Sustainable TRANSPORTATION

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Advancing PEVs and the Future of PEV R&D and Deployment

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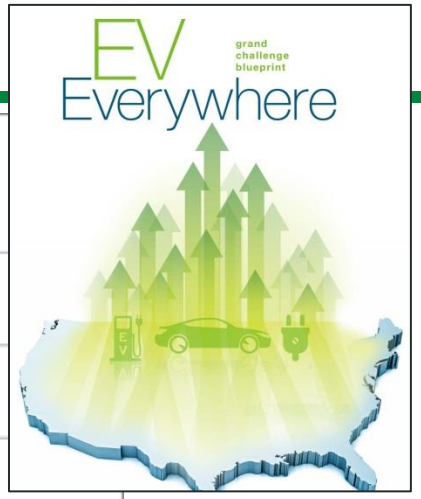
EV Everywhere Grand Challenge

President Obama announced EV Everywhere during a visit to Daimler Trucks in North Carolina, March 2012

EV Everywhere Goal

Enable the U.S. to be the first in the world to produce plug-in electric vehicles that are as affordable and convenient as today's gasoline-powered vehicles by 2022

EV Everywhere Targets



Meeting EV Everywhere Targets Will Significantly Lower PEV 5-year Cost of Ownership (vehicle cost plus fuel)[1]

Cost of Ownership ($)

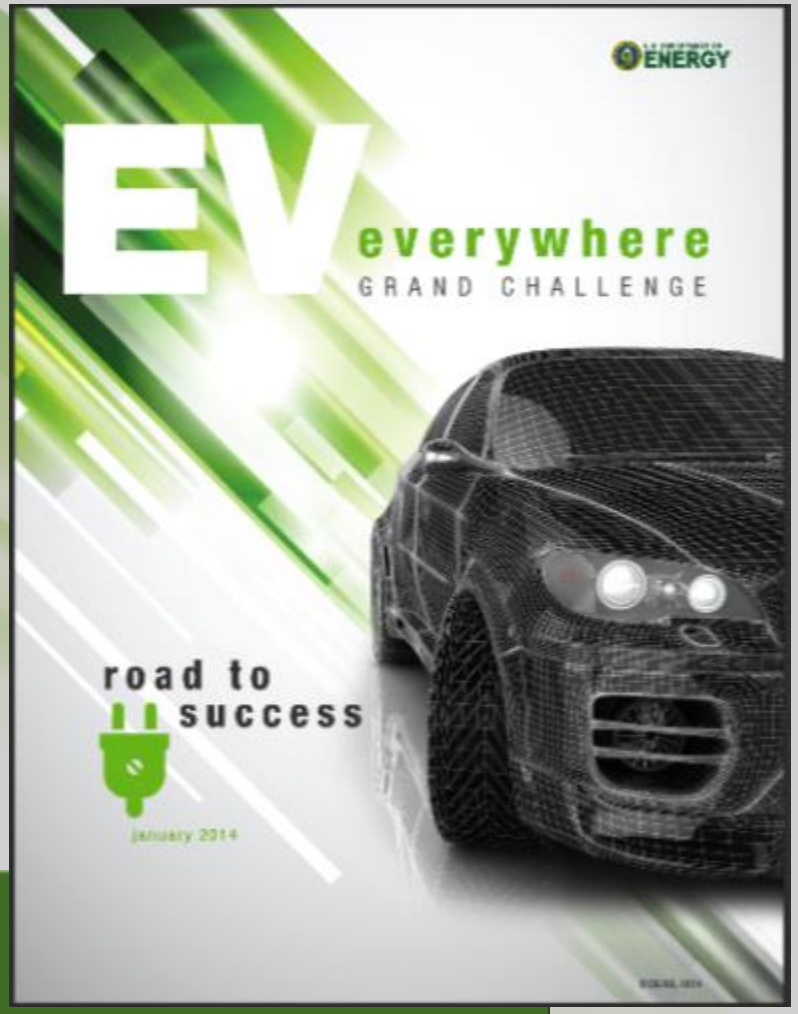
$90,000
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0

Cost Reduction

Conventional ICE
Plug-in Hybrid 40
Battery Electric, 100-mile range
Battery Electric, 300-mile range

[1]2022 vehicle cost, plus 5-year fuel (EIA AEO 2013 Reference Cost) expressed in 2012 dollars

EV Everywhere Progress Report Released January 22, 2014



EV EVERYWHERE – EARLY SUCCESSES

The top four things you need to know

- DOE research and development has reduced the cost of electric drive vehicle batteries to $325/kWhr, 50% lower than just four years ago.
- In the first year of the Workplace Charging Challenge, more than 50 U.S. employers joined the Challenge and pledged to provide charging access at more than 150 sites.
- DOE investments in *EV Everywhere* technology topped $225 million in the last 12 months, addressing key barriers to achieving the Grand Challenge.
- Consumer acceptance is rapidly growing – 97,000 plug-in electric vehicles were sold in 2013, nearly doubling 2012 sales.

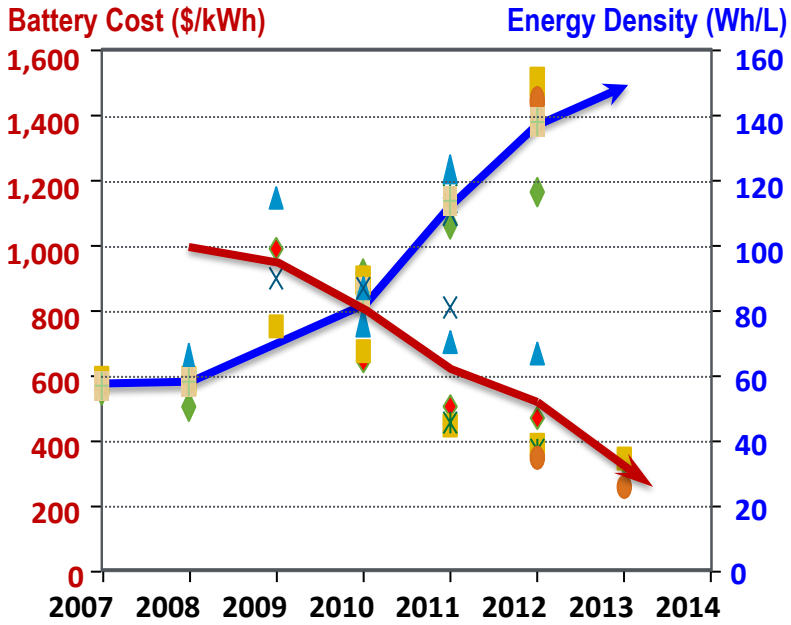
Battery Development Over Time

1990's → Nickel Metal Hydride (NiMH) batteries enabled commercial introduction of HEVs

2000 – 2010's → Lithium ion batteries enabled next generation HEVs, PHEVs and EREVs

Future → Next Generation Li-ion or Li-metal Chemistry with 3x energy density

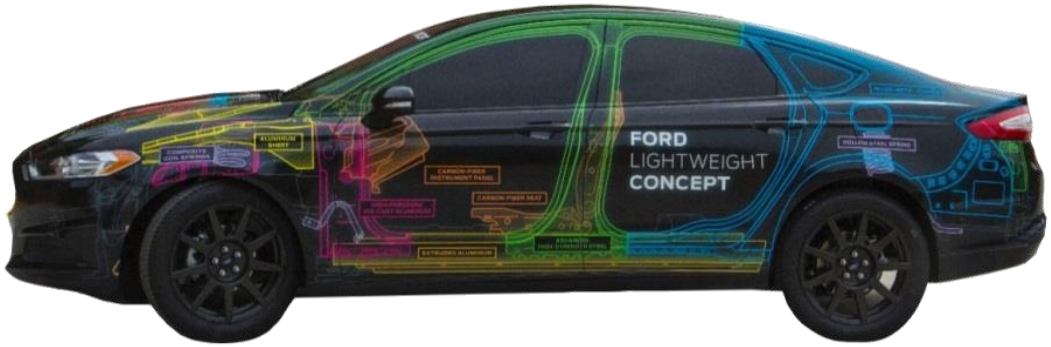
Vehicles sold from 1999-2012 resulted in savings of 1 billion gallons of gasoline or $3.3 billion.



Technology Progress/Success Stories (2)

Multi-material vehicle (MMLV)

Mach I: achieves a 23.5% overall weight reduction using commercially viable materials & processes vs. 2013 Fusion baseline.
Mach II: Approaches 50% weight reduction with technologies with future viability



Power Electronics and Electric Machines

- 2013 traction drive cost target met, now at $16/kW
- GM - first U.S.-based OEM manufacturing electric motors in U.S.
  - Cost-shared project
  - Chevy Spark EV electric IPM (rare earth magnets) motor
  - Plan to produce of low-rare earth content motor to replace PM motors in future vehicles (*sensitive)*
- Delphi - producing inverters based on technology innovations from R&D effort:
  - Cost-shared APEEM project
  - Innovative inverter design with integrated controller met 2015 R&D targets

Collaborating Through Government-Industry Partnerships

USDRIVE

DRIVING RESEARCH AND INNOVATION FOR VEHICLE EFFICIENCY AND ENERGY SUSTAINABILITY

Partners:

USCAR – United States Council for Automotive Research LLC
Chrysler
Ford
GM
bp
Chevron
ExxonMobil
DTE Energy
Edison
Phillips 66
Tesla
Shell
EPRI – Electric Power Research Institute

Associate Members at the Technical Level

21st CENTURY TRUCK PARTNERSHIP

INDUSTRY PARTNERS

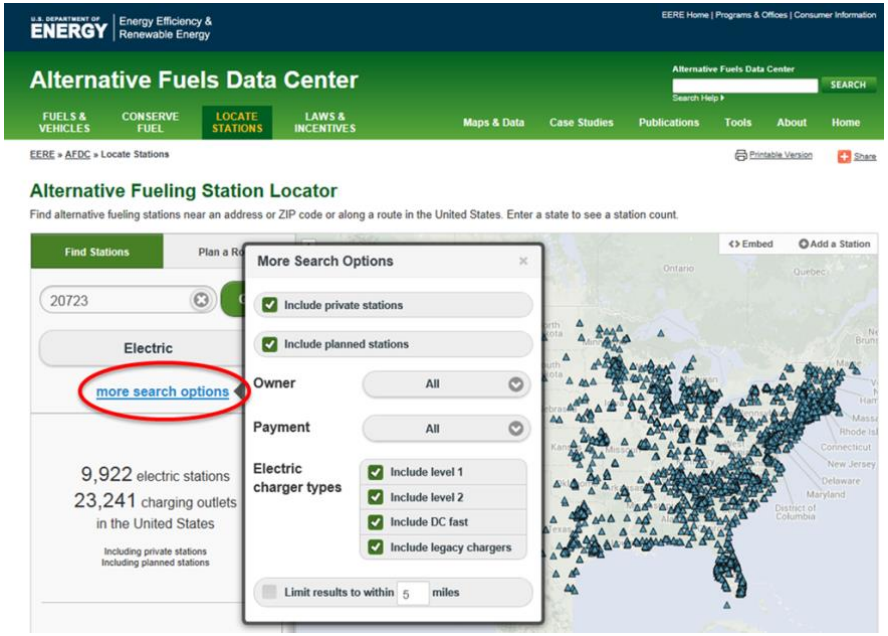
Allison Transmission
Daimler
Detroit Diesel
Oshkosh
Paccar
Meritor
BAE Systems
Eaton
Volvo
Mack
Caterpillar
Cummins
Honeywell
Navistar
Nova Bus

GOVERNMENT PARTNERS

energy.gov/eere/vehicles/vehicle-technologies-office-partnerships

DOE Deployment Efforts: Clean Cities

Mission: Advance U.S. energy, economic, and environmental security by supporting local decisions to reduce petroleum use in transportation



Goal: Reduce U.S. petroleum use by 2.5 billion gallons per year by 2020

1,000,000,000 Gallons Saved Annually

Clean Cities is shifting transportation away from petroleum—**one vehicle, fleet, and community** at a time. For the first time ever, coalitions and their stakeholders across the nation hit a major milestone in 2013 by reducing U.S. petroleum consumption by **one billion gallons** in a single year.

This puts the Clean Cities program ahead of schedule for meeting its petroleum-reduction goal of **2.5 billion gallons a year by 2020**.

Clean Cities reduced U.S. petroleum consumption by one billion gallons in 2013, a major step toward the program's 2.5 billion gallon per year goal.

Clean Cities advances the **energy, economic, and environmental security** of the United States by supporting local actions to reduce petroleum use in transportation.

In 2013 alone, the program:

- Reduced petroleum use by **1 billion gallons**
- Prevented **7.5 million tons** of greenhouse gas emissions
- Put **475,000 alternative fuel vehicles** on the road

Clean Cities: Reducing America's Oil Dependency a Billion Gallons at a Time

National Clean Fleets Partnership

April 2011 - President Announces Clean Fleets Partnership with 5 Charter Partners

(photo courtesy of White House)

- Challenge to top fleets across the country to adopt alt-fuels, advanced vehicles, petroleum reduction plans
- Pace-setters for others to follow

Program has grown to 26 National Clean Fleets Partners

(logos used with permission of companies represented)

Direct Impact: The 100 largest commercial fleets account for more than 1 million vehicles. Every 2,000 vehicles converted to alternative fuel = 1M gal/year petroleum displacement.

U.S. DOE Workplace Charging Challenge

Goal: Increase the number of employers offering charging by 10x by 2018

Workplace Charging Challenge
U.S. DEPARTMENT OF ENERGY

150 Partner employers committing to provide EVSE for employees

3,000+ EVSE installed or planned for installation

17 Ambassadors promoting and supporting workplace charging

Workplace Charging Challenge Resources & Technical Assistance

- EV 101 Content
- Targeted Employer Resources
- Employee PEV Outreach Resources
- Case Studies
- Workshops
- Quarterly Newsletters
- One-on-One Technical Assistance

http://energy.gov/eere/vehicles/ev-everywhere-workplace-charging-challenge

Workplace Charging Challenge Recognition

NASCAR®

Sprint®

MotorWeek

Television's Original Automotive Magazine

PBS

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electricvehicles.energy.gov