- Construction Technology/ Building Construction
- Climate Control Technology
- Power line Design
- Power Station Operation

In the Renewable Energy Program, the curriculum was redeveloped to create a Renewable Energy Certificate of 15 to 18 credit hours aligned to the following pathways and suggested Associate Degree Programs:

Pathway 1: Wind Energy, 18 cr hr, Suggested AAS Program: Automated Systems/Mechatronics
Pathway 2: Solar Energy, 17 cr hr, Suggested AAS Program: Electrical-Industrial Maintenance
Pathway 3: Biomass Energy/alternative Fuels, 15 cr hr, Suggested AAS Program: Automotive Technology
Pathway 4: Geothermal Energy, 15 cr hr, Suggested AAS Program: Climate Control Technology
Pathway 5: Green Building/Sustainable Design, 16 cr hr, Suggested AAS Program: Construction Technology/ Building Construction
Pathway 6: Entrepreneurship & Small Business, 16 cr hr, Suggested AAS Program: Entrepreneurship & Small Business

In the Automotive Program, the College has had 2 Hybrid Vehicle Service Courses for several years. Another course, Auto 3440, is ready for launch in January 2011 targeting the motors, controls and batteries in Electric Vehicles and strong hybrids. These programs target the automotive service sector, but the 3 Hybrid/EV classes now open doors to other careers for this student population.

The College also has courses readying for pilot launch in January for development, tooling and manufacturing technicians that cover motors, controls, batteries, smart grid and line design. These classes are suggested for those in AAS programs Automated Systems/ Mechatronics and Electrical-Industrial Maintenance.

Phase II

The requirements for experiments for the courses mentioned above were developed early in 2010 and the equipment to support the experiments was determined. The College was fortunate that another grant was available to support the needs of the automotive program expansion, so as we prioritized needs the bulk of the funds were dedicated to the renewable energy space. Also, it should be noted that as we went through the process, synergies with other programs were identified and some of the equipment will have dual use between programs.

The equipment purchased through the grant is supporting several labs at the College. We now have an excellent experiential resource for the education of technicians seeking opportunities in emerging industries, as the State of Michigan seeks to broaden its industrial revenue base. The College view has long been that hands on work with real equipment is the best way to do educational programs for those destined to perform hands on work in the field.

The following chart summarizes the equipment purchased under the grant, the educational program the equipment primarily serves, the course number the equipment primarily supports, and the corresponding course name.

Department of Energy Equipment Grant: Equipment to Course Linkage	Date: Dec. 17, 2010		MCC Project : TE.CDPEQUIPMENT
Equipment Description	Program Name	Course Number	Course Name
Marcraft Solar PV Technology Trainers (6 ea)	Renewable Energy Certificate	RNEW 1200	Principles of Solar Energy
	Renewable Energy Certificate	RNEW 2000	Renewable Power Systems
	Renewable Energy	RNEW 2200	Photovoltaic Design and Installation
	Development/Continuing Education	N/A	Non Credit Solar Installation and Designing preparation for NABCEP certification
Marcraft Wind Turbine Technology Trainers (6 ea)	Renewable Energy	RNEW 1100	Principles of Wind Energy
	Renewable Energy Certificate	RNEW 2000	Renewable Power Systems
Marcraft Smart Grid Panels (6 ea)	Electrical Engineering Technology	ELEC 1125	Electric Line and Smart Grid Design
Marcraft Bio-Fuels Technology (6 ea)	Renewable Energy	RNEW 1300	Principles of Biomass Technology
Marcraft Green Electrons Combo Panel	Renewable Energy	RNEW 1100	Renewable Energy Concepts
	Renewable Energy	RNEW 1200	Principles of Solar Energy
	Renewable Energy	RNEW 1500	Principles of Hydrogen Fuel Cell Technologies
Siemens Programmable Controller Learning Systems and Panels (3 ea)	Automated Systems Technology	MECT 2110/2112	Mechatronics Programming
Solar/Wind/Energy Monitoring System Equipment: Wireless N Gigabit Security Router Home Energy Mgt. System and Inline Wired Noise Filter 2 each Sony KDL 46" Bravia EX 400 Series LCD HDTV Hallway Mount for LCD TV Monitor Classroom Tilt Mount for LCD TV Monitor 150 Ft. Cable 75 foot cable VGA Display Board Card 28 pc maste set and ladder Fluke 117 and KLE 11055	Renewable Energy	RNEW 1000	Introduction to Energy
	Renewable Energy	RNEW 1010	Renewable Energy Concepts
	Renewable Energy	RNEW 1800	Energy Management Fundamentals
	Applied Technology	ATBC2911	Green Building Design and Construction
Solar Powered Wind Data Logger System and Fluke Clamp meter, cables, modem, etc.	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 1200	Principles of Solar Energy
1.2 KW Wind Spire and installation	Renewable Energy	RENEW 1010	Renewable Energy Concepts
	Renewable Energy	RNEW 1020	Introduction to Sustainability
	Renewable Energy	RNEW 1100	Principles of Wind Energy
	Renewable Energy	RNEW 2000	Renewable Energy Power Systems

Hampden Geo Thermal Trainers (2 each)	Renewable Energy	RNEW 1400	Principles of Geothermal Energy
	Climate Control Technology	CLCT 2550	Steam and Hot Water Heating Systems
Solar Electric Vehicle	Automotive	Auto 1440	Hybrid Electric Vehicle Fundamentals
Wind Turbine Kits	Renewable Energy	RNEW 1100	Principles of Wind Energy
5V Solar Panel Kit	Renewable Energy	RNEW 1200	Principles of Solar Energy
Fuel Cell Car Kits	Renewable Energy	RNEW 1500	Principles of Hydrogen Fuel Cell Technologies
MAX RAZIR Infrared Camera	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Air Blower / Cloth door Fan	Renewable Energy	RNEW 1800	Energy Management Fundamentals
U-12 Data Logger	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Light Meter	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Solar Path Finder, software, diagrams (4 units) and 4 Digital Cameras	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
4 systems - fixed, portable, grid tie and off grid: MI Safety Products - list of materials, Ultimate Attic Fan w/ 25 watt solar panel and gable fan w/12.6 watt solar panel and Trojan deep cycle battery installation items, Test equipment and more Light Meter Struts, caps, washers, screws, etc. Outback Flex Power one Roof Mount Assembly Roof Mount Kit, Air X Land, Helio Pac PRO , Mechanics Tool Set, power cords, Drawer Tool Chests, various building/construction items	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 2200	Photovoltaic Design and Installation
	Development/Continuing Education	N/A	Non Credit Solar Installation and Designing preparation for NABCEP certification
	Workforce Development/Continuing Education	N/A	Weatherization / Green Construction Program
Automotive Trailer for Hybrid/EDV vehicles	Automotive	Auto 3440	Electric Vehicle Motors, Batteries, Controls
Automotive Equipment: Snap On Tools; Carquest auto Parts - Matertech VCI Trio Pkg , preloaded with GM scan test software; Modis Elite Industrial Scanner, Lab scope, adaptor, transducer Kit, cables	Automotive	Auto 1440	Hybrid Electric Vehicle Fundamentals
	Automotive	Auto 2440	Hybrid Electric Vehicle Power Mgt.
	Automotive	Auto 3440	Electric Vehicle Motors, Batteries, Controls
AMST Furnace, Vent termination kit, Gas conversion Kit, Filer, Trunk Duct, Condensate Pump, test equipment, light meters, roof mount, kelo pack solar water heater	Workforce Development/Continuing Education	N/A	Weatherization / Green Construction Program

Unistrut and parts for RENEW equipment cart creation and assembly	Renewable Energy	RNEW 1100	Principles of Wind Energy
	Renewable Energy	RNEW 1200	Principles of Solar Energy
	Renewable Energy	RNEW 1300	Principles of Biomass Technology
	Renewable Energy	RNEW 1500	Principles of Hydrogen Fuel Cell Technologies
	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 2200	Photovoltaic Design and Installation
	Electrical Engineering Technology	ELEC 1125	Electric Line and Smart Grid Design
	Applied Technology	ATBC2911	Green Building Design and Construction
	Automated Systems Technology	MECT 2110/2112	Mechatronics Programming
	Climate Control Technology	CLCT 2550	Steam and Hot Water Heating Systems
Wind Data Logger Wall mount and Strap kit	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
Digital Multi Meters	Electrical Engineering Technology	ELEC 1161	Electronic Technology
2 - Hydrogen Fuel Cells	Renewable Energy	RNEW1100	Hydrogen Fuel Cells
Infrared Camera	Renewable Energy	RNEW 1800	Energy Management Fundamentals
General Tools Mini Combo Anemometer/Temp/Light/Humid.	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Extech Pocket Digital Light Meter	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Testo CO2 Stick and Detector	Renewable Energy	RNEW 1800	Energy Management Fundamentals
Micro Camera	Renewable Energy	RNEW 1800	Energy Management Fundamentals
TSI IAG Calc Co2 Meter	Renewable Energy	RNEW 1800	Energy Management Fundamentals
200 W spi 156 200w	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
1500 watt 24 vdc pure sine wave power inverter	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
Personal Protection Equipment : 40Cal Arc Flash Protection Kit, Bucket of Safe Ties, Anchors, Safety Harness, Insulated Tool Kits	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
	Renewable Energy	RNEW 2000	Renewable Energy Power Systems
Fuel Cell car kits, wind turbine kit, solar electricity kit Turbine Classroom kit, 5V Solar Panel, Solar Thermal kit, Solar electricity education	Renewable Energy	N/A	K-12 academies and teacher workshops
	Renewable Energy	RNEW 1000	Introduction to Energy
	Automotive	Auto 1440	Hybrid Electric Vehicle Fundamentals
	Natural Science	NATS 130	Environmental Science
240V-32A/12V-12A Bollard Chargepoint Networked charging station w/ hanging cord and mounting kit.	Automotive	Auto 1440	Hybrid Electric Vehicle Fundamentals
Smart Board whiteboard and projector system with Mobile Floor stand and shipping	Renewable Energy	RENEW 1020	Introduction to Sustainability

The equipment noted has been tagged as required by the DOE procedures, using DOE directed notation, and has been photographed with its location identified for audit readiness purposes.

The College is pleased to have had this opportunity to improve our laboratories in conjunction with a curricular reform activity, and we are confident that the student experience and preparation for interesting and valuable careers has been enhanced by this endeavor.

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