

X.3 Hydrogen/Alternative Energy Center*

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Start Date: November 2005

Projected End Date: June 30, 2006

**Congressionally directed project*

Objectives

- Increase the number of technicians available to service and maintain equipment using hydrogen technologies
- Provide an open and accessible site to view and work with hydrogen fuel cells and alternative energy equipment in a laboratory setting
- Build links with business, industry and educational institutions
- Become a resource center for educators, innovators and policy makers

Technical Barriers

This project addresses the following technical barriers from the Education section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- A. Lack of Awareness
- B. Lack of Demonstrations or Examples of Real World Use
- C. Institutional Barriers and Access to Audiences.
- D. Regional Differences

Approach

- Hydrogen and Alternative Energy curriculum development across the Technical Careers curriculum using the Developing a Curriculum (DACUM) process
- Faculty development and teacher preparation programs
- Community education and outreach
- Equipping a hydrogen fuel cell/alternative energy education technology (AEET) lab/facility

Accomplishments

- T.1 -- Alternative Energy Technician Program
 - AEET degree well into development; first courses offered Spring 2005
- T.1--Hydrogen Modules Integrated Across Tech Curriculum
 - Integration of hydrogen and alternative energy elements in academic programs in all three Technical Careers departments underway/on track
- T.2 -- Lansing Community College (LCC) Tech Careers Faculty Professional Development; Four Programs
 - Faculty currently attending conferences, workshops; August development program planned
- T.2 -- Faculty-to-Faculty Training.
 - Statewide focus
 - Exploring use of interactive television to complete; conference planned for Spring 2006
- T.3 -- Increased Awareness of Hydrogen Education Programs Through Conference Presentations
 - Numerous meetings/presentations/media plan in place
- T.3 -- Increased Awareness Through Comprehensive Public Relations Outreach Program
 - Available print collateral/website
- T.4 -- Hydrogen Safety Plan/Safety Readiness Review with DOE Participation
 - Activity scheduled for June –August 2005
- T.4 -- Creation/Operation of Instructional Laboratory
 - Equipment identified and in process for August 2005 installation
- T.5 -- Quarterly Technical Progress Reports

Future Directions

- Complete installation of hydrogen/alternative energy instructional laboratories
- Completion of dynamometer room for automotive program's internal combustion engine
- Collaboration with Michigan community colleges and four year institutions to create a unified hydrogen/alternative energy educational strategy for Michigan
 - Sponsorship of alternative energy day at state capital to raise awareness among key decision makers
- Completion on curriculum development for alternative energy segments across technical careers curriculum
- Publication of print collateral and dissemination of information on web site
- Strategic engagement of community colleges across the country; ongoing awareness raising activities
- Faculty development
- Final curriculum development
- Hydrogen internal combustion engine developed; laboratory; kiosk, and vehicles integrated into classroom instruction
- Expanded outreach and awareness activities

Introduction

Lansing Community College’s (LCC) alternative energy initiative aims to support DOE’s educational efforts to raise awareness about the effectiveness and importance of embracing hydrogen as a viable energy source. LCC’s program focuses on creating an associate degree program to train a workforce as alternative energy engineering technicians capable of entering the workforce or transferring to a four year program. A complementing strategy is to expose all students in a technical career program to hydrogen and alternative energy concepts.

Completing the educational strategy of the DOE supported program are efforts to construct and equip operating instructional laboratories so that students and the public can better understand how a fuel cell operates and a public outreach campaign to raise general awareness about hydrogen and alternative fuels.

Approach

LCC has adopted a comprehensive, college-wide approach that integrates hydrogen fuel cell and alternative energy concepts into many technical career programs as well as enhancing the instructional facilities so that students and the public can have easy access to viewing, using and understanding the mechanics of alternative fuel technology.

Staff from the advancement, academic affairs, and facilities divisions collaborate to implement the project.

Results

Curriculum Development/Instructional Support

- Creation of Alternative Energy Engineering Technician Associate Degree Program
 - AEET Curriculum course listing is provided in Table 1.
 - 2+2 Transfer Program with Partner Colleges & Universities
 - Lawrence Institute of Technology
 - Wayne State University
 - University of Michigan, Ann Arbor

- Kettering University, formerly GM Institute
- Integration of alternative energy concepts into the following programs:
 - Architecture
 - Residential Building
 - Civil Technology
 - Alternative Energy

Table 1. AEET Curriculum

| AEET Requirements | | Total Credits: 67* |
|---|-----------------------------------|--------------------|
| Code | Title | Credit Hours |
| AEET 102 | Prin of Alt/Renewable Energies | 3 |
| AEET 110 | Conventional Energy Sources/Use | 3 |
| AEET 115 | Geothermal Technology | 3 |
| AEET 116 | Solar Energy Technology | 3 |
| AEET 117 | Biomass, Biogas and Microtur Tech | 3 |
| AEET 118 | Fuel Cell & Hydrogen Tech | 3 |
| AEET 119 | Wind Energies | 3 |
| AEET 200 | Energy Site Evaluation | 3 |
| AEET 220 | Energy Efficiency & Management | 3 |
| AEET 250 | Alt Energy Inventory & Analysis | 3 |
| AEET 251 | Planning & Design | 3 |
| AEET 252 | Alt Energy Implement/ Maintenance | 3 |
| AEET 260 | Codes, Regulations & Standards | 3 |
| *Other prerequisite courses are required to complete the curriculum | | 28 |

- Alternative Energy Laboratory equipment identified and ordered for August installation
- Advanced Vehicle/Automotive Technology Program Results
 - Faculty Training/Workshops
 - Hydrogen Safety Plan for LCC underway
 - Hydrogen Refueling Station concept explored
 - Hydrogen Powered Engine in development
 - Hydrogen Engine Lab explored

- Hydrogen Modules for Automotive Courses in development
- Fuel Cell Golf Cart in progress
- Hybrid Vehicle purchased/integrated into curriculum
- Demonstration Truck/Trailer purchased

Faculty Development

- Professional Development faculty training and workshops identified and faculty attending
- Sponsored alternative energy programs at LCC

Outreach/Public Awareness

- Key Contacts
 - General Motors Knowledge Center
 - Numerous educational institutions
 - State of Michigan
 - American Association of Community Colleges
 - Association of Community College Trustees
 - Michigan NextEnergy
 - Michigan Community Colleges
 - Central Michigan Sustainability Council
 - Montana Tech
 - Michigan Economic Development Corporation
 - Michigan Department of Environmental Quality
 - State of Michigan EDGE 2 initiative
 - Public relations plan completed
- Web site developed
- Print materials developed for dissemination in FY 2006

- State Capital Alternative Energy Day planned for September 21, 2005
- Grand Opening of greenhouse
- Ongoing media placements and advertising

Conclusions

- The public is interested in learning more about the feasibility of alternative fuels, but general knowledge and understanding is very limited.
- Students have difficulty in envisioning alternative energy careers and thus demonstrate some reluctance on enrolling and committing to an alternative energy associate's degree.
- There is a lot of activity and interest regarding fuel cells and alternative energy among community colleges in Michigan, but our collective focus remains scattered. Recent efforts by LCC and the state are making progress in creating a stateside vision.
- There is a steep learning curve among faculty and staff in understanding what is needed to construct and equip an alternative energy laboratory and integrate fuel cells into the automotive program.

FY 2005 Publications/Presentations

1. American Community College Trustees
2. MI Department of Economic Growth
3. MI Department of Career Development Governor's Conference
4. Edge 2 Project (MI Governor's Office)
5. MI Department of Environmental Quality
6. DOE Hydrogen Review Conference