Clean Energy and Education Workforce Conference

Saratoga, New York

- Dr. Pam Carpenter-NC Solar Center
- Dr. William DeLuca-College of Education
  North Carolina State University
Progress Energy

[Logos and emblems of various institutions]
Why teach about Electric Vehicles?

- Paradigm shift
- Affordability
- Less Energy
- Zero emissions
- Cleaner environment
- Students relate to transportation
Mission of STEP

• Creating an educational pathway for students in electrification of transportation
• STEM education
• Engaging and immersing students through a minds-on, hands-on program
STEP preparing for the future

- Innovation
- Creativity
- Technologically literate society and skilled workforce
STEP Pathway

Middle School

High School

University

Community College

Elementary
North Carolina’s role in Electric Transportation
Plug-In Road Map | A sampling of efforts around the nation to get ready for electric cars

In August, the U.S. Department of Energy awarded Electric Transportation Engineering Corp., a charging-station maker, $100 million to deploy more than 11,000 charging stations and 4,700 Nissan Leaf vehicles in five states. Nissan is a partner in the venture.

Cities that are part of the project (indicated by blue symbols): Seattle; Portland, Corvallis and Eugene, Ore.; San Diego; Phoenix; and Tucson, Ariz.; and Nashville, Knoxville and Chattanooga, Tenn.

West Sacramento, Calif., opened its first electric-vehicle charging station in August, the first of a program by retailer DMC Green Inc. to retrofit gas stations in California.

San Francisco, San Jose and Oakland: The California cities are partnering with Better Place, an electric-car company that plans to launch its vehicle in 2012. The plan includes expediting permits and installation of outlets, creating employer incentives for cars to charge in the workplace, and placing 220-volt charging equipment throughout the city. In February 2009, the mayor unveiled three charging stations in front of San Francisco City Hall.

Detroit: Coulomb Technologies, a charging-station maker, said in January that it has installed six charging stations in Detroit and Ann Arbor, for a study funded by the Michigan Public Service Commission.

Elk Horn, Iowa, installed four public charging stations in November.

Massachusetts: Nissan and the state government are jointly developing plans for home, workplace and public charging.

Raleigh, N.C.: The municipality has partnered with Nissan and local utility Progress Energy to create local charging infrastructure for electric vehicles.

Las Vegas: The Rampart Casino unveiled one charging station in June 2009.

The city of Houston and Reliant Energy have partnered with Nissan to make Houston an early launch market for the Nissan Leaf. The partnership has already installed 10 charging stations—seven of them public—and envisions installing more.

Orlando, Fla.: Nissan, the city of Orlando and the Orlando Utilities Commission have agreed to promote an electric-vehicle network for both area homes and public places.

The Electric Power Research Institute (EPRI) Plug-In 2011 held in Raleigh, NC July 18-21.

International conference of expert insights on technical advances, market research and policy initiatives shaping the future of plug-in hybrid and electric transportation.
STEP Program

• Advisory Board
• Standards based curriculum
• Teachers involved in the program
• Equipment provided by program
STEM-based curriculum working with industry experts

- Advisory board comprised of experts from education, engineering, utilities, and automotive with quarterly meetings.
- Share information regarding latest technologies, trends, and policies.
- Review curriculum for appropriate content
- Review competition and rules
Standards-based curriculum

- Battery technologies
- Virtual and physical modeling
- Data collection, analysis, and interpretation
- Charging stations
- Different types technologies e.g., PEVs, REVs, PHEVs

- Smart Grid
- Green careers
- Design
- Soft skills
- Team work
- Annual Competition
Teachers’ Workshop

- STEP Workshop 2011.wmv
Virtual Modeling-
Whiteboxlearning.com
Virtual Modeling-
Whiteboxlearning.com
Teachers involved in the program

- Technology Education
- Science
- Mathematics
STEP

- Provide kits-cars, solar panels, batteries
- Curriculum
- Support
NCSU Wolfpack Energy Efficient Locomotion (WEEL) and EcoCAR Challenge

• Hybrid technologies and fuel efficiency without compromising aesthetics and vehicle performance
• Outreach

• [http://www.mae.ncsu.edu/org/weel/Introduction.html](http://www.mae.ncsu.edu/org/weel/Introduction.html)
Annual Competition

- STEP2010Promo.wmv
Annual Competition
Renewable Energy Data Acquisition System

Energy data for each system listed below can be viewed and downloaded for research and learning. Performance readings for each system is averaged over a fifteen minute period and made available for data export or RSS feeds.

House
- 5.4 kW Photovoltaic Panel (24 SunPower Residential SPR-235)
- Solar Thermal Water Heater
- Passiva Solar Sun Space Design
- Geothermal Heat Pump

Garage
- 3 kW Photovoltaic Panel (Solar Cells)
- Hydrogen Fuel Cell

Annex
- 10.8 kW Photovoltaic Panel (16 KANEKA G-S683 Thin Film Silicon)
- Wind Turbine (Wisp 200)
- Solar Thermal Water Heater
GRIDc Key Points-

- **Comprehensive data acquisition system in a residential setting**
  - Data is collected from renewable energy technologies at the North Carolina Solar House located on the campus of North Carolina State University (NCSU), averaged over 15 minutes, and uploaded to the Internet where daily, monthly, and yearly information can be viewed graphically, or downloaded in a spreadsheet form.

- The data is currently being used in the development of instructional units designed for engineering, teacher education and construction technologies.

- The GRIDc project has developed curriculum to teach science, technology, engineering and mathematics (STEM) concepts using the renewable energy data.

- **The project enhances instruction and improves learning, while addressing a highly relevant social issue: renewable energy.**

- The project gives aspiring engineers and scientists a data-rich resource to study these renewable energy systems.
Creating a trained workforce today and the future
Questions and Comments

- william_deluca@ncsu.edu
- pam_carpenter@ncsu.edu