Indiana Advanced Electric Vehicle Training and Education Consortium (I-AEVtec)

Project ID: ARRAVT032

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Indiana Advanced Electric Vehicle Training and Education Consortium (I-AEVtecc)

US Dept of Energy - $6.2M plus $ 1.9M Cost Share

Partnership: Purdue (Engineering and Technology)
   Ivy Tech   IUPUI
   Notre Dame IU - Northwest

A consortium of the leading technical universities and colleges in Indiana will establish a program to educate and train the workforce needed to design, manufacture and maintain advanced electric vehicles and the associated infrastructure. The Indiana Advanced Electric Vehicle Training and Education Consortium (I-AEVtecc) will develop and offer Certificates as well as Associate degrees for training vehicle technicians, BS and MS degree programs for design and manufacturing engineers in the electric vehicle industry and a Certificate program in electric vehicle safety for emergency responders.
Major Project Activities

1. Development of degree/certificate programs in electric vehicle technology at the I-AEVtec partner institutions.

2. Produce a series of web-enabled courses that address batteries, fuel cells, electric motors and controls, hybrid engines, grid technology and consumer issues concerning this technology.

3. Deliver these programs to students in Indiana and the Midwest.

4. Establish the ElectricVehicle-Hub – as the website for EV, PHEV and FCV technology, including educational material, simulations, video demonstrations and information for the general public.

5. Develop an active partnership with industry and government stakeholders in advanced electric vehicles in order to ensure that the educational products meet the demands of employers.

6. Develop a series of educational modules for secondary schools that satisfy Indiana’s curricula requirements so that they can be used in the classroom.

7. Begin development of an Electric Grand Prix go-kart race to excite the imagination of young people to commit to a career in electric vehicle technology.
Degree/Certificate programs in electric vehicle technology at the I-AEVtec partner institutions

• Purdue
  o Engineering – Certificate as part of BS or MS
  o Technology – Certificate as part of BS or MS

• Notre Dame
  o Engineering – Certificate as part of BS or MS

• IUPUI
  o Engineering – Certificate as part of BS or MS

• Ivy Tech
  o Associate Degree in electric vehicle technology
  o First Responder certificate

• Purdue – Calumet
  o Modules for undergrad p-chemistry lecture/lab

• Indiana Univ. – Northwest
  o Modules for undergrad p-chemistry lecture/lab
Current Status of I–AEVtec Partnership

- **Purdue**
  - Spring semester – 4 courses with approx. 60 students
  - 13 course sequence designed & courses are being developed
  - Designing Battery and EV Labs
  - Established sub-contracts with partner institutions

- **Ivy Tech**
  - Sub-contract in place
  - Teaching 2 courses with approx. 30 students
  - Working on establishing new Associate Program in EV Technology

- **Notre Dame**
  - Sub-contract in place
  - Course planned for Fall ’10 semester

- **IUPUI**
  - Sub-contract nearly in place

- **Purdue – Calumet**
  - Sub-contract in place

- **Indiana Univ. – Northwest**
  - Sub-contract in place
I-AEVtec Course Development

Web-enabled courses in batteries, fuel cells, electric motors, hybrid engines, grid technology and consumer issues

- Solar
- Gas/Oil/Coal
- Wind
- Bio Energy
- SmartGrid
- EV/PHEV
- Power Electronics
- Electrochemical

- Power Electronics
The faculty from these institutions, with consultation with industrial partners, will design degree and certificate programs in EV, PHEV and FCV technology which build upon their existing educational programs and areas of expertise.

Yearly Enrollment in I-AEVtec (est.)

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree or Certificate</th>
<th>Individual Classes</th>
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</thead>
<tbody>
<tr>
<td>Purdue/Eng. - BS</td>
<td>100</td>
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<tr>
<td>Purdue/Technol.– BS</td>
<td>40</td>
<td>400</td>
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<tr>
<td>Purdue - MS</td>
<td>30</td>
<td>100</td>
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<tr>
<td>Ivy Tech</td>
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<td>60</td>
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<td>IUPUI</td>
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<td>300</td>
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<tr>
<td>Notre Dame</td>
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<td>25</td>
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<td>Purdue - Calumet</td>
<td>NA</td>
<td>15</td>
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<tr>
<td>IU-Northwest</td>
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Electric Vehicle Hub

Establish an informational outlet – the Electric Vehicle Hub – as the website for EV, PHEV, and FCV technology, including educational material, simulations, video demonstrations and information for the general public

Core technology: HUBzero™
Unique science gateway technology developed at Purdue NSF sponsorship ($13.5M over 7+ years)
NanoHub- the international web portal for nanotechnology
90,000 users/visitors per year
SmartEnergyHub.org

• ElectricVehicle-Hub; Battery-Hub; SmartGrid-Hub; Windmill-Hub
• Delivery of I-AEVtec educational material
  coursework – lecture notes, syllabus, homework, exams
  streaming videos of experiments
  demonstrations
  lectures
  computer simulations
• Information for general public
• Secure website for research discussions, wikis and blogs
• Advanced searching capabilities
  example: search for “fuel cells” - find scholarly articles + education materials + consumer information + relevant simulations + discussion sites
Industry Partnerships

• Develop an active partnership with industry and government in advanced electric vehicles to ensure that the educational products meet the needs and demands of employers.

• These activities include workforce development, summer interns, research focus and assist with the economic engine for the state of Indiana and surrounding states.

• Larger deployment opportunities in support of specific workforce needs
  MS program with Delphi
  MS program with Crane
  (several certificates that can be assembled into a MS degree)
K-12 Engagement

• Develop educational modules for secondary schools that illustrate electric vehicle technology, that meet Indiana’s curricula requirements that can be used in the classroom.

• Modules on batteries, fuel cells, motors, controls, electric vehicles and environmental impact for general science, chemistry, physics, industrial technology and consumer science.

• These will include materials for secondary school teachers, who may not be familiar with the technology, as well as for students.

• Partner with high school teachers - summer support for secondary school teachers to work at Purdue.

• Purdue University Spring Fest engages with more than 25,000 students, families and local media

Emerging partnership with 4H: 12 module electric vehicle program
150,000 3rd through 12th grade students in Indiana
6 million 3rd-12th grade in the US
Spring Fest 2010

Great day for college students, industry, parents & kids
Unique go-kart track at Purdue
Event scoring
  fastest time
  energy efficiency
  technical design
  community outreach
Timeline
  Year 1  I-AEVtec partners + other Indiana colleges
  Year 2  Regional universities and colleges
  Year 3  National event
Vision
  Corporate sponsorships
  Offer substantial scholarships
  Associated K-12 event
  Technology Celebration Week

Inaugural evGrandPrix

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<tr>
<th>Attendance</th>
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<tr>
<td>1st Annual Race</td>
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• 100 laps (approx. 2 hours)
• 15 Teams – 90 students with common focus
• Addition 100 students and staff in support roles

Vision
Year 1 – Indiana
Year 2 – Regional
Year 3 – National
Courses in Spring 2010 semester

College of Engineering
   EPICS 1 (15 Students) Design, plan and implement the core infrastructure for the EVGrand Prix event
   EPICS 2 (11 Students) Design, plan and implement the outreach component for the EVGrand Prix

College of Technology
   Electric Vehicle Systems (24 Students) Basic instruction on electromechanical systems and then building 4 karts to be used in the evGrand Prix – scalable to other institutions
CNIT 581 – Electro-mechanical Systems (goKart build class)

**go-kart Laboratory**

- Stations for 4 teams
- Full electrical diagnostics
- 4 go-kart components
- Future – small dynamometer

Recent email from a current Purdue student

“Also, you might be intrigued to know that I just received a job offer at Tesla Motors out in Los Angeles working on chassis design and power train of their upcoming Model-S EV. During my interviews I had a lot to say about the things we have been learning in this class and they were pretty impressed with what we are doing.”
a competition to design, build, and race the fastest and most energy-efficient battery electric powered go kart.
## Project Timeline

<table>
<thead>
<tr>
<th>Task 1.0: Project Management and Planning</th>
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<th>2nd</th>
<th>3rd</th>
<th>4th</th>
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<tr>
<th>Task 2.0: Develop Certificate and Degree Programs in EV, PHEV and FCV</th>
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<tr>
<td>Task 3.0: Develop High-Value Course Materials in EV, PHEV and FCV</td>
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<tr>
<td>Task 4.0: Deliver Degree and Certificate Programs to Traditional and Non-Traditional Students</td>
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<td>Task 5.0: Establish the Electric Vehicle Hub (EV Hub)</td>
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<td>Task 6.0: Partnership with Regional EV, PHEV and FCV Industries and Governmental</td>
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<td>Task 7.0: Secondary School Program in EVs, PHEVs and FCVs and Consumer Outreach</td>
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<td>Task 8.0: Electric Grand Prix</td>
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Limited View (full Gantt chart is 5 pages)
Summary

- Education and Training Program that involves the major technical universities in Indiana
- Good initial progress in establishing program
- Excellent response from
  - Students
  - Industry partners
- Community outreach
  - Specially designed coursework programs
  - ElectricVehicleHub
  - evGrandPrix

Thank you. Questions ??