

# DOE's *EV Everywhere* Grand Challenge



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**President Obama announced  
the EV Everywhere Challenge  
on March 7, 2012**

## **EV Everywhere Goal:**

**Enable U.S. companies to  
produce plug-in electric vehicles  
as affordable and convenient  
as today's gas-powered vehicles  
by 2022**

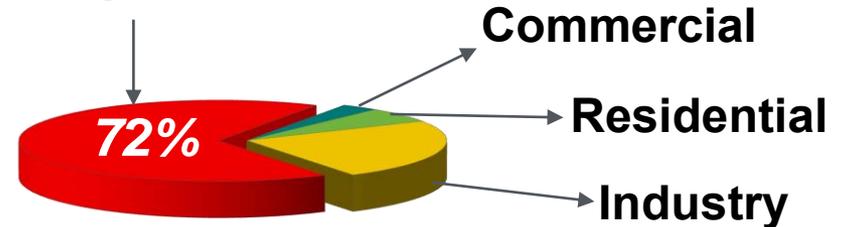
## Key Process Steps

- Defining the Challenge
  - Identify problem, potential solution, and barrier(s)
- Challenge announced by the President
  - statement of the goal
- Framing Document
  - identifies key barriers and potential approaches
- Workshops
  - stakeholder input from diverse sectors
- Blueprint
  - specifies refined targets
  - update R&D Roadmaps
- FOA announcement and Workplace Charging Partnership

## Problem: U.S. Oil-dependence is Driven by Transportation

- 72% of the daily consumption in 2012 (12.3 Million Barrels per Day)
- On-road vehicles are responsible for ~80% of transportation oil usage
- 97% Oil-dependent

## Transportation



Source: DOE/EIA Annual Energy Review (2013 Early Release Overview)

**Potential Solution:** Electric traction drive vehicles have the potential to significantly reduce oil consumption and provide a clear pathway for low-carbon transportation.

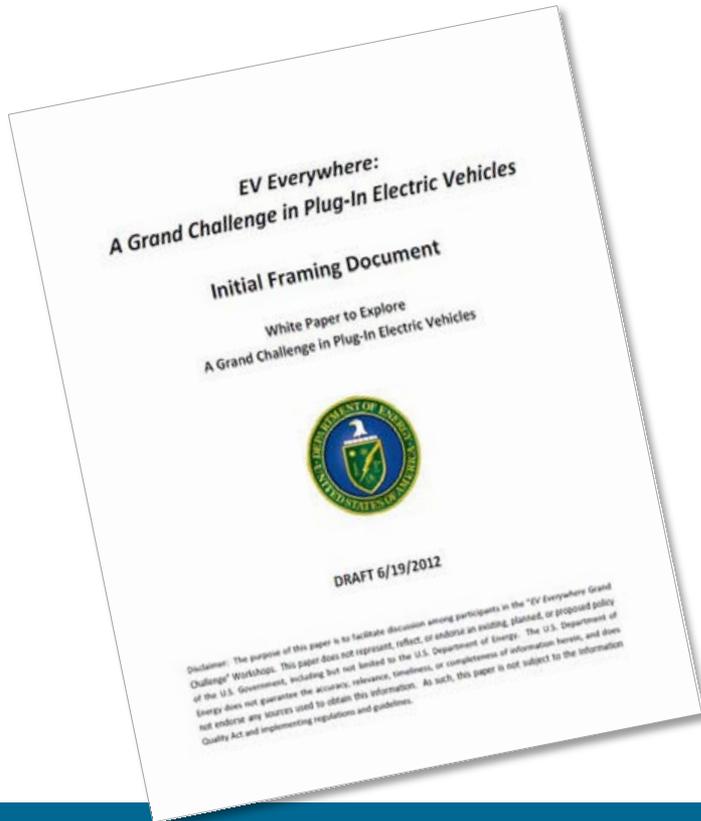
**Barrier:** Significant advances in EV affordability and performance are needed in order to achieve market penetration necessary to achieve a large reduction in petroleum consumption.

## **A Framing Document Set Forth Initial Parameters:**

- Benchmark: 5-passenger vehicle
- Majority of vehicle-miles-traveled powered by electricity under standard drive cycles
- 5-year simple payback vs. equivalent gasoline-powered vehicle
- Any “vehicle range-charging infrastructure” scenario to be considered must credibly allow for the majority of American consumers to be willing to purchase the PEV as a primary vehicle
- No reduction in grid reliability

# Framing Document Posed Three Potential Scenarios

1. **PHEV-40** with limited fast-charge infrastructure,
2. **AEV-100** with significant intra-city and inter-city fast charge infrastructure, and
3. **AEV-300** with significant inter-city fast charge infrastructure

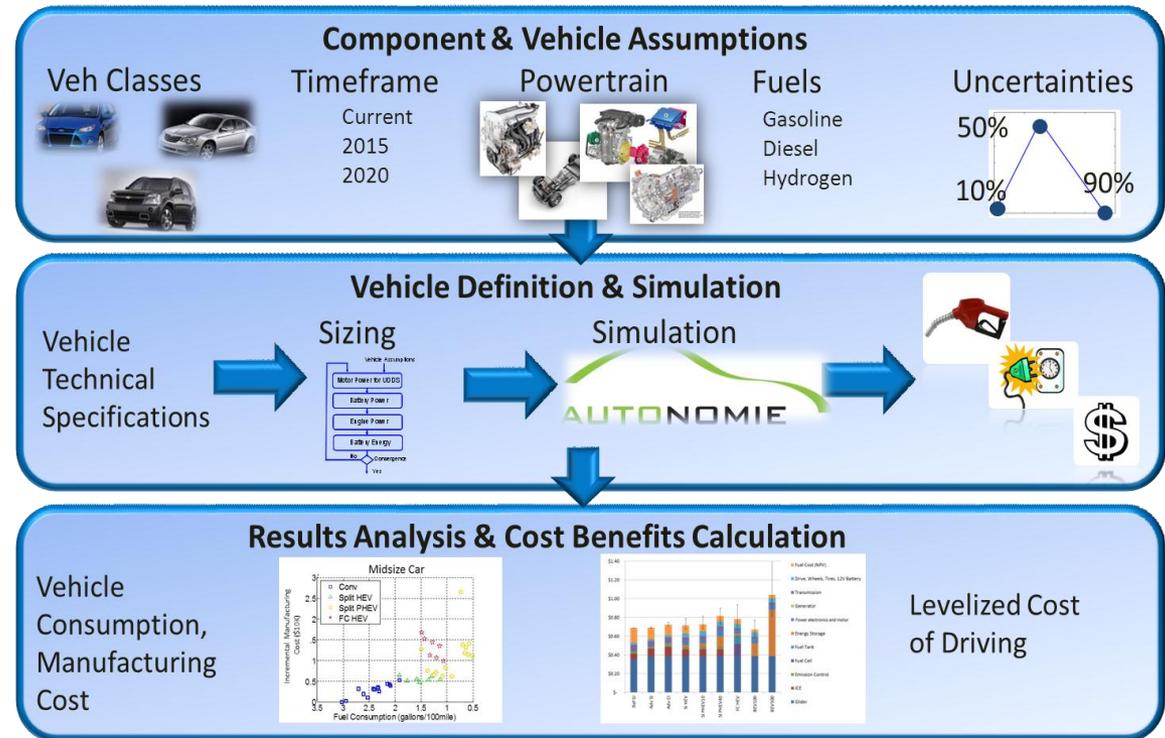


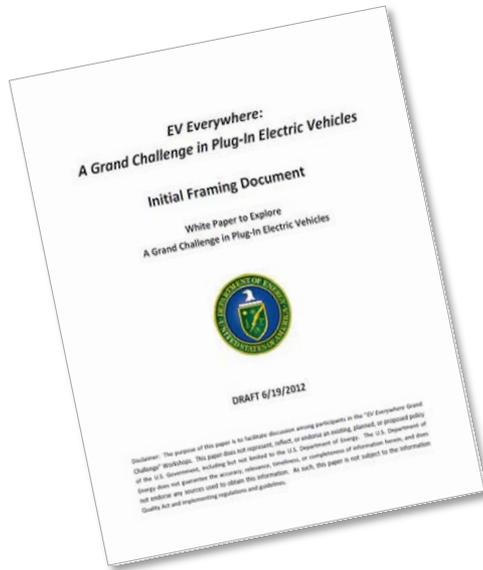
*Vehicle-level analysis provides a starting point for setting technical targets for these vehicles*

# EV Everywhere Analysis Process Flow

*in three steps...*

- DOE experts (with industry input) **define the bounds of technical possibility** for technology key metrics
  - 90% “low progress” scenario
  - 50% “mid case” scenario
  - 10% “high progress” scenario
- Define virtual vehicles** in Argonne National Lab’s *Autonomie* modeling and simulation software
- Compare vehicles in a 5-year simple payback framework** within bounds defined by experts





- Five workshops were held to get broad stakeholder input
- Framing document facilitated discussion among participants
- Re-evaluate and refine the existing technical goals for increasing performance and cutting costs

Topic	Date	Location
Kick-Off Framing Workshop	June 21	Detroit
Electric Drive Components	July 24	Chicago
Advanced Batteries	July 26	Chicago
Consumer Behavior and Charging Infrastructure	July 30	Los Angeles
Vehicle Design & Lightweight Vehicles	Sept 13	Washington

# Looking for major Impacts?

Lithium-ion and beyond battery technology?

Pack-level battery innovation?

Disruptive approaches to fast-charge/battery-swap?

Innovations for grid stability for fast charge?

Wide bandgap crystal growth?

New non-rare earth magnet/motor designs?

Autonomous vehicle control to enable ultra-lightweight PEV's?

Workplace Charging Challenge?

New vehicle ownership/usage models?

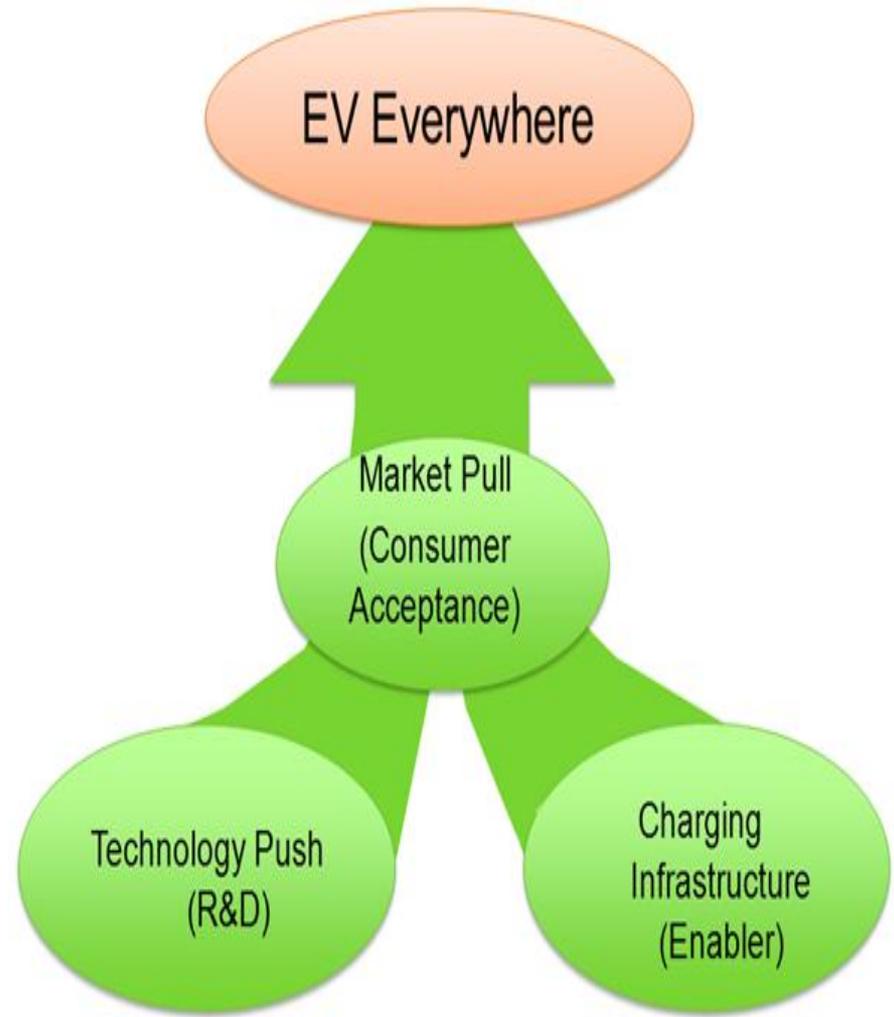
Non-economic drivers/psychological factors of PEV consumer adoption?

HOV Access for EV's?

- Key themes from workshops:
  - “Majority of vehicle miles electric” or “Maximize electric miles driven”
  - Payback time of 5 years may be too long for typical consumers
  - Need nationwide standardizations of charging stations, signage, and payment
  - Importance of workplace charging
  - EVs should not just be a replacement product, they need value added components

# Major Components of the *EV Everywhere* Grand Challenge

- ❑ **Technology Push (R&D):** reducing PEV costs through advancements in:
  - advanced batteries,
  - electric drive systems,
  - lighter weight structures,
  - enabling technologies such as advanced climate control.
- ❑ **Charging Infrastructure (Enablers):** Critical issues include codes and standards, siting, grid integration, permitting, and signage.
- ❑ **Market Pull (Consumer Acceptance):** Moving from early adoption to mainstream use requires consumer education and exposure to PEVs, innovative PEV ownership incentives, and leadership by example among public and private fleets.

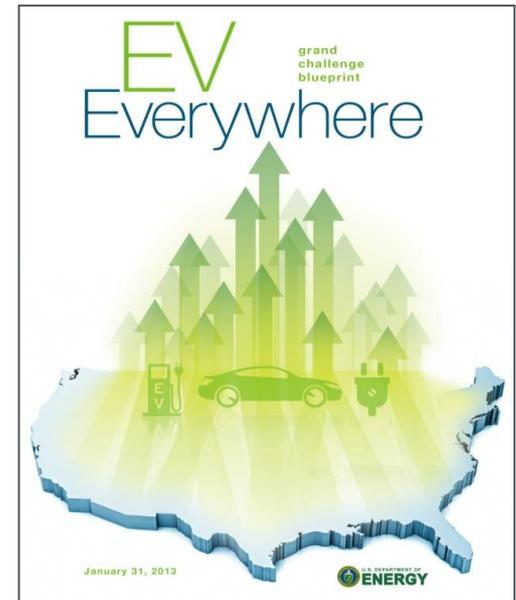


Secretary Chu announced the EV Everywhere Blueprint release and Workplace Charging Challenge at the Washington Auto Show on January 31, 2013.



## Workplace Charging Challenge

Increase number of U.S. companies offering workplace charging by tenfold in five years.



For a copy of the Blueprint, visit <http://electricvehicles.energy.gov>

# Workplace Charging Challenge goal: increase number of US employers offering charging tenfold in 5 years

## Benefits for the big picture

- + Fill infrastructure gap
- + Grow the PEV market
- + Increase visibility of PEVs
- + Add electric VMT
- + Primary charge point for multi-unit/urban dwellers

## Benefits for the employer

- + Employee benefit
- + Corporate sustainability
- + Contribute to LEED certification
- + Keeping up with the Googles

## 31 Partners



## 12 Ambassadors



## R&D Roadmaps Updated to reflect EV Everywhere Targets

## Funding Opportunity Announcement (FOA) release February 2013

- DOE investment of over \$50 million
- Request R&D proposals in 4 technical areas:
  - vehicle lightweighting
  - electric drive systems
  - advanced batteries
  - auxiliary load reduction

### Vehicle Weight Reduction

Reduce vehicle weight by nearly 30% (Includes body, chassis, interior, electric drive components, and compounding weight reductions)

### Battery

Reduce cost from \$500/kWh in 2012 to \$125/kWh (250 Wh/kg, 400 Wh/L, 2 kW/kg)

### Electric Drive System

Reduce cost from \$30/kW in 2012 to \$8/kW (1.4 kW/kg, 4 kW/L, 94% efficiency)



# QUESTIONS?

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