

Advanced Electric Drive Vehicle Education Program: CSU Ventures

Gary W. Caille Ph.D., P.E.
CSU Ventures
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Timeline

- Project start date: Dec 2009
- Project end date: Dec 2012
- Percent complete:
 - 16% in June
 - 11% in April

Budget

- Total project funding
 - DOE share: \$4,999,834
 - Contractor share: \$1,497,599
 - Fully funded in Dec 2009

Barriers

- Acceptance of new training methods and approaches
- Parochial processes at educational institutions

Partners

- Interactions/collaborations:
 - OEMs, US Army, USMC, Colorado Governor's Energy Office, Raytheon, Veterans for Green Jobs
- Project team:
 - Colorado State University (CSU), Georgia Tech (GT), Ricardo, MRI, KShare, Arapahoe Community College, Douglas County Schools



Automotive Industry Status:

- Projected 40% to 50% shortage of qualified vehicle technicians over the next 5 to 10 years¹.
- Estimated shortage of 60,000 qualified technicians² currently.
- This situation is further complicated by:
 - the introduction of new propulsion technologies such as hybrid-electric vehicles (HEV), all electric vehicles (EV), and their associated support systems.

1. <http://www.citytowninfo.com/education-articles/career-exploration/mechanic-shortages-looming>

2. <http://www.doityourself.com/stry/technicianshortage>



Support of the President's Jobs Initiative :

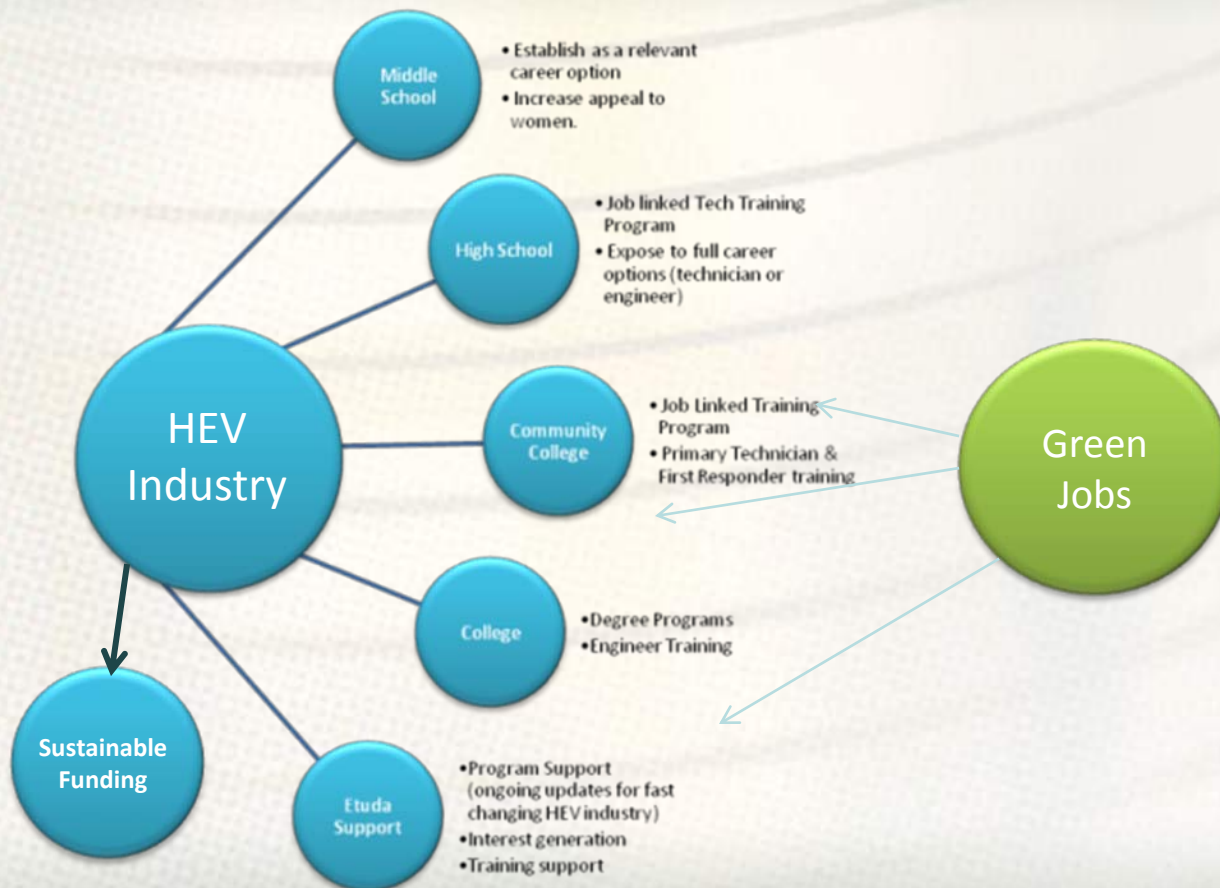
- Automotive technician jobs already exist...do not need to be created, only filled.
- Automotive technicians can not be out-sourced.
- Number of vehicles on road continues to increase (approximately 150M vehicles -7% -10% new technology vehicles entering market per year).
- Jobs not minimum wage and easily expand to \$70,000 to \$80,000 per year with experience.
- Increased opportunities for women in traditionally all-male work force/ environment.
- Approximately 25% of our returning veterans are unemployed (the National Guard is higher).
- With changes in technology, opportunities exist for disabled workers and Wounded Warriors.

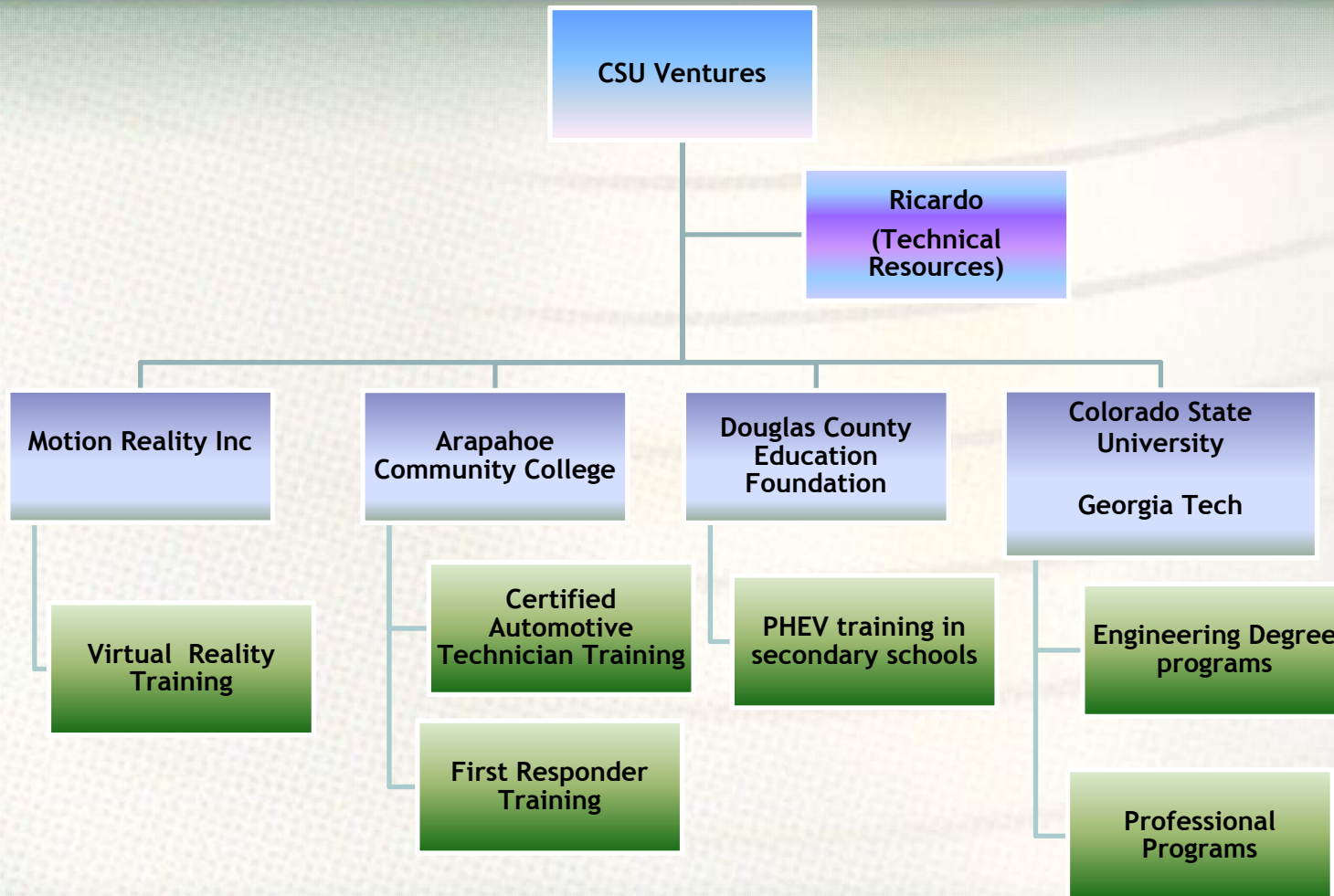


Objective: A virtual continuous cycle to engage and train students, create jobs, help the HEV segment speed time to market and increase consumer confidence.

Impacts

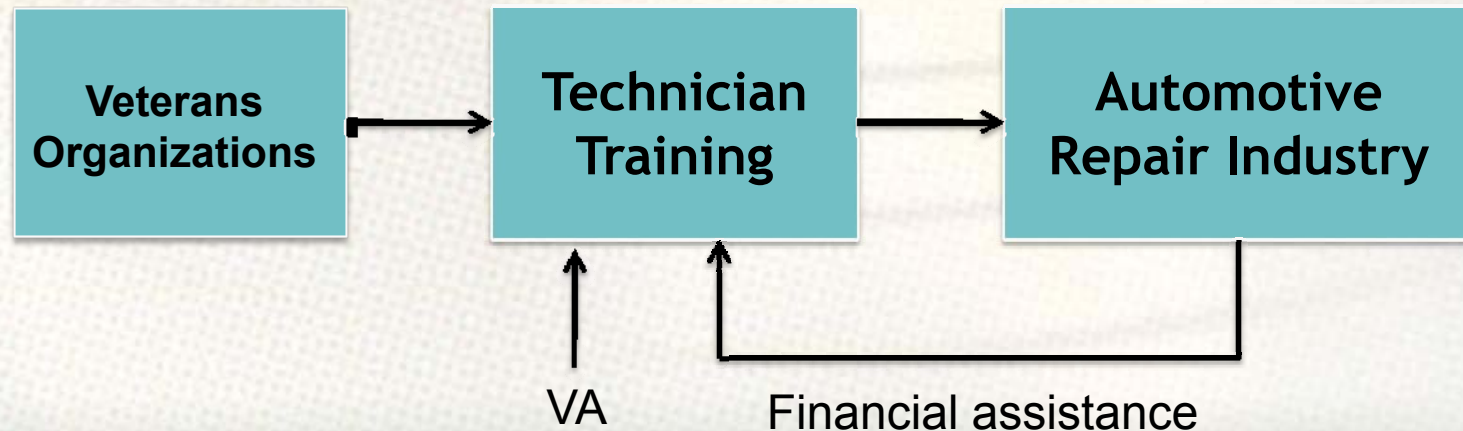
1. Increased student enrollment
2. Increased training effectiveness in HEV segment
3. Fill projected job shortages
4. Catalyst to quality job creation
5. Speed HEV segment time to market
6. Help industry gain needed infrastructure
7. Wider adoption as industry best practice







- Create a multi-linked approach that combines PHEV education from secondary through postgraduate/professional courses.
- Train first responders on the characteristics and hazards of PHEVs.
- Explore new ways to train technicians using virtual reality.
- Develop an outreach program that reaches the students and community.
- Create a job-filling path that solves multiple problems:





- **Business/Reporting:**
 - Contracts are in place for all subcontractors
 - Submitted required ARRA and DOE reports
- **Attended DOE kick-off meeting in February**
- **Nothing to report concerning pervious year's work (new start)**
- **Progress at research universities (CSU & GT):**
 - Graduate students and post-doctorate students are being hired
 - Undergraduate/graduate course development has started
 - Professional course in Hybrid Electric Vehicles/Electric Vehicles is being developed.

Momentum is building for summer...expect significant progress in summer term



- **First responder course modifications 75% complete at Arapahoe Community College (ACC)**
- **Modification of automotive technician training courses are in progress**
 - Looking to expand from 42 students to 120 students
- **Multiple hybrid vehicles have been procured and received**
 - Supporting test equipment is being procured
- **Motion Reality and ACC have initiated collaboration on virtual reality training options for technicians**
 - Discussions with Raytheon have started regarding incorporation into a larger training vision.

We have the tools...time to start using



- **Initiated design study to develop a management engine to take inquiries to appropriate web locations**
 - Study includes possible direction to other Grant awardees sites, professional societies, and possibly OEM sites.
 - Initiated discussion with Colorado Governors Energy Office to synergize with State's outreach effort on energy conservation and renewable energy.
 - Planning with CSU Extension Program on how to develop state-wide outreach:
 - County offices puts Extension resources in Colorado's 64 counties.
 - Outreach to secondary schools, community colleges and local industry.



• Partners

- CSU and Georgia Tech: Research universities developing courses (undergraduate and graduate) that will be co-taught at both institutions.
- CSU's School of Occupational Therapy: Investigation methods of changing automotive technician maintenance approach to allow for more disabled to participate.
- Arapahoe Community College (ACC): One of the top Auto Training programs in the nation. Training Center for GM, Chrysler, Honda, Nissan, Ford certified auto technicians.
- Douglas County Schools: Feeder school for ACC and developing Auto Tech program in their high schools
- Motion Reality Inc.: World leader in the development of motion capture technology and virtual reality.
- Ricardo Inc.: World leader/Subject Matter Expert in vehicle engineering and associated systems.

• Collaborators

- Veterans for Green Jobs: Funnel process to focus returning veterans into this industry
- Colorado Governor's Energy Office: Extend Governor's message on energy conservation and renewables to include HEVs and education/community awareness.



- **Collaborations**

- Raytheon: Provides Mr. Goodwrench training and other automotive training throughout the industry.
- US Army and USMC: Exploring ways to vector returning veterans into vehicle technology programs and maintaining the technical competencies required by the respective reserve forces.
- Visiting OEMs and large dealerships to get program content input.

- **Technology or Process Transfer**

- Seeking to reproduce technician training funnel process with other community colleges and industry participants.



- **Remainder of FY 10:**

- Continue developing college courses and offer at least 2 new courses in the Fall 2010 semester cooperatively at CSU and GT. Begin faculty approval process so course may become approved as part of the permanent curriculums.
 - Complete two simulation models, to be used in a graduate-level model-based HEV/EV design course, for predicting the performance of a Prius-based parallel-series hybrid.
 - Basic ‘backwards-looking’ simulation written in Matlab where the vehicle follows a standard drive cycle.
 - Create dynamic SimScape model with detailed models of the ICE, EM, transmission, drivetrain, battery, etc. for courses.
 - Courses to be developed:
 - EV/HEV Computational Systems Design Course
 - Introductory HEV Powertrains Course
- Work with other grant awardees to leverage courses they are working on and developing cooperative arrangement to teach courses at different universities.



- **Remainder of FY 10:**

- Develop a course at the BS ME level focused on maintenance practices ,design considerations, and logistics for PHEVs.
- Continue working with collaborators to develop a more national reaching program for job placement of automotive technicians.
- For virtual reality simulations, create graphical models and motion capture of technicians performing maintenance tasks.
- Complete First Responder course modifications.
 - Initiate working group within grant awardees to ensure completeness and consistency in training programs
 - Training will be offered in the 5 Denver metro area counties this summer.
- Continue to develop CSU Extension program



- **FY 11:**

- Complete approval for graduate certificate in Electric Transportation (CSU).
- Develop laboratory facilities to support university-level education program and courses developed under this grant (equipment privately funded).
- Develop training animations of technicians properly repairing virtual vehicles for playback on a dedicated computer with a Head Mounted Display.
- Continue course development.
 - Vehicle Energy Storage System Design Course
 - Transportation Electrification Course
- Continue outreach and development of management engine for web information and applications.
- Continue interaction and cooperation with other grant awardees so as to leverage effort and breath of courses.
- First responder training will be offered throughout Colorado and portions of Nebraska and Wyoming.
- Developing a complementary automotive technician program for Douglas County High Schools (Ponderosa High School).



Month/Year	Milestone or Go/No-Go Decision
July 2010	Design review of outreach management engine. Complete simulations for graduate courses.
August 2010	Technical review of courses to be taught in fall semester.
March 2011	Demonstration of first level virtual reality training.
June 2011	Complete PHEV professional short course development.
July 2011	Beta testing of outreach management engine.
September 2011	First short course offering. Go/No-Go decision...is enrollment sufficient to pay for course offering?



The CSUV Team is:

- On target on all programmatic and technical fronts.
- Providing programmatic, technical and entrepreneurial innovation.
- Bringing community – education – industry together to solve multiple problems.
 - Jobs for veterans
 - Qualified personnel to fill the shortage of automotive technicians
 - How do we make this a national program?
 - Rethinking maintenance methodology for the partially disable and Wounded Warriors
- Providing industry input and best practices from the OEM level back to the educational institutions.

“It is amazing what you can accomplish if you do not care who gets the credit.”

Harry Truman